

# Carrigtwohill to Midleton Inter-urban Cycleway Phase 2

Ecological Impact Assessment

Cork County Council

19/12/2023



# Notice

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# 1. Introduction

## 1.1. Background and Scope

WS Atkins Ireland Ltd (“Atkins”) was appointed by Cork County Council to undertake, on its behalf, an Ecological Impact Assessment (EclA) of the proposed Carrigtwohill to Midleton Inter-urban Cycleway Phase 2 (“the proposed development”), which is proposed to provide an off-road, safe cycling and walking facility between the towns of Carrigtwohill and Midleton.

This report comprises the EclA in respect of the proposed development. It describes the biodiversity present within the footprint of the proposed development, evaluates the importance of ecological features on a geographic scale, assesses the likely effects of the proposed development on key ecological features and proposes appropriate measures to avoid or reduce those effects. Furthermore, this EclA proposes ecological enhancements of the proposed development to ensure that it reflects the principle of Biodiversity Net Gain, in line with Cork County Council policy.

This report should be read in conjunction with the Appropriate Assessment Screening Report for the proposed development (Atkins Doc. Ref. 5194601DG0228), which assesses the potential for the proposed development to significantly affect Natura 2000 sites.

## 1.2. Project Description

The description of the proposed development provided here is taken from Sections 4 and 5 of the *Part 8 Planning Application Report* (Atkins Doc. Ref. 5194601DG0224), where full details can be found.

### 1.2.1. Overview

The proposed development comprises a section of inter-urban cycle route running to the north of Carrigtwohill and connecting the Inter-urban Cycleway Phase 1 with the Water Rock Services Corridor Link Road Cycleway. It forms part of the cycle route connecting Midleton to Dunkettle, which is proposed in the Cork Metropolitan Area Transport Strategy 2040 (CMATS). This inter-urban route (IU-1) will connect major employment centres such as Little Island (10,000+ employees) and Carrigtwohill IDA Business Park (3,800 employees) with existing and proposed residential areas including in Carrigtwohill, Midleton, Glanmire and Glounthaune.

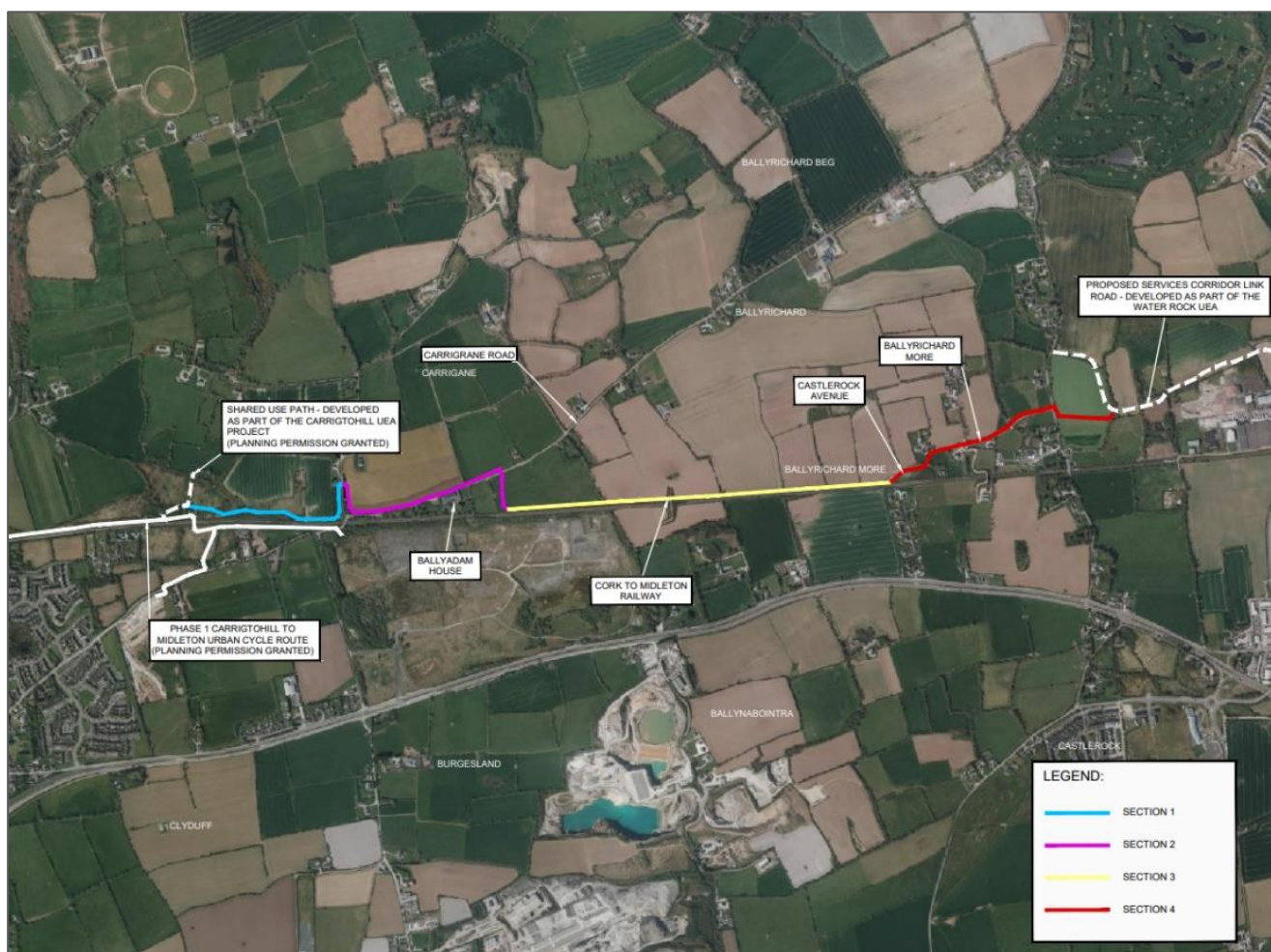
The proposed development is a high-quality, predominantly off-road cycling and walking facility that is c. 3.7km long, with c. 66m as a shared street (with a very low vehicular traffic) and the rest as a segregated path from vehicular traffic. In addition, the proposed development includes: -

- 1 no. pedestrian/cyclist underpass (at existing overpass agricultural road),
- 4 no. at-grade road crossings,
- Traffic calming measures on existing roads,
- Potential for native planting corridor, and
- Public lighting.

The route is designed to interface with and is compatible with new infrastructure planned in the Carrigtwohill UEA and the Water Rock UEA.

### 1.2.2. Proposed Design

The proposed route is divided into 4 no. sections as shown in Figure 1-1 below. These sections are described in summary below with further detail provided in the Part 8 drawings.



**Figure 1-1 - Overall layout of the proposed development.**

*Section 1: Connection to Phase 1*

The cycleway commences just north of the Cork to Midleton Railway Line within lands zoned for the Carrigtwohill Urban Expansion Area (UEA). The route connects to Phase 1 via a short link of active travel infrastructure being developed as part of the Carrigtwohill URDF Initiative – UEA Infrastructure. The Part 8 Planning Application for the UEA Infrastructure was published by Cork County Council in June 2023 with a decision expected by October 2023. The connecting active travel link, being integral to the development of Phase 2, will thus be constructed in tandem with or ahead of the Phase 2 route.

The route will then be accessible from Phase 1 via the abovementioned link, before continuing in an easterly direction and running in parallel with the railway line. The alignment along this section is fairly straight, with minor changes in direction to avoid any impact to dense outcrops of vegetation while keeping to field boundary lines in general. The existing field boundaries along this section will be maintained with sections of hedgerow planted along a new fence line.

The route then turns northwards as it approaches Ballyadham Road Junction. The route continues northwards parallel to Ballyadham Road for a short section until adequate sight lines are achieved for a safe at-grade crossing. At this point, an uncontrolled raised table crossing will be provided, with a coloured surface texture. The proposed crossing point will include street lighting to improve visibility of pedestrians and cyclists, including traffic calming measures e.g. rumble strips and road signage to reduce the speed of approaching vehicles. The crossing point will require the removal of sections of existing hedges within the Ballyadham Road verge to provide adequate sight lines to cyclists and pedestrians, as indicated in the Part 8 Drawings.

New ducting will be provided to the road crossing on Ballyadham Road to facilitate connection of street lighting.

A nature-based surface water drainage system involving a combination of over-the-edge drainage and swales will be provided along Section 1. Surface water run-off will be directed to the grassed verge on one or both sides of the cycleway where water will infiltrate to ground. This will be augmented by the provision of a linear planted swale in the northern verge. A collector pipe in the swale will convey excess water and discharge it to an existing drainage ditch. Discharge will be limited to greenfield run-off rates via check dams in the swale and a flow control device if required. The drainage ditch discharges to the Poulaniska stream north of the railway line.

Existing natural vegetation and trees that will be removed as part of the works will be replaced by similar or suitable native planting, semi-mature trees and shrubs.

### *Section 2: Carrigane Road*

From its crossing point on Ballyadam Road (N), the cycleway continues its east-west alignment north of and parallel to the Carrigane Road with the existing hedgerow maintained as a buffer between the road and cycle route. The buffer area will also include a grassed verge of 3m. Agricultural lands form a boundary on the northern side of the route. A new hedge will be planted inside a new fence line to screen these lands from the cycle route. This will also act as a wind break for cyclists.

The alignment then proceeds southwards with an at-grade road crossing proposed on Carrigane Road, provided to the east of Ballyadam House. The crossing location will consist of a signalised toucan crossing with new street lighting to improve visibility of pedestrians and cyclists. The crossing location will include traffic calming measures in the form of rumble strips and road signage to reduce the speed of approaching vehicles. The crossing point will require the removal of the existing hedgerow within the northern road verge to facilitate adequate sight lines for cyclists and pedestrians, as indicated in the Part 8 drawings. New ducting will be provided for the street lights and signal infrastructure.

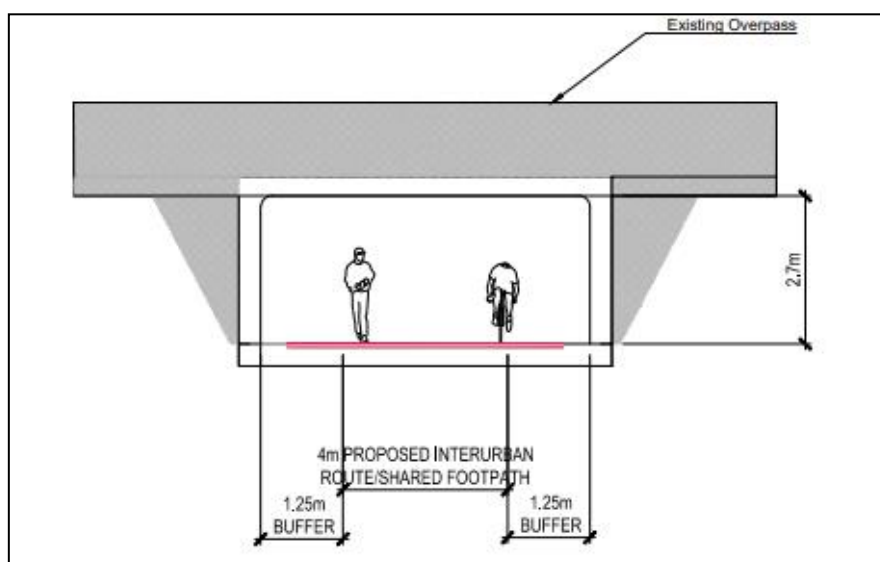
The southern alignment passes through an agricultural field with an existing stone boundary wall. A length of c. 10m of the wall will be demolished to allow the cycle lane to pass through. The route proceeds southwards through the field before re-joining the general railway line alignment, proceeding in an easterly direction.

To the north of Carrigane Road, a nature-based surface water drainage system involving a combination of over-the-edge drainage and swales will be provided. Surface water runoff will be directed to a grassed verge on one or both sides of the cycleway where water will infiltrate into the ground via a linear planted swale.

Over-the-edge drainage is proposed south of the crossing of Carrigane Road. Again, a planted swale with check dams will collect water in the verge and allow it to infiltrate to ground. Excess water will be conveyed to an additional sustainable drainage systems (SuDS) feature such as a rain garden i.e. a planted depression provided at the lowest point on the field.

### *Section 3: North of Cork to Midleton Railway Line*

In Section 3 the cycle route follows the railway line along an east-west axis keeping to agricultural field boundaries. Trees will be planted along the northern field boundary, while maintaining the hedgerow to the south along the railway line. Approximately halfway through Section 3, the route crosses an existing agricultural overpass which facilitates farm activity across the railway line. Given the proximity of the cycle route to the railway line at this point, it was necessary to create an underpass beneath the embankment of the overbridge to maintain a straight cycle route. A cross-sectional profile of the underpass is provided in Figure 1-2 below. The proposed underpass will be a minimum of 10m from the existing overpass abutments.



**Figure 1-2 - Typical cross-section through the proposed underpass.**

Nature-based over the edge drainage is again proposed along this section. Again, a planted swale with check dams will collect water in the verge and allow it to infiltrate to ground. Excess water will be conveyed to an additional SuDS feature such as a rain garden i.e. a planted depression provided at the lowest point on the field.

#### *Section 4: Ballyrichard More Road*

The cycle route deviates slightly from the railway line once it meets an existing access track to the west of the Ballyrichard More Road, which accommodates minor farm movements. The route continues as a segregated cycle lane adjacent the farm track before proceeding northwards along Ballyrichard More Road. The short northern section of road that provides access to 3 no. private properties will be re-surfaced and converted to a 4m wide shared street, where cyclists will have priority over vehicle movements. The shared street will be denoted by road signage and road markings.

The cycle route will then continue off road, and to the north of Ballyrichard More Road following agricultural field boundaries. An at-grade raised crossing is proposed at the junction with Castle Rock Avenue. The route then crosses the Water Rock stream, above the existing culvert structure, thus removing the need for an additional water crossing or works within the stream. The route continues across Water Rock Road, with an at-grade crossing provided just north of its junction with Ballyrichard More Road.

An uncontrolled raised table crossing will be provided. The existing streetlights will be enhanced by new lighting columns provided at the junction, and may require additional ducting. Traffic calming measures in the form of rumble strips and road signage will be included.

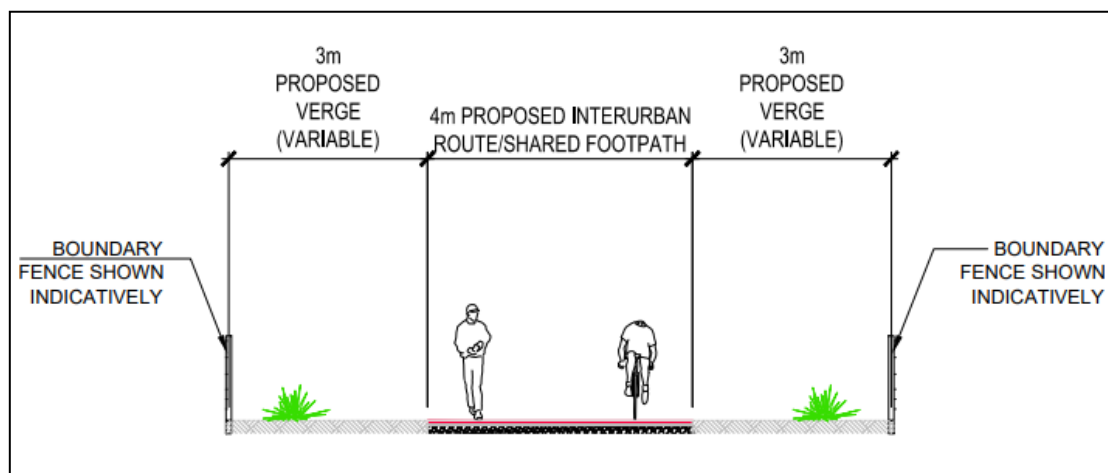
From this point, the route crosses through the hedgerow/treeline, a section of which will be removed to ensure adequate sightlines are provided for pedestrians and cyclists crossing. The route then emerges at the Water Rock Urban Expansion Area (UEA), where it joins the planned Services Corridor Link Road.

The route running parallel to the farm track will include a grassed verge allowing water to infiltrate to ground. Any excess surface water will be directed to the lowest point of the field on the adjacent Section 3 where various SuDS features including a rain garden are proposed. The existing over-the-edge drainage system will be retained along the shared-use section. The detailed design will ensure there is no increased risk of flooding to adjacent properties. The cycleway running parallel to Ballyrichard More Road will be sloped towards the grassed verge on the southern side. A perforated large collector pipe will be provided in this verge. This will collect and attenuate excess run-off in the verge. This pipe will connect to the existing drainage system on Ballyrichard More Road. Discharge will be limited to greenfield run-off rates. The road drainage system connects to the Water Rock Stream. The section crossing over to the Water Rock UEA lands will comprise a grassed verge with filter drain on the northern side of the cycleway. This filter drain will discharge attenuated flows to the surface water drainage system within the Water Rock Local Infrastructure Housing Activation Fund (LIHAF) Initiative.



## Proposed Cross-section

The cross-section of the cycleway, as shown in Figure 1-3 below, will be a minimum of 4m wide with a minimum planted verge of 3m on either side where this is achievable. The path will generally consist of an asphalt surface and will be constructed at-grade or slightly above existing ground levels. The total area of hard surface will be c. 14,850m<sup>2</sup> with drainage as described above.



**Figure 1-3 - Typical cross-section of the proposed cycling and walking facility.**

## Street Lighting

Public lighting will be provided at junction crossings to improve the safety and security of all users. The public lighting design will be undertaken in accordance with Cork County Council's Public Lighting Manual and Product Specification 2021 and will include the proposed layout and associated ducting and power supply details. The cycle route itself will include lighting along its length. The design of the lighting system will take into consideration the potential impacts of artificial lighting on bats and other wildlife occurring along the corridor. The design will also take into account the bat roost identified at Ballyadam House as well as foraging and commuting routes such as hedgerows and treelines present in the study area. The lighting design will include low-wattage, warm light consisting of Light Emitting Diode (LED) luminaires and will be directed downward to retain darkness above.

## Proposed Landscape Strategy

Ecological considerations have been key factors in the route selection of the inter-urban cycle route. Where possible, the route has been chosen to run parallel and offset from existing hedgerows and treelines so that they can be preserved. In total, it will be necessary to remove approximately 891m of hedgerows/treelines to construct the route. This will be mitigated by the replacement of this with a minimum of 2,281m of new hedgerows/treelines (an increase of 1,390m) aligned to the route as well as new areas of planting in SuDS features throughout.

Planting will be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist to enhance local biodiversity value as appropriate for each section of the route. An objective of the planting strategy will also provide amenity value to enhance the cycle route and to provide surface water pollution prevention measures.

### 1.2.3. Construction Methodology

The works will commence with site clearance and accommodation works. Temporary traffic management including measures for pedestrians and cyclists will be put in place. Trees/vegetation to be retained will be marked and protected and the site boundary will be fenced off. Natural buffer areas on existing watercourses outside of the infrastructure area will be maintained and protected during construction. The site will be cleared of redundant fencing and road signage, street lighting to be replaced and vegetation to be removed. Vegetation clearance will be done in the appropriate season, i.e. outside of the bird nesting season (1<sup>st</sup> March to 31<sup>st</sup> August, inclusive).

Underground utilities that conflict with the main works will be uncovered using mechanical excavators and hand digging where appropriate. A utility survey, including slit trenches for verification, will be carried out during the detailed design stage to determine the location of services to the most accurate extent possible. Protection works or any service diversions that are required will be undertaken at this stage.

The route of the cycle/pedestrian path will be excavated to formation/sub-formation level. It is anticipated that generally the maximum excavation depth will be 500mm. Excavation of the topsoil and road verge will largely be undertaken by mechanical means with any spoil arisings to be removed off site or reused locally where testing confirms its suitability. The path will be limited to a 4m wide asphalt path with concrete kerb restraints on either side of the pavement. The new path will be constructed using a bituminous pavement construction in accordance with the TII Specification for Road Works Series 900 – Road Pavements. A 150mm layer of imported stone will be placed and compacted followed by asphalt layers respectively.

At the existing agricultural overpass that crosses the railway line, an underpass with a 6.5m wide clearance will be constructed through the embankment of the existing overbridge to facilitate the cycle route. This will require temporary closure of the overbridge. The area for the underpass will be excavated and a pre-cast concrete box culvert installed. Spoil arisings will be removed offsite or re-used locally where testing confirms its suitability. The overbridge and embankments will be reinstated and the bridge re-opened. Once installation is complete, lighting and surfacing will be installed in the underpass and it will be connected to the rest of the route.

The route passes through an existing stone wall of which approximately 10m will be demolished. Suitable hand tools, alternatively a jack hammer, will be used and the demolished material will be removed as soon as possible. A temporary fence and barricading of the area around the structure will be undertaken to ensure safety of the travelling public along the Carrigane Road.

Where the route crosses the Water Rock stream, west of the Ballyrichard More/Castle Rock Avenue junction, the existing culvert structure will be used, thus eliminating the need for additional construction works or in-stream works associated with a new crossing.

Drainage works will run in tandem with the route construction phase. Drainage will be 'over-the-edge' to a filter drain (perforated pipe in gravel trench) running alongside the length of the route, as described in Section 1.2.2.

At grade road crossings of Ballyadam Road, Carrigane Road and Castle Rock Avenue will be constructed under temporary traffic management measures. New road signs, road markings, public lighting columns, traffic signals and bollards will be installed and commissioned where required. Temporary traffic management measures will be removed when appropriate.

Areas of soft landscaping along the route will be top-soiled, seeded and planted following specification by a Landscape Architect working with a suitably qualified and experienced ecologist. Maintenance of new planting will be undertaken by the Contractor for a minimum of two years following completion.

## 2. Methodology

### 2.1. Guidance

This report was prepared with due regard to the relevant guidance, including but not limited to: -

- All-Ireland Pollinator Plan 2021-2025. *National Biodiversity Data Centre Series 25*. National Biodiversity Data Centre, Waterford. March 2021.
- *Biodiversity Action Plan for Carrigtwohill 2019-2023*. Produced by William O'Halloran, Finbarr Wallace and the Carrigtwohill Community as part of the Wild Work initiative.
- *Biodiversity and the Planning Process: Guidance for developers on the management of biodiversity issues during the planning process*. Planning Department, Cork County Council, Cork.
- CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.2 - Updated April 2022*. Chartered Institute of Ecology and Environmental Management, Winchester.
- Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3<sup>rd</sup> edition)*. Bat Conservation Trust, London.
- Collins, J. (ed.) (2023). *Bat Surveys for Professional Ecologists: Good Practice Guidelines (4<sup>th</sup> edition)*. Bat Conservation Trust, London.
- *Cork County Council Recommended List of Native Tree and Shrub Species for Residential & Industrial Developments, Version 2*. Ecology Office, Cork County Council, Cork. June 2022.
- *Cork County Development Plan 2022-2028*. Cork County Council, Cork. June 2022.
- EPA (2022). *Guidelines on the information to be contained in Environmental Impact Assessment Reports. May 2022*. Environmental Protection Agency, Wexford.
- NRA (2006). *Guidelines for the Treatment of Bats during the Construction of National Roads Schemes*. National Roads Authority, Dublin.
- NRA (2008a). *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*. National Roads Authority, Dublin.
- NRA (2008b). *Guidelines for the Crossing of Watercourses during the construction of National Road Schemes*. National Roads Authority, Dublin.
- NRA (2009a). *Guidelines for Assessment of Ecological Impacts of National Roads Schemes. Revision 2*. National Roads Authority, Dublin.
- NRA (2009b). *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*. National Roads Authority, Dublin.
- Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E. (2011). *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council, Kilkenny.
- TII (2006). *A Guide to Landscape Treatments for National Road Schemes in Ireland. GE-ENV-01102. February 2006*. Transport Infrastructure Ireland, Dublin.
- TII (2012). *Guidelines on the Implementation of Landscape Treatment on National Road Schemes in Ireland. GE-ENV-01103. July 2012*. Transport Infrastructure Ireland, Dublin.

- TII (2020a). *The Management of Invasive Alien Plant Species on National Roads – Standard*. GE-ENV-01104. December 2020. Transport Infrastructure Ireland, Dublin.
- TII (2020b). *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance*. GE-ENV-01105. December 2020. Transport Infrastructure Ireland, Dublin.

## 2.2. Desk Study

Baseline data regarding the receiving environment, including Natura 2000 sites, was gathered through a thorough desk study. The locations and boundaries of Natura 2000 sites in relation to the proposed development were reviewed on the National Parks & Wildlife Service (NPWS) *Designations Viewer*. Information on the qualifying interests and the structures and functions of Natura 2000 sites was found in the Site Synopsis, Natura 2000 Standard Data Form, Conservation Objectives and supporting documents for each site. Reporting under Article 17 of the Habitats Directive (NPWS, 2019a-c; ETC/DB, 2022a) and Article 12 of the Birds Directive (NPWS, 2022c; ETC/BD, 2022b) provided further information on the habitats and species concerned at the national level.

Spatial and other data regarding rivers and other waterbodies were obtained from the Environmental Protection Agency (EPA) using its online facility *EPA Maps*. Spatial data for other features of the natural environment were viewed on the *ESM Webtool*. Information relating to recent and historical records of species was obtained from the National Biodiversity Data Centre (NBDC) *Biodiversity Maps* and via a data request to the NPWS. In addition, reports listed below relating to other proposed developments whose study areas partly overlapped that of the cycleway were also reviewed for relevant information, having due regard to the *Advice note on the lifespan of ecological reports and surveys* (CIEEM, 2019): -

- Limosa (2015). *Preliminary Ecological Appraisal for the Carrigtwohill North Masterplan Site*. RP15-GW102-02. Report by Limosa Environmental.
- Atkins (2018). *Water Rock Urban Expansion Area Infrastructure Works. Ecological Impact Assessment*. November 2018. Report by WS Atkins Ireland Ltd for Cork County Council.
- Greenleaf Ecology (2020a). *Ecological Walkover Survey, Carrigtwohill URDF Initiative, Carrigtwohill, Co. Cork*. Report by Greenleaf Ecology for WS Atkins Ireland Ltd and Cork County Council.
- Greenleaf Ecology (2020b). *Bat Survey, Carrigtwohill URDF Initiative, Carrigtwohill, Co. Cork*. Report by Greenleaf Ecology for WS Atkins Ireland Ltd and Cork County Council.
- Atkins (2021a). *Carrigtwohill to Middleton Inter-urban Cycleway Phase 1. Environmental Impact Assessment Screening Report*. November 2021. Report by WS Atkins Ireland Ltd for Cork County Council.
- Atkins (2021b). *Carrigtwohill to Middleton Inter-urban Cycleway Phase 1. Screening for Appropriate Assessment*. November 2021. Report by WS Atkins Ireland Ltd for Cork County Council.
- Atkins (2021c). *Carrigtwohill to Middleton Inter-urban Cycleway Phase 1. Ecological Impact Assessment*. November 2021. Report by WS Atkins Ireland Ltd for Cork County Council.
- Gittings, T. (2023). *Carrigtwohill Waterbird Survey, November 2022 - February 2023. Report No. 2227-F1, Revision 1, dated 20/03/2023*. Tom Gittings PhD MCIEEM for WS Atkins Ireland Ltd on behalf of Cork County Council.
- Atkins (2023a). *Carrigtwohill URDF Initiative. Appropriate Assessment Screening Report*. May 2023. Report by WS Atkins Ireland Ltd for Cork County Council.
- Atkins (2023b.) *Carrigtwohill URDF Initiative. Ecological Impact Assessment*. May 2023. Report by WS Atkins Ireland Ltd for Cork County Council.
- Atkins (2023c). *Carrigtwohill URDF Initiative. UEA Infrastructure - Environmental Impact Assessment Screening Report*. May 2023. Report by WS Atkins Ireland Ltd for Cork County Council.

## 2.3. Field Surveys

A preliminary walkover of the route of the proposed cycleway was undertaken by Atkins ecologist Owen O’Keefe on 8<sup>th</sup> April 2023. The purpose of this walkover was to highlight any major ecological constraints at an early stage and to determine the scope of ecological surveys required.

Multi-disciplinary surveys were undertaken by Atkins ecologists Owen O’Keefe and Caroline Downey, covering the eastern half of the proposed development on 29<sup>th</sup> June 2023 and the western half on 3<sup>rd</sup> July 2023. These surveys included: -

- classifying habitats within the study area using *A Guide to Habitats in Ireland* (Fossitt, 2000).
- identifying habitats with potential links to natural habitat types listed on Annex I to the Habitats Directive (“Annex I habitats”).
- compiling comprehensive botanical lists for each habitat.
- identifying and mapping invasive alien species (IAS), especially legally restricted IAS such as Japanese Knotweed.
- recording direct observations or evidence of protected or threatened species, whether mammals, birds, reptiles, amphibians or invertebrates, or suitable habitats, especially potential breeding or resting places, for such species.

Bat surveys were carried out by Karen Banks MCIEEM of Greenleaf Ecology. These surveys included walkovers to identify suitable foraging and commuting habitat, assessment of potential roost features, activity transects, passive monitoring, and dusk emergence surveys at potential roost features. Full details of the bat surveys are provided in the report cited below, which is presented in Appendix A to this EclA.

- Greenleaf Ecology (2023). *Bat Survey, Carrigtwohill to Water Rock Inter-Urban Cycle Route - Phase 2, Co. Cork*. Report by Greenleaf Ecology for WS Atkins Ireland Ltd and Cork County Council.

The above site visits were conducted following the most appropriate and most recent guidelines available at the time of survey and reporting, including: -

- NRA (2009b). *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*. National Roads Authority, Dublin.
- Smith, G.F., O’Donoghue, P., O’Hora, K. and Delaney, E. (2011). *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council, Kilkenny.
- Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3<sup>rd</sup> edition)*. Bat Conservation Trust, London.<sup>1</sup>

In addition, the results of ongoing (July to October 2023) pre-works surveys for bat roosts, non-volant mammals and invasive alien plant species in relation to Work Package 7 of the Water Rock UEA Infrastructure Works (along the Water Rock Road) were also taken into account, where relevant.

## 2.4. Ecological Impact Assessment

The overall methodology followed in the preparation of this report was informed by the most recent guidelines for EclA in the UK and Ireland, i.e. the CIEEM (2018) guidelines, as updated in April 2022. In addition, the methods for specific aspects of the assessment, e.g. evaluation of receptors, assessment of impacts and effects, and development of mitigation and enhancement measures, had regard to appropriate guidelines from the National Roads Authority (now Transport Infrastructure Ireland) and the EPA. These methods are described below.

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<sup>1</sup> The 4<sup>th</sup> edition of these guidelines was published in September 2023, after most of the surveys to inform this EclA had been completed. Therefore, the 3<sup>rd</sup> edition applied to these surveys.

## 2.4.1. Evaluation of Ecological Receptors

The evaluation of the importance of ecological features present within the footprint of the proposed development, the Carrigtwohill UEA and the Zone of Influence followed *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (NRA, 2009a). The geographic frame of reference summarised in Table 2-1 below was used.

**Table 2-1 - Geographic frame of reference for evaluating the importance of ecological features. Following: NRA (2009a).**

Level	Examples (non-exhaustive)
International Importance	<ul style="list-style-type: none"> <li>• European (Natura 2000) sites or sites which fulfil the criteria for such a designation.</li> <li>• Features essential to the coherence of the Natura 2000 network.</li> <li>• Best examples of natural habitat types listed on Annex I to the Habitats Directive (“Annex I habitats”).</li> <li>• Resident of regularly occurring populations of bird species listed on Annex I to the Birds Directive or animal or plant species listed on Annex II or IV to the Habitats Directive (“Annex II/IV species”) (in numbers of national importance).</li> <li>• Wetlands of International Importance (under the Ramsar Convention).</li> <li>• UNESCO World Heritage Sites or Biosphere Reserves.</li> </ul>
National Importance	<ul style="list-style-type: none"> <li>• Designated or proposed Natural Heritage Areas (NHA/pNHA), statutory Nature Reserves or sites fulfilling the criteria for such a designation.</li> <li>• Resident or regularly occurring populations of species protected under the Wildlife Act, 1976 (as amended) or listed on the relevant national Red List (in numbers of national importance).</li> <li>• Viable examples of Annex I habitats.</li> </ul>
County Importance	<ul style="list-style-type: none"> <li>• Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity.</li> <li>• Resident or regularly occurring populations of protected or threatened species (in numbers significant at the county level, e.g. &gt;1% of the county population).</li> <li>• Examples (not of National or International Importance) of Annex I habitats.</li> <li>• Other features of ecological interest identified in relevant local or national biodiversity action plans.</li> <li>• Sites or habitats of high biodiversity value or degree of naturalness in a county context or species which are uncommon in the county.</li> <li>• Sites containing habitats or species which are in decline nationally.</li> </ul>
Local Importance (Higher Value)	<ul style="list-style-type: none"> <li>• Ecological features identified in the relevant local biodiversity action plan.</li> <li>• Resident or regularly occurring populations of protected or threatened species (in numbers significant at the local level).</li> <li>• Sites habitats of high biodiversity value or degree of naturalness in a local context or species which are uncommon locally.</li> <li>• Sites or features containing common or lower value habitats which provide connectivity between features of higher ecological value.</li> </ul>
Local Importance (Lower Value)	<ul style="list-style-type: none"> <li>• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife.</li> <li>• Sites or features containing non-native species that are of some importance in maintaining habitat links.</li> </ul>

Accordingly, factors which were taken into account when evaluating importance included the following: -

- National or international designations on sites, or identification of sites in local plans.
- Level (if any) of statutory protection of the habitats and species concerned.
- Conservation status and trends in habitats and species in a local, national and international context.
- Quality and extent of habitats and numbers of individuals of species within the study area.
- Likely future prospects of habitats and species in the study area in the 'do-nothing' scenario.
- Inter-relationships between habitats, species and other ecological features in the study area and wider landscape.

## 2.4.2. Assessment of Impacts & Effects

Once the importance of ecological features in the study area had been evaluated, the assessment of the potential impacts focussed on key ecological receptors (KERs), i.e. ecological features of at least Local Importance (Higher Value), in accordance with *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022). The assessment of impacts is carried out in three stages, as follows:

1. First, potential impacts are identified by the examination of possible source-pathway-receptor chains.
2. Then, impacts and their effects are characterised in terms of the following: -
  - a. Nature (type) and quality (whether positive, neutral or negative).
  - b. Probability of occurrence.
  - c. Intensity, magnitude and/or spatial extent
  - d. Timing, duration and frequency.
  - e. Reversibility or potential for recovery.
3. Finally, the significance of effects are evaluated by considering their characteristics in the context of the particular sensitivities of the relevant KERs.

With regard to the duration of effects, EPA (2022) specifies the following definitions for what may be considered as "temporary", "short-term", "long-term" etc.: -

- 'Momentary' – Seconds to minutes.
- 'Brief' – Less than a day.
- 'Temporary' – Less than 1 year.
- 'Short-term' – 1 to 7 years.
- 'Medium-term' – 7 to 15 years.
- 'Long-term' – 15 to 60 years.
- 'Permanent' – Over 60 years.

EPA (2022) also provides definitions for other relevant terms which might otherwise be subjective.

With regard to defining levels of significance, EPA (2022) provides for the following scale: -

- ‘Imperceptible’ – Capable of measurement but without significant consequences.
- ‘Not significant’ – Causes noticeable changes in the character of the environment but without significant consequences.
- ‘Slight’ – Causes noticeable changes in the character of the environment without affecting its sensitivities.
- ‘Moderate’ – Alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
- ‘Significant’ – Alters a sensitive aspect of the environment.
- ‘Very significant’ – Significantly alters most of a sensitive aspect of the environment.
- ‘Profound’ – Obliterates sensitive characteristics.

The significance of an impact or effect may also be evaluated on the same geographical scale as the importance of ecological features. However, as noted in NRA (2009a), “*significance [...] is determined empirically, on the basis of an analysis of the factors which characterise it, irrespective of the value of the receptor. [...] If impacts are not found to be significant at the highest geographical level at which the resource has been valued, they may be significant at a lower level.*”

### 2.4.3. Mitigation & Enhancement

The development of the mitigation measures followed the “mitigation hierarchy”, which prioritises avoidance over reduction, and actions at source over pathway over receptor, as follows: -

1. Eliminate the source of the impact.
2. Minimise or reduce the impact at its source.
3. Block or weaken the pathway for effects.
4. Abate effects at the receptor.

This approach assists with more complete removal of negative effects, minimises the risk of effects occurring by less obvious pathways, protects non-target receptors, and minimises the risks of unintended harm associated with measures focussed at or near receptors.

The enhancements outlined in this report have been developed with due regard to the policies and objectives of the Cork County Development Plan 2022-2028 in relation to sustainable drainage systems (SuDS), green and blue infrastructure, biodiversity on Council lands, and Biodiversity Net Gain, as well as the following action plans and guidance (as demonstrated throughout this report): -

- All-Ireland Pollinator Plan 2021-2025. *National Biodiversity Data Centre Series 25*. National Biodiversity Data Centre, Waterford. March 2021.
- *Biodiversity Action Plan for Carrigtwohill 2019-2023*. Produced by William O’Halloran, Finbarr Wallace and the Carrigtwohill Community as part of the Wild Work initiative.
- *Cork County Council Recommended List of Native Tree and Shrub Species for Residential & Industrial Developments, Version 2*. Ecology Office, Cork County Council, Cork. June 2022.
- *Midleton Pollinator Plan*. East Cork Municipal District, Cork County Council, Cork. February 2020.
- TII (2006) *A Guide to Landscape Treatments for National Road Schemes in Ireland*. GE-ENV-01102. February 2006. Transport Infrastructure Ireland, Dublin.



- TII (2012) *Guidelines on the Implementation of Landscape Treatment on National Road Schemes in Ireland. GE-ENV-01103. July 2012.* Transport Infrastructure Ireland, Dublin.

In accordance with NRA (2009a), it is recognised that ecological mitigation and enhancement measures “*may have a significant beneficial impact, but at a higher or lower geographic scale than the value of the receptor to which they have been applied.*”

## 2.5. Statement of Authority

This report has been prepared by Owen O’Keefe and peer-reviewed by Paul O’Donoghue.

**Owen O’Keefe** is a Senior Ecologist at Atkins. Owen holds a BSc (Hons) in Ecology from University College Cork (2015) and is a Full Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). He has 8 years’ professional experience in ecological consultancy, has carried out a wide range of habitat and species surveys for both large and small infrastructure projects, and has prepared numerous reports for Appropriate Assessment and Ecological Impact Assessment. Owen carried out the 2023 field surveys and prepared this report.

**Paul O’Donoghue** is an Associate Director (Ecology) at Atkins. Paul holds a BSc (Zoology), MSc (Behavioural Ecology) and a PhD in avian ecology and genetics. Paul is a Chartered member of the Society for the Environment (CEnv) and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Paul has over 20 years’ experience in ecology; including extensive experience in the preparation of Habitat Directive Assessments/Natura Impact Statements (i.e. Appropriate Assessment under the Habitats Directive). Paul carried out the technical review of this report.

## 3. Baseline Ecological Conditions

### 3.1. Zone of Influence

The “Zone of Influence” of a plan or project is the area which may experience ecological effects as a result of its implementation, including any ancillary activities. The various impacts of a plan or project will each have their own characteristics, e.g. nature, extent, magnitude, duration etc. Accordingly, the area subject to each impact (“zone of impact”) will vary depending on characteristics of the impact and the presence of pathways for its propagation. Ecological features within or connected to one or more zones of impact could, depending on their sensitivities, be affected by the plan or project under consideration. The area containing such features may be regarded as the Zone of Influence. As such, in establishing the Zone of Influence for a plan or project, regard must be had to the characteristics of its potential impacts, potential pathways for impacts and the sensitivities of ecological features in the receiving environment.

Box 10 of *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018) lists useful questions which should be asked in order to assist in establishing the Zone of Influence for a proposal under consideration. This is reproduced in Figure 3-1 below. Consideration must be given to all phases, e.g. ground investigations, site preparation, construction, operation, decommissioning, of proposal under consideration (NRA, 2009a; CIEEM, 2018).

**Box 10: Ecological considerations for establishing the zone(s) of influence**

The following questions will help to determine the zone(s) of influence on ecological features:

- What ‘important’ ecological features (see Chapter 4) are known to occur within the project site and the surrounding area?
- What other ‘important’ ecological features could occur within the project site and surrounding area based on knowledge of the local distribution of relevant habitats and species?
- What activities may generate ecological impacts and which of these might have an influence on ecological features beyond the site boundaries? (see Box 9)
- Is the project likely to affect migratory species?
- Is the area used by mobile species that make regular movements to, from, or across the site?
- What are the key ecological processes or species activity periods? Are there seasonal variations in distribution, abundance and activity?
- What are the key hydrodynamic processes at the site (e.g. tidal currents, wave activity)? Are there seasonal or cyclic variations in these?
- Does the project affect any sites, directly or indirectly, that are designated or likely to be designated in the foreseeable future? What are the reasons for designation?
- What is required for the maintenance of particular ecosystems, networks, habitats or species populations? How would these be affected by project activities?
  - What are their distribution and status elsewhere for comparison?
  - What were their historical distributions, status and management compared with present?
  - Is anything known about the key factors influencing distribution and abundance of the feature(s)?
  - What are their scales of variation, vulnerability and likely exposure to the project?
- Are there any features whose disappearance would have significant consequences for other features?
- Are there any other projects planned within the same area or time-frame that may contribute to cumulative effects? (see 5.19 - 5.22)

**Figure 3-1 – Factors in establishing the Zone of Influence. Source: CIEEM (2018).**

Following the guidance in NRA (2009a) and CIEEM (2018), and on the basis of the description of the proposed development and an examination of potential pathways for ecological impacts in the receiving environment, the likely zones of impact from the proposed development were defined as follows: -

- For habitat loss and fragmentation, all areas within the proposed development boundary, including any areas temporarily required during construction
- For disturbance to birds and other fauna, all areas within a precautionary buffer of 500m from the proposed development.
- For water quality impacts, all surface waters which intersect the proposed development or are located within 100m thereof, as well as connected upstream and downstream stretches.
- For the introduction or spread of invasive alien species, the proposed development site, and adjoining areas, as well as likely haul routes to/from the construction site.

The Zone of Influence was defined as the above zones of impact as well as other areas with potential ecological connectivity to them, i.e., woodlands and other semi-natural habitats connected to the proposed development by proximity or linear landscape features such as hedgerows or treelines and connected wetlands and waterbodies.

Publicly available spatial data for river, transitional and coastal waterbodies (*EPA Maps*) was used in conjunction with aerial imagery to identify pathways and zones of impact for disturbance and water quality impacts from the proposed development. These were then mapped in relation to designated sites (Figure 3-1 below). In addition, the Zone of Influence was examined to identify any other sites or sensitive ecological features with potential ecological connections to these zones of impact.

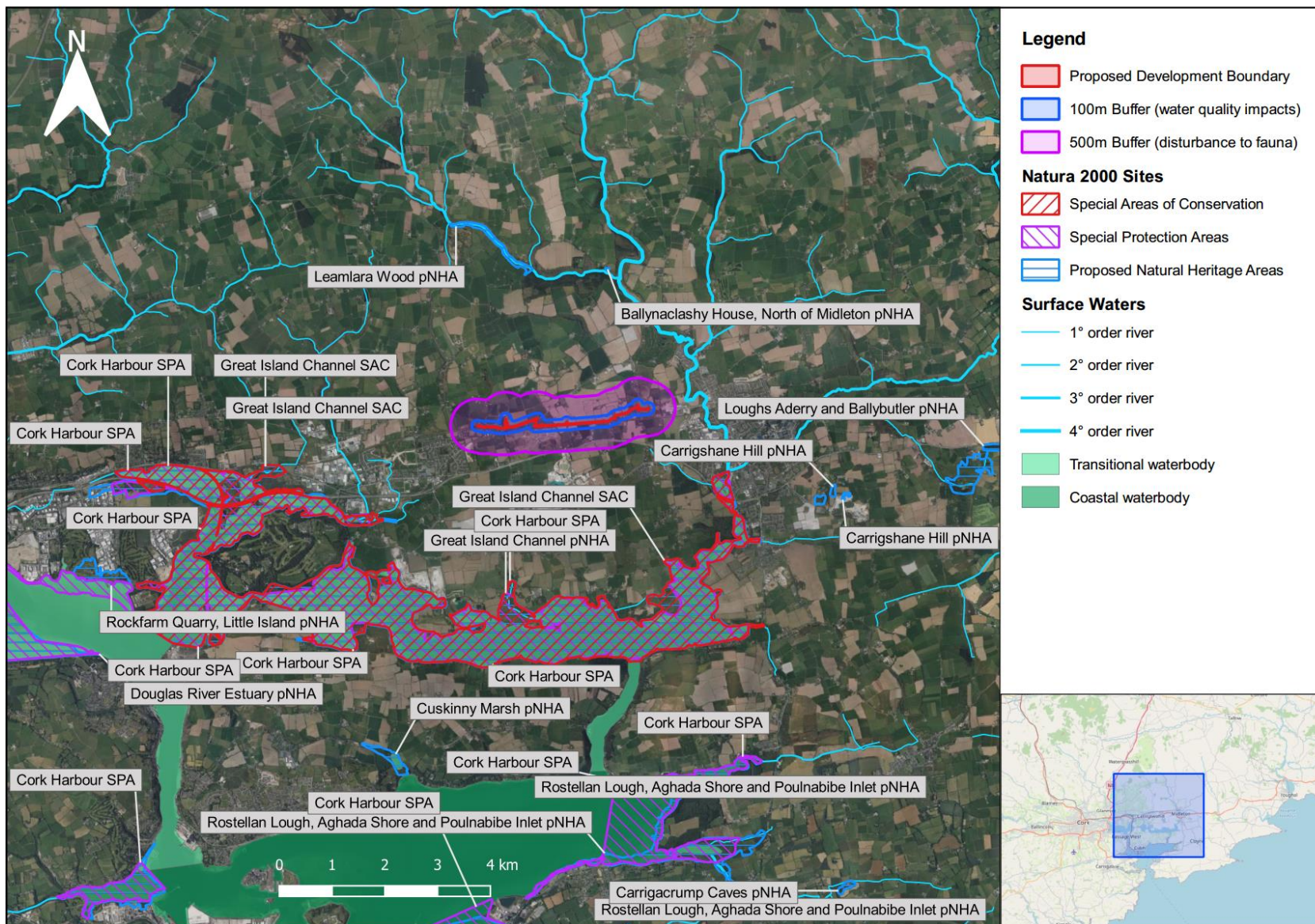


Figure 3-1 - Designated sites and EPA waterbodies in relation to the proposed development.

## 3.2. Designated Sites

### 3.2.1. International

Cork Harbour is listed as Wetland of International Importance (site no. 837) under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (“the Ramsar Convention”). Cork Harbour is also recognised as an Important Bird Area (site code: IE088) by BirdLife International. These designations are based on the significant examples of estuarine habitats occurring within and adjoining the harbour, particularly mudflats and saltmarshes, as well as the importance of the harbour for both wintering and breeding waterbirds, with numbers of wintering waterfowl regularly exceeding 20,000 individuals from 22 different species. There are likely hydrological links to these sites from the proposed development, via the Poulaniska stream, groundwater and the Slatty Water to the west, and via the Water Rock stream, groundwater and the Owenacurra estuary to the east.

There are no UNESCO World Heritage or UNESCO Biosphere Reserve sites, or sites designated under the Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention), in close proximity to the proposed development or within its Zone of Influence.

### 3.2.2. European

The Habitats Directive (92/43/EEC) is primary legislation of the European Union which provides legal protection for habitats and species of Community interest. Article 2 requires the maintenance or restoration of such habitats and species at a favourable conservation status, while Articles 3 to 9, inclusive, provide for the establishment and conservation of a Community-wide network of special areas of conservation (SACs), known as Natura 2000, which also includes special protection areas (SPAs) designated under the Birds Directive (2009/147/EC). Both SACs and SPAs are commonly referred to as “European sites” or “Natura 2000 sites”.

SACs are selected for natural habitat types listed on Annex I to the Habitats Directive and the habitats of species listed on Annex II to the Habitats Directive. SPAs are selected for species listed on Annex I to the Birds Directive, other regularly occurring migratory species and other species of special conservation interest. The habitats and species for which a Natura 2000 site is selected are referred to as the “qualifying interests” of that site and each is assigned a “conservation objective” aimed at maintaining or restoring its “favourable conservation condition” at the site, which contributes to the maintenance or restoration of its “favourable conservation status” at national and European levels.

There are 2 no. European sites within the Zone of Influence of the proposed development, namely the Great Island Channel SAC (site code: 001058) and Cork Harbour SPA (site code: 004030). There are potential hydrological links for water quality impacts from the proposed development to both of these sites. There is no connectivity to the Blackwater River (Cork/Waterford) SAC (site code: 002170), which is located c. 11.8km to the north. Similarly, there is no connectivity to the Ballycotton Bay SPA (site code: 004022), which is located c. 14.2km to the south-east.

The Great Island Channel SAC was selected for the following qualifying interests: -

- Mudflats and sandflats not covered by seawater at low tide (1140)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) (1330)

The Cork Harbour SPA was selected for the following qualifying interests: -

- Little Grebe (*Tachybaptus ruficollis*) (A004)
- Great Crested Grebe (*Podiceps cristatus*) (A005)
- Cormorant (*Phalacrocorax carbo*) (A017)
- Grey Heron (*Ardea cinerea*) (A028)

- Shelduck (*Tadorna tadorna*) (A048)
- Wigeon (*Anas penelope*) (A050)
- Teal (*Anas crecca*) (A052)
- Pintail (*Anas acuta*) (A054)
- Shoveler (*Anas clypeata*) (A056)
- Red-breasted Merganser (*Mergus serrator*) (A069)
- Oystercatcher (*Haematopus ostralegus*) (A130)
- Golden Plover (*Pluvialis apricaria*) (A140)
- Grey Plover (*Pluvialis squatarola*) (A141)
- Lapwing (*Vanellus vanellus*) (A142)
- Dunlin (*Calidris alpina alpina*) (A149)
- Black-tailed Godwit (*Limosa limosa*) (A156)
- Bar-tailed Godwit (*Limosa lapponica*) (A157)
- Curlew (*Numenius arquata*) (A160)
- Redshank (*Tringa totanus*) (A162)
- Black-headed Gull (*Chroicocephalus ridibundus*) (A179)
- Common Gull (*Larus canus*) (A182)
- Lesser Black-backed Gull (*Larus fuscus*) (A183)
- Common Tern (*Sterna hirundo*) (A193)
- Wetlands (A999)

The Appropriate Assessment (AA) Screening Report (Atkins Doc. Ref. 5194601DG0228) submitted with the Part VIII application for the proposed development provides more detailed descriptions of these European sites and assesses the potential for likely significant effects thereon, in view of their conservation objectives.

### 3.2.3. National

Natural Heritage Areas (NHAs) are designated under the Wildlife Act, 1976 (as amended) due to their importance for the habitats present or which support species of plants and animals whose habitat requires protection. In addition, there are 630 No. proposed Natural Heritage Areas (pNHAs) nationally; these sites were published on a non-statutory basis in 1995 and, although they have not yet been formally designated, their ecological value is recognised by planning and licensing authorities.

There are no NHAs formally designated in the Zone of Influence of the proposed development; however, there are 20 no. pNHAs (see Table 3-1). The Great Island Channel pNHA is connected to the proposed development via hydrological links and is largely encompassed within the boundaries of the Great Island Channel SAC and Cork Harbour SPA. Other pNHAs and their connectivity to the proposed development are summarised in Table 3-2 below.

**Table 3-1 - Proposed Natural Heritage Areas in the Zone of Influence of the proposed development (highlighted sites have some degree of connectivity to the proposed development).**

Site code	Name	Location (relative to the proposed development) and connectivity
000076	Ballycotton, Ballynamona and Shanagarry	c. 13.2km south-east, no connectivity
000099	Ballynaclashy House, North of Midleton	c. 2.6km north, connectivity via hedgerow and treeline network for bats and other mobile species
000107	Templebreedy National School, Crosshaven	c. 13.6km south-west, near Crosshaven, no connectivity
000446	Loughs Aderry and Ballybutler	c. 5.8km east, on the opposite side of Midleton, no connectivity
001042	Carrigshane Hill	c. 3.6km south-east, on the opposite side of Midleton, no connectivity
001046	Douglas River Estuary	c. 8.4km south-west, includes parts of Lough Mahon, weak hydrological connectivity
001054	Glanmire Wood	c. 10.4km west, near Glanmire, no connectivity
001058	Great Island Channel	c. 2.4km south-west and c. 1.8km south-east, likely hydrological connectivity
001064	Leamlara Wood	c. 2.7km north, connectivity via hedgerow and treeline network for bats and other mobile species
001066	Lough Beg (Cork)	c. 10.9km south-west, in Lower Cork Harbour, weak hydrological connectivity
001074	Rockfarm Quarry, Little Island	c. 7.2km south-west of the proposed development, no connectivity
001076	Rostellan Lough, Aghada Shore and Poul nabibe Inlet	c. 6.8km south, in Lower Cork Harbour, weak hydrological connectivity
001082	Dunkettle Shore	c. 9.3km west, no connectivity
001084	Whitegate Bay	c. 9.3km south, in Lower Cork Harbour, weak hydrological connectivity
001183	Clasharinka Pond	c. 10.7km east, other side of Castlemartyr, no connectivity
001235	Ballyquirk Pond	c. 12.3km east, other side of Mogeely, no connectivity
001408	Carrigacrump Caves	c. 9.7km south-east, no connectivity
001979	Monkstown Creek	c. 10.0km south-west, in Lower Cork Harbour, weak hydrological connectivity
001987	Cuskinny Marsh	c. 6.4km south-west, near Cobh, no connectivity
001990	Owenboy River	c. 13.6km south-west, near Carrigaline, no connectivity

Wildfowl Sanctuaries are areas that have been excluded from the Wildlife (Wild Birds) (Open Seasons) Order, 1979-2012 so that game birds can rest and feed undisturbed from shooting. One such area, namely the Douglas Estuary (site code: WFS-67), is part of the wider Cork Harbour complex and within the Zone of Influence of the proposed development.

There are no statutory Nature Reserves or any National Parks designated in close proximity to the proposed development or within its Zone of Influence.

### 3.3. Habitats

As detailed in Section 2.3, habitat surveys and mapping of the proposed development footprint were carried out in April, June and July 2023 (Atkins), following the Fossitt (2000) classification and Smith et al. (2011) guidelines. Correspondence to Annex I habitats was checked using *Interpretation Manual of European Union Habitats* (DG Env, 2013) and with reference to the relevant national habitat monitoring programmes.

#### 3.3.1. Fossitt (2000) Classification

The study area is dominated by agricultural grassland and arable crops in large fields separated by hedgerows and treelines, with some areas of more species-rich grasslands, and two small streams. There are also roads, buildings and other artificial surfaces, as well as gardens and scrub. Habitats identified in the study area are listed in and described in Table 3-2 below and illustrated in the habitat maps shown in Figures 3-8 to 3-11, inclusive, below.

**Table 3-2 - Fossitt (2000) habitat types identified in the study area.**

Habitat	Description
<i>Non-linear habitats</i>	
BC1	'Arable crops' – Fields of arable crops account for a large share of the agricultural land within the study area. The main crops are wheat ( <i>Triticum aestivum</i> ) and maize ( <i>Zea mays</i> subsp. <i>mays</i> ), but there is also some barley ( <i>Hordeum vulgare</i> ). These fields provide forage for a variety of farmland birds and the edges and corners are botanically rich, supporting a wide range of predominantly annual wildflowers (see plant list in Section 3.4.1).
BC2	'Horticultural land' – One large field in the centre of the study area, where there is an existing farm overpass crossing the railway line, is planted with broad bean ( <i>Vicia faba</i> ). Similar to BC1, this field provides some forage farmland birds and the edges and corners are support a range of wildflowers. The high-impact and legally restricted invasive species Japanese Knotweed ( <i>Fallopia japonica</i> ) is present within and around an area of scrub in the centre of this field.
BC3/ED3	The field immediately west of the Ballyadam Road represents BC1 'Arable crops'. However, A c. 10m-wide corridor along the southern and eastern edges of this field was fences off after the area was tilled but before it could be sown. As such, this area now represents a much-widened margin of an arable field, best represented as a transitional habitat between BC3 'Tilled land' and ED3 'Recolonising bare ground'. Species include Common Field-speedwell ( <i>Veronica persica</i> ), Pineappleweed ( <i>Matricaria discoidea</i> ), Common Ramping Fumitory ( <i>Fumaria muralis</i> ), Changing Forget-me-not ( <i>Myosotis discolor</i> ), Wall Speedwell ( <i>Veronica arvensis</i> ), Wild Pansy ( <i>Viola tricolor</i> ), Spear-leaved Orache ( <i>Atriplex prostrata</i> ), Fat Hen ( <i>Chenopodium album</i> ), Lesser Swinecress ( <i>Lepidium didymium</i> ), Field Pansy ( <i>Viola arvensis</i> ), Sun Spurge ( <i>Euphorbia helioscopia</i> ), Common Orache ( <i>Atriplex patula</i> ), Black Bindweed ( <i>Fallopia convolvulus</i> ) and Black Nightshade ( <i>Solanum nigrum</i> ), among many others. See Figure 3-4 below.
BL3	'Buildings and artificial surfaces' - Within the proposed development, these include roads, bridges, domestic dwellings and working buildings and yards. Most of the buildings and artificial surfaces in the study area are of negligible ecological value. Certain buildings and other structures within the study area, owing to their materials, state of repair, levels of disturbance and connectivity to other habitats, provide potential roost features for bat species and nesting habitat for birds such as Barn Swallow and House Martin.
BL3/GA2(*)	Buildings such as domestic dwellings and their associated landscaped areas or gardens are mapped as a mosaic of 'Buildings and artificial surfaces' (BL3) and 'Amenity grassland (improved)' (GA2). These mosaics also frequently contain small areas of 'Ornamental/non-native shrub' (WS3), 'Horticultural land' (BC2), 'Flower beds and borders' (BC4) and 'Stone walls and other stonework' (BL1). Small, isolated and newer gardens are generally of lower biodiversity value, whereas larger, connected and more mature gardens tend to be of higher value. The gardens of Ballyadam House are marked with an asterisk (*) to indicate their higher biodiversity value due to their size and maturity, particularly mature trees/small woodlands.
ED2	'Spoil and bare ground' - Areas under construction and other areas with unbound surfaces and remaining largely unvegetated due to repeated disturbance. This habitat is subject to disturbance and is not of conservation interest.



Habitat	Description
ED3	'Recolonising bare ground' - Areas of cleared land recolonising with ruderal species. Areas of bare ground in the study area are re-vegetating with a range of species that are of limited botanical interest.
ER2	'Exposed calcareous rock' – c. 200m south-east (downstream) of where the cycleway crosses the Water Rock stream, there is a large limestone outcrop where the stream disappears below ground, hence the name of the stream and townland.
GA1(*)	'Improved agricultural grassland' – This habitat represents more intensively managed grasslands for grazing of livestock or production of silage. Within the study area, some of these fields are very species-poor, dominated almost completely by perennial rye-grass ( <i>Lolium perenne</i> ) monocultures which are regularly reseeded and under high fertiliser application, while others contain a greater diversity of grasses and herbaceous plants such as White Clover ( <i>Trifolium repens</i> ), Creeping Buttercup ( <i>Ranunculus repens</i> ), plantains ( <i>Plantago</i> spp.) and docks ( <i>Rumex</i> spp.). Some areas of semi-natural grasslands within the study area are in the process of conversion to GA1 through drainage, reseeded and fertilising. Most fields of GA1 in the study area are grazed by cattle or horses, but one small field marked as GA1* in Figure 3-5 below is grazed by a single goat and has a very high cover of tall ruderals such as Creeping Thistle ( <i>Cirsium arvense</i> ), Spear Thistle ( <i>C. vulgare</i> ) and Nettle ( <i>Urtica dioica</i> ).
GA2	'Amenity grassland (improved)' - Present throughout the study area in domestic gardens and public green space. It is intensively managed and is of low botanical importance.
GS2(*)	'Dry meadows and grassy verges' - Present in less intensively managed grasslands throughout the study area, particularly in fields that have not been improved in recent years and do not show any indication of recent grazing. Fields which have been abandoned entirely and are not dominant by tall ruderals and early-stage scrub are marked with an asterisk (*). Species-poor variants of this habitat were present in a number of fields within the study area. Dry meadows and grassy verges in the study area do not correspond to any Annex I habitat.
GS4	'Wet grassland' - Relatively species-poor examples occur in the vicinity of the Poulanska stream in the west of the study area (see Figure 2-2 below). These fields have been subject to recent attempts at improvement through the clearance of scrub and trees and the enlargement of drainage ditches. As such, they are of limited biodiversity value and in places are transitioning to 'Improved agricultural grassland' (GA1). Wet grassland, as recorded in the study area, does not correspond to Annex I habitat. Frogspawn was noted in a waterlogged depression in one area of this habitat just north of the railway line during surveys for the Carrigtwohill URDF Infrastructure Project.
WD1	'(Mixed) broadleaved woodland' - The only area of woodland within the footprint of the proposed development is a corner of Ash ( <i>Fraxinus excelsior</i> ) – Sycamore ( <i>Acer pseudoplatanus</i> ) woodland at the southern end of the shared-use section on Ballyrichard More Road (see Figure 3-7 below). Woodlands present within the study area are all very small and contain a mix of both native and introduced tree species. Invasion by Cherry Laurel ( <i>Prunus laurocerasus</i> ) and other invasive alien species negatively impacts on most of these woodlands. While not being of high biodiversity value, they provide suitable habitat for fauna such as bats, birds and mammals.
WS1	'Scrub' – Present in small patches throughout the study area where it has been allowed to develop through the cessation of grazing or other disturbance, e.g. in the corners of fields or in association with recolonising bare ground. It provides cover and forage for fauna and avifauna and if left undisturbed can succeed to woodland.
WS4/WN6	Densely planted stands of willow along the northern side of the railway line in the eastern part of the study area were likely planted to assist in drying out the adjoining lands. Some of these areas have been left to mature and are beginning to develop into a more natural 'Wet willow-alder-ash woodland' (WN6).
WS5	'Recently-felled woodland' - Much of the WS4/WN6 north of the railway line in Poulanska has recently been cleared/felled and, as such, is mapped as WS5. Many of the 'Hedgerows' (WL1) and 'Treelines' (WL2) in Poulanska have also been recently cleared/felled. As there is no Fossitt (2000) habitat class for recently cleared hedgerows/treelines, these are also mapped as WS5.
*RC	'Railway corridor' - This is not a habitat type as per the Fossitt (2000) classification and has been created for ease of mapping habitats for the current project. The character and extents of the various constituent habitats of this mosaic vary along its length. However, in the study area, a cross-section from railway centreline to edge may be generalised as follows: rails and

Habitat	Description
	concrete sleepers represent 'Buildings and artificial surfaces' (BL3); railway ballast of crushed stone (generally limestone) represents 'Spoil and bare ground' (ED2); moving towards the verges, there may be a very narrow transitional zone where vegetation colonising undisturbed ballast may represent 'Dry calcareous and neutral grassland' (GS1); behind this there may be a band of 'Dry meadows and grassy verges' (GS2) or other grassland type (depending on the soil type); and, finally, there is unusually a 2-5m wide strip of 'Scrub' (WS1), dominated by Gorse but with species such as Bramble and Elder also major components. Given the continuity of these habitats along the railway corridor, they provide important ecological connectivity in the landscape for many species. See Figure 3-5 for an example.
<i>Linear habitats</i>	
BL1	'Stone walls and other stonework' - A number of roads in the study area are lined by stone walls and the complex of buildings at Ballyadam House are also good examples of this habitat. These stone walls can provide habitat for a range of calcicolous flora, as well as refugia for fauna, particularly invertebrates. Species identified on stone walls in the study area include Ivy ( <i>Hedera hibernica</i> ), spleenworts ( <i>Asplenium</i> spp.), polypodies ( <i>Polypodium</i> spp.), Ivy-leaved Toadflax ( <i>Cymbalaria muralis</i> ), Shining Crane's-bill ( <i>Geranium lucidum</i> ) and Foxglove ( <i>Digitalis purpurea</i> ).
FW1(.c) and FW4(.c)	'Eroding/upland rivers' (FW1) represents flowing waters where erosion is the dominant process. This class include natural watercourses, including those which have been modified. Entirely artificial watercourses excavated or modified for drainage purposes are classed as 'Drainage ditches' (FW4). Where watercourses have been crosses by culverts or low bridges in the study area, these have been mapped as "FW1.c" or "FW4.c". The proposed development crosses the Poulaniska and the Water Rock streams (see Figures 3-3 and 3-6, respectively). While small in scale and generally highly modified, they provide important connectivity in the landscape, particularly where they occur in association with hedgerows and other linear habitats, where they provide and enhance foraging and commuting lines for bats and other fauna. As the watercourses in the study area are isolated from larger waterbodies (they both enter groundwater systems a short distance downstream), they are considered very unlikely to support fish communities.
WL1 and WL2	The agricultural fields in the study area are enclosed by a network of 'Hedgerows' (WL1) and 'Treelines' (WL2). These comprise native species including Ash ( <i>Fraxinus excelsior</i> ), Oak ( <i>Quercus</i> spp.), Elm ( <i>Ulmus</i> spp.), Hawthorn ( <i>Crataegus monogyna</i> ) and occasional Elder ( <i>Sambucus nigra</i> ) and Willow ( <i>Salix</i> spp.). These habitats have higher intrinsic ecological value, providing connectivity in the landscape and potential foraging and shelter for avifauna and commuting and foraging areas for bats. Some individual trees also provide roosting opportunities for bats.



**Figure 3-2 - View towards wet grassland (GS4) to the west of the Poulaniska stream (03/07/2023).**



**Figure 3-3 - View upstream along the Poulaniska stream (18/04/2023).**



**Figure 3-4 - Extended arable field margin (BC3/ED3) west of Ballyadam Road (03/07/2023).**



**Figure 3-5 - Railway corridor (\*RC) viewed from the farm overpass (29/06/2023).**



**Figure 3-6 - Water Rock stream immediately upstream of the Ballyrichard More Road (29/06/2023).**



**Figure 3-7 - Ash-sycamore woodland (WD1) off Ballyrichard More Road (18/04/2023).**

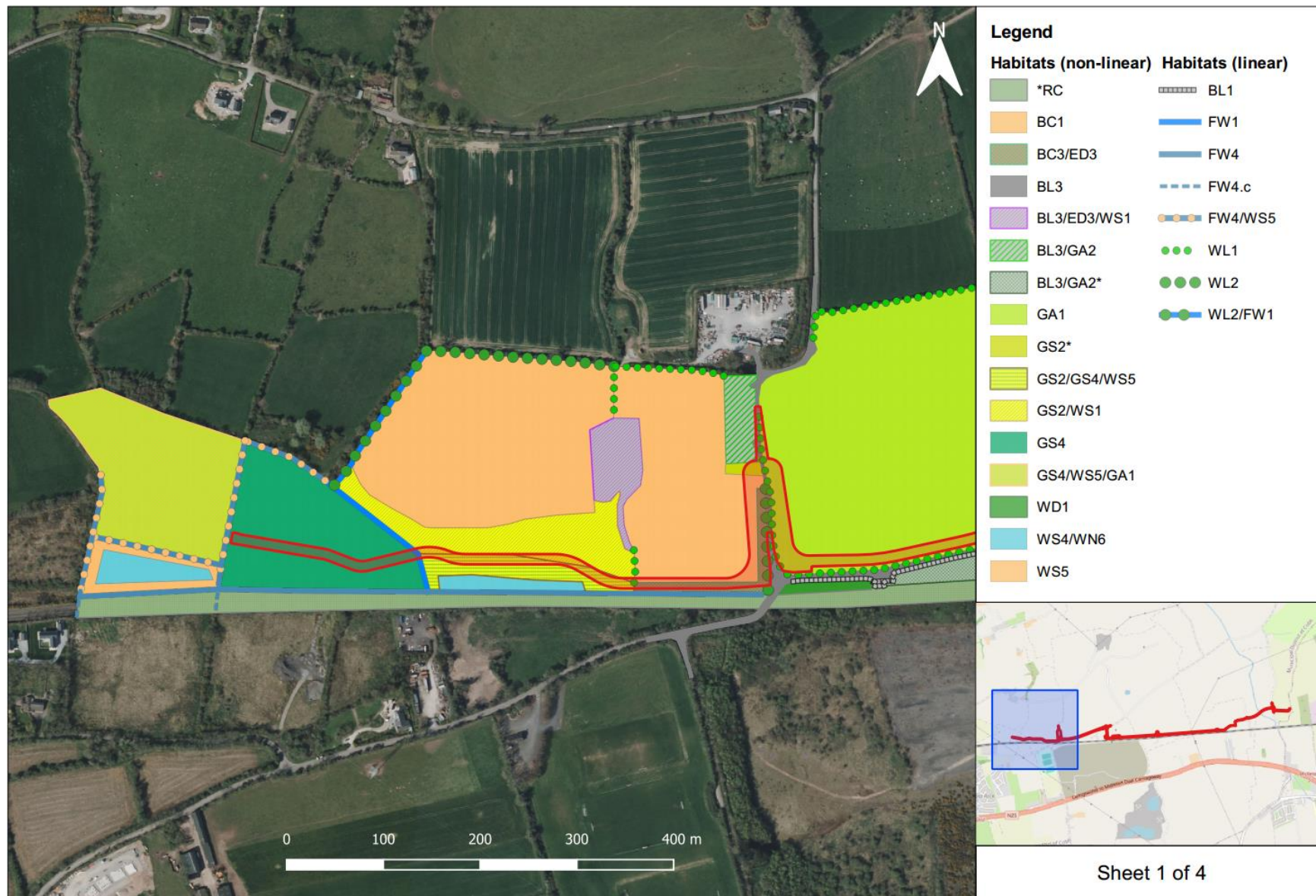


Figure 3-8 - Fossitt (2000) habitats in the study area (first quarter west to east).



Figure 3-9 - Fossitt (2000) habitats in the study area (second quarter west to east).



Figure 3-10 - Fossitt (2000) habitats in the study area (third quarter west to east).





Figure 3-11 - Fossitt (2000) habitats in the study area (fourth quarter west to east).

### 3.3.2. Habitats Directive: Annex I

None of the habitats mapped during the field surveys were deemed to represent examples of Annex I habitats. Strictly, some of the watercourses in the study area, particularly the Water Rock stream and, to a lesser degree, the Poulaniska stream, may be defined as being examples of the Annex I habitat ‘Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation’ (3260). However, almost all flowing waters in Ireland fall within the very broad interpretation of this habitat type. Given that the watercourses in question represent poor examples of this common and widespread habitat and their lack of connectivity to better examples, they are not treated as this Annex I type. However, as they enhance the value of other ecological corridors, i.e. hedgerows and treelines, they are evaluated as being of Local Importance (Higher Value) for biodiversity.

Downstream from the proposed development, within the Slatty Water/Glounthaune Estuary and the Great Island Channel, the Annex I habitats ‘Mudflats and sandflats not covered by seawater at low tide’ (1140) and ‘Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)’ (1330) occur. These habitats are listed as qualifying interests of the Great Island Channel SAC. Furthermore, these habitats constitute part of the wetland habitat for waterbirds, which is a qualifying interest of the Cork Harbour SPA.

## 3.4. Protected and Threatened Species

### 3.4.1. Flora

The NBDC database for the 10km × 10km grid square (hectad) W87 contains records for 5 no. threatened plant species, as shown in Table 3-3 below along with their Irish Red List status as per Wyse Jackson et al. (2016). More precise location data was not available for these records. None of these species are protected under the Flora (Protected) Order, 2022.

**Table 3-3 - NBDC records for protected and threatened flora in hectad W87.**

Common Name	Scientific Name	Irish Red List Status
Dropwort	<i>Filipendula vulgaris</i>	Least Concern
Round-leaved Crane's-bill	<i>Geranium rotundifolium</i>	Least Concern
Pale Flax	<i>Linum bienne</i>	Near Threatened
Yellow Bartsia	<i>Parentucellia viscosa</i>	Near Threatened
Cornflower	<i>Centaurea cyanus</i>	Waiting List

In addition, the NPWS database for the same hectad contains records for 3 no. further species, namely Henbane (*Hyoscyamus niger*), which is listed as Near Threatened, Weasel's-snout or Lesser Snapdragon (*Misopates orontium*), which is listed as Endangered, and Knotted Hedge-parsley (*Torilis nodosa*), which is also listed as Near Threatened. The records for Henbane and Lesser Snapdragon all date from the 19<sup>th</sup> Century and those for Henbane relate to locations on the shore of the Great Island Channel, while that for Knotted Hedge-parsley relates to a location on the far side of Midleton.

The NBDC database also contained records of over 40 no. different bryophyte species, three of which, namely Common Extinguisher-moss (*Encalypta vulgaris*), Hasselquist's Hyssop (*Entosthodon fascicularis*) and Lesser Striated Feather-moss (*Eurhynchium striatulum*), are listed as Near Threatened in Lockhart et al. (2012). The rest are listed as Least Concern. None of these species are protected under the Flora (Protected) Order, 2022.

None of the above listed plants or bryophytes were recorded during the field surveys. All flora recorded during the field surveys undertaken in 2023 are listed in Appendix B.1. None of these species are protected under the Flora (Protected) Order, 2022 or listed as greater than Least Concern in the relevant Irish Red Lists. Those which are non-native and considered invasive are dealt with in more detail in Section 3.5.1 below.

### 3.4.2. Non-volant Mammals

This section covers mammals other than bats and marine mammals. Bats are covered in Section 3.4.3 below. Given the nature, scale and location of the proposed development, it was not considered necessary to cover marine mammals. Species considered invasive are dealt with separately in Section 3.5.2.

The NBDC and NPWS databases for hectad W87 contain records for 8 no. species, as listed in Table 3-4 below. All are protected under the Wildlife Act, 1976 (as amended) and listed as Least Concern in Marnell et al. (2019). Otter (*Lutra lutra*) is additionally listed on Annexes II and IV to the Habitats Directive, while Pine Marten (*Martes martes*) and Irish Hare (*Lepus timidus* subsp. *hibernicus*) are listed on Annex V to the Habitats Directive.

**Table 3-4 - NBDC and NPWS records for protected and threatened non-volant mammals in hectad W87.**

Common Name	Scientific Name
Hedgehog	<i>Erinaceus europaeus</i>
Irish Hare	<i>Lepus timidus</i> subsp. <i>hibernicus</i>
Otter	<i>Lutra lutra</i>
Pine Marten	<i>Martes martes</i>
Badger	<i>Meles meles</i>
Irish Stoat	<i>Mustela erminea</i> subsp. <i>hibernica</i>
Red Squirrel	<i>Sciurus vulgaris</i>
Pygmy Shrew	<i>Sorex minutus</i>

During the field surveys, evidence of Red Fox (*Vulpes vulpes*) was found throughout the study area. This species is listed as Least Concern and is not protected under the Habitats Directive or the Wildlife Act.

No evidence of Otter (*Lutra lutra*) was observed during the field surveys. Given the small size and isolation of the watercourses in the vicinity of the proposed development, they are considered to be capable of supporting this species.

Evidence of Badger (*Meles meles*) within the study area was limited to feeding signs (snuffle holes) at the western end of Ballyrichard More Road. Badger prints were also noted just north of the railway corridor at the far western end of the proposed development during surveys for the Carrigtwohill URDF Infrastructure Project in February 2023. No confirmed or possible badger setts were noted during any of these surveys. While badgers are likely to forage and commute within the footprint of the proposed development, there is not considered to be any breeding or resting places at present.

While no evidence of Hedgehog, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel or Pygmy Shrew were noted during the surveys, these species are considered likely to be present in the study area as they are common and widespread in Ireland and are also highly mobile.

Other non-volant mammals which were observed or for which evidence was noted during the field surveys are all considered to be invasive species and are dealt with in Section 3.5.2 below.

### 3.4.3. Bats

All bat species occurring in Ireland are protected under the Wildlife Act and are also listed on Annex IV to the Habitats Directive, affording strict protection to them and their breeding and resting places. Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is further listed on Annex II to the Habitats Directive, requiring the designation of SACs for its conservation. All bat species occurring in Ireland are listed as Least Concern in Marnell et al. (2019).

The NBDC database for hectad W87 contains records for 7 no. bat species, as listed in Table 3-5 below, and a nursery roost of Natterer's Bat (*Myotis nattereri*) is known from Ballynaclashy House, located to the north of the study area, which is designated as a pNHA for this reason.

**Table 3-5 - NBDC records for bat species in hectad W87.**

Common Name	Scientific Name
Brown Long-eared Bat	<i>Plecotus auritus</i>
Daubenton's Bat	<i>Myotis daubentonii</i>
Leisler's Bat	<i>Nyctalus leisleri</i>
Natterer's Bat	<i>Myotis nattereri</i>
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>
Whiskered Bat	<i>Myotis mystacinus</i>

The bat study undertaken by Greenleaf Ecology (2023) found that 7 no. of the 10 no. known Irish bat species have been recorded within 4km (a precautionary core sustenance zone for bats) of the proposed development, with the Natterer's Bat nursery roost at Ballyaclashy House being the only known roost within this zone.

This study also found the following: -

- Overall, the study area is considered to be of 'Moderate' suitability for foraging and commuting bats due to the presence of connectivity to other suitable habitats in the wider landscape.
- There are currently no trees with potential roost features within the study area. Structures of 'Moderate' suitability for roosting bats include a disused building and outbuildings associated with Ballyadam House and, potentially, domestic dwellings in Ballyrichard More.
- A farm outbuilding at Ballyadam House supports a small Common and Soprano Pipistrelle roost. These species were also recorded foraging throughout the site.
- Four species, namely Leisler's, Daubenton's, Natterer's and Brown Long-eared Bat also commute to the site to forage.
- The conservation status of all of these species recorded is considered to be 'Favourable' (NPWS, 2019).

The Greenleaf Ecology (2023) report is presented in full in Appendix A to this EclA.



**Figure 3-12 - Ballyadam House and outbuildings (03/07/2023).**

### 3.4.4. Birds

The NBDC database for hectad W87 contains records for a very large number of bird species. Appendix B.2 lists those which are on Annex I to the Birds Directive or the 4<sup>th</sup> Birds of Conservation Concern in Ireland (BoCCI) list (Gilbert et al., 2021). In addition, the NPWS provided relevant results of the 2017 National Peregrine Survey for hectad W87, which showed 2 no. occupied nest sites (1 no. known and 1 no. not known in 2002), as well as 1 no. unoccupied nest site (known from 2002). Peregrine (*Falco peregrinus*) is listed on Annex I to the Birds Directive and is on the BoCCI Green List. Species considered to be invasive are dealt with separately in Section 3.5.2 below.

Bird species incidentally observed during the field surveys, along with their BoCCI status, are listed in Table 3-6 below. None of these species are listed on Annex I to the Birds Directive. All wild birds are protected under the Wildlife Act.

**Table 3-6 - Bird species observed during the field surveys. BoCCI = status as per Gilbert et al. (2021).**

Common Name	Scientific Name	Status
Grey Heron	<i>Ardea cinerea</i>	BoCCI-Green
Buzzard	<i>Buteo buteo</i>	BoCCI-Green
Goldfinch	<i>Carduelis carduelis</i>	BoCCI-Green
Woodpigeon	<i>Columba palumbus</i>	BoCCI-Green
Robin	<i>Erithacus rubecula</i>	BoCCI-Green
Yellowhammer	<i>Emberiza citrinella</i>	BoCCI-Red
Chaffinch	<i>Fringilla coelebs</i>	BoCCI-Green
Swallow	<i>Hirundo rustica</i>	BoCCI-Amber
Magpie	<i>Pica pica</i>	BoCCI-Green
Bullfinch	<i>Pyrrhula pyrrhula</i>	BoCCI-Green
Starling	<i>Sturnus vulgaris</i>	BoCCI-Amber
Blackbird	<i>Turdus merula</i>	BoCCI-Green

Also, during the surveys, a local resident indicated to the surveyors that a mature Ash (*Fraxinus excelsior*) near the junction of the Ballyrichard More Road and Castle Rock Avenue was used as a roost by Barn Owl (*Tyto alba*), which is listed on the BoCCI Red List.

### 3.4.5. Reptiles and Amphibians

The NBDC and NPWS databases for hectad W87 both contain records for Common Frog (*Rana temporaria*), which is listed on Annex V to the Habitats Directive, protected under the Wildlife Act and listed as Least Concern in King et al. (2011). There are no records for other amphibians or reptiles in the study area.

While no evidence of Common Frog or other amphibians or reptiles was noted during the field surveys carried out to inform this EclA, during the surveys for the Carrigtwohill URDF Infrastructure Project in February 2023, frogspawn was observed in large puddles in wet grassland just north of the railway corridor in Poulaniska, at the western end of the proposed cycleway. Given the relative lack of ponds and other suitable wetlands across the study area, it is considered that the drainage ditches and wet grasslands west of the Ballyadam Road are the only areas of importance for frogs in the study area.

Suitable habitat for Viviparous Lizard (*Zootoca vivipara*) is limited in the study and there are no recent or historical records of its presence. Similarly, no suitable habitat for Smooth Newt (*Lissotriton vulgaris*) was noted during the surveys and there are no records for this species. Natterjack Toad (*Epidalea calamita*) does not occur in County Cork. Therefore, these species are not of concern with regard to the proposed development.

### 3.4.6. Freshwater Fish

The NBDC database for W87 contains records for the following freshwater fish species: European Eel (*Anguilla anguilla*), which is listed as Critically Endangered in King et al. (2011), Brown/Sea Trout (*Salmo trutta*), which is listed as Least Concern and protected under the Fisheries Act, 1959 (as amended), Flounder (*Platichthys flesus*), also listed as Least Concern and protected under the Fisheries Act, and Tench (*Tinca tinca*), which is listed as a benign non-native and protected under the Conservation and Prohibition on Sale of Coarse Fish Bye-law No. 806, 2006. However, as the Water Rock and Poulaniska streams are isolated from larger waterbodies (they both enter groundwater systems a short distance downstream of the proposed development), they are both considered very unlikely to support fish communities.

### 3.4.7. Invertebrates

The NBDC database for W87 contains records for a very large number of invertebrates, the vast majority of which are listed as Least Concern in the relevant Irish Red Lists. Table 3-7 below lists all of those listed as greater than Least Concern. None of these species are afforded legal protection in Ireland.

**Table 3-7 - NBDC records for protected and threatened invertebrates in hectad W87.**

Common Name	Scientific Name	Irish Red List Status
<i>Non-marine Molluscs, status as per Byrne et al. (2009)</i>		
Lake Orb Mussel	<i>Musculium lacustre</i>	Vulnerable
Moss Chrysalis Snail	<i>Pupilla muscorum</i>	Endangered
Common Whorl Snail	<i>Vertigo pygmaea</i>	Near Threatened
Moss Bladder Snail	<i>Aplexa hypnorum</i>	Vulnerable
English Chrysalis Snail	<i>Leiostryla anglica</i>	Vulnerable
Marsh Whorl Snail	<i>Vertigo antivertigo</i>	Vulnerable
<i>Bees, status as per Fitzpatrick et al. (2006)</i>		
Sandpit Mining Bee	<i>Andrena barbilabris</i>	Near Threatened
Painted Mining Bee	<i>Andrena fucata</i>	Near Threatened
Gypsy Cuckoo Bee	<i>Bombus bohemicus</i>	Near Threatened
Red-tailed Bumblebee	<i>Bombus lapidarius</i>	Near Threatened
Moss Carder Bee	<i>Bombus muscorum</i>	Near Threatened
Barbut's Cuckoo Bee	<i>Bombus barbutellus</i>	Endangered
Patchwork Leafcutter Bee	<i>Megachile centuncularis</i>	Near Threatened
Panzer's Nomad Bee	<i>Nomada panzeri</i>	Near Threatened
Small Flecked Mining Bee	<i>Andrena coitana</i>	Vulnerable
Field Cuckoo Bee	<i>Bombus campestris</i>	Vulnerable
Red-shanked Bumblebee	<i>Bombus ruderarius</i>	Vulnerable
<i>Butterflies, status as per Regan et al. (2010)</i>		
Small Blue	<i>Cupido minimus</i>	Endangered
Wall	<i>Lasiommata megera</i>	Endangered
Small Heath	<i>Coenonympha pamphilus</i>	Near Threatened
Wood White	<i>Leptidea sinapis</i>	Near Threatened
Gatekeeper	<i>Pyronia tithonus</i>	Near Threatened
Dark Green Fritillary	<i>Argynnis aglaja</i>	Vulnerable
<i>Macro-moths, status as per Allen et al. (2016)</i>		

Common Name	Scientific Name	Irish Red List Status
Yellow Shell	<i>Camptogramma bilineata</i>	Near Threatened

Invertebrates incidentally observed during the field surveys, along with their Irish Red List status, are listed in Table 3-8 below. None of these species are afforded legal protection in Ireland. Species considered invasive are dealt with separately in Section 3.5.2 below.

**Table 3-8 - Invertebrates observed during the field surveys.**

Common Name	Scientific Name	Irish Red List Status
Seven-spotted Ladybird	<i>Coccinella septempunctata</i>	No relevant Irish Red List
Meadow Grasshopper	<i>Chorthippus parallelus</i>	No relevant Irish Red List
Small Tortoiseshell	<i>Aglais urticae</i>	Least Concern
Meadow Brown	<i>Maniola jurtina</i>	Least Concern
Comma	<i>Polygonia calbum</i>	Not assessed (recent arrival)
Red Admiral	<i>Vanessa atalanta</i>	Least Concern
Painted Lady	<i>Vanessa cardui</i>	Least Concern
Cinnabar Moth	<i>Tyria jacobaeae</i>	Least Concern

Specimens of Meadow Grasshopper (*Chorthippus parallelus*) observed during the surveys included one female which was notable as an example of the vivid pink/purple colour form, as shown in Figure 3-13 below. This occurs in females of this species occasionally and is an individual variation rather than a distinct subspecies or race.



**Figure 3-13 - Vivid pink/purple variant of Meadow Grasshopper (*Chorthippus parallelus*) female from Ballyrichard More Road (29/06/2023).**

A range of other invertebrates, including bees, hoverflies, spiders etc., were also incidentally observed during the surveys. However, given the nature of the proposed development and the habitats which it traverses, it was not considered necessary to record or identify all of these to species level.

## 3.5. Invasive Alien Species

Invasive alien species are species which are caused to spread outside their natural range due to human activities and become problematic in their new habitats. Such species can have significant negative effects on biodiversity and related ecosystem services, human health and safety, and the economy. *Ireland's invasive and non-native species – trends in introductions* (O'Flynn et al., 2014) presents a risk assessment of 377 recorded non-native species and 342 non-native potential invaders and categorised them as 'High-impact', 'Medium-impact' and 'Low-impact' species, according to their environmental, social, and economic impacts. With regard to site development and construction works, invasive alien plant species (IAPS) are of particular concern.

The Third Schedule to the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended) ("the Habitats Regulations") lists invasive alien species requiring legal restrictions to prevent their spread (see Appendix A). Section 49 of the Habitats Regulations make it an offence to cause or allow the spread of any of the species (or their hybrids, cultivars etc.) listed on the Third Schedule, except where all reasonable steps have been taken and due diligence exercised to avoid committing the offence.

In addition, the EU Invasive Alien Species (IAS) Regulation (No. 1143/2014) (as amended) which came into force on 1<sup>st</sup> January 2015, establishes rules to prevent, minimise and mitigate the negative effects of IAS within the EU. The species to which this Regulation applies are included in the official *List of Invasive Alien Species of Union concern* (DC Env, 2023). Given the environmental, social, and economic effects of these species and the legal restrictions on them at an EU level, they are also of concern for planning and development.

Ireland's *National Biodiversity Action Plan 2017-2021* (the next plan is still at draft stage) sets out the national policies, objectives and targets required to ensure that "harmful invasive alien species are controlled and there is reduced risk of introduction and/or spread of new species"<sup>2</sup>.

### 3.5.1. Flora

The NBDC database for W87 contains records 15 no. IAPS, as listed in Table 3-9 below, along with their impact ratings as per O'Flynn et al. (2014) and whether or not they are on the EU IAS Regulation or the Third Schedule to the Habitats Directive.

**Table 3-9 - NBDC records for invasive alien plant species in hectad W87.**

Common Name	Scientific Name	Status
Sycamore	<i>Acer pseudoplatanus</i>	Medium-impact
Three-cornered Garlic	<i>Allium triquetrum</i>	Medium-impact; Third Schedule
Butterfly Bush	<i>Buddleja davidii</i>	Medium-impact
Traveller's Joy	<i>Clematis vitalba</i>	Medium-impact
Nuttall's Waterweed	<i>Elodea nuttallii</i>	High-impact; EU IAS Regulation; Third Schedule
Japanese Knotweed	<i>Fallopia japonica</i>	High-impact; Third Schedule
Bohemian Knotweed (hybrid)	<i>Fallopia japonica</i> × <i>sachalinensis</i> = <i>F. × bohemica</i>	High-impact; Third Schedule
Himalayan Balsam	<i>Impatiens glandulifera</i>	High-impact; EU IAS Regulation; Third Schedule
Himalayan Honeysuckle	<i>Leycesteria formosa</i>	Medium-impact
Cherry Laurel	<i>Prunus laurocerasus</i>	High-impact
Douglas Fir	<i>Pseudotsuga menziesii</i>	Medium-impact
Turkey Oak	<i>Quercus cerris</i>	Medium-impact
Rhododendron	<i>Rhododendron ponticum</i>	High-impact; Third Schedule

<sup>2</sup> Target 4.4 of Ireland's National Biodiversity Action Plan 2017-2021 (DCHG, 2017).



Common Name	Scientific Name	Status
Narrow-leaved Ragwort	<i>Senecio inaequidens</i>	Medium-impact
Common Cord-grass	<i>Spartina anglica</i>	High-impact; Third Schedule

Particular vigilance was maintained during the field surveys for any occurrence or evidence of the IAPS listed in Table 3-9 above. All of the IAPS identified during the field surveys are listed in Table 3-10 below.

**Table 3-10 - IAPS identified during the field surveys, their impact ratings and status.**

Species	O'Flynn <i>et al.</i> (2014)	Third Schedule	EU IAS Regulation
Himalayan Balsam ( <i>Impatiens glandulifera</i> )	High-impact	Yes	Yes
Japanese Knotweed ( <i>Fallopia japonica</i> )	High-impact	Yes	No
Cherry Laurel ( <i>Prunus laurocerasus</i> )	High-impact	No	No
Three-cornered Leek ( <i>Allium triquetrum</i> )	Medium-impact	Yes	No
Sycamore ( <i>Acer pseudoplatanus</i> )	Medium-impact	No	No
Traveller's-joy ( <i>Clematis vitalba</i> )	Medium-impact	No	No
Winter Heliotrope ( <i>Petasites fragrans</i> )	n/a	No	No

Non-native garden escapes observed during the surveys included Giant Bugloss (*Echium pininana*), Variegated Yellow Archangel (*Lamiastrum galeobdolon* subsp. *argentatum*), Greater Periwinkle (*Vinca major*) and Silver Ragwort (*Jacobaea maritima*), and shrubs such as dogwoods (*Cornus* spp.) and a cotoneaster (*Cotoneaster* sp.). Other non-native trees present included Bay Laurel (*Laurus nobilis*), Beech (*Fagus sylvatica*), Horse Chestnut (*Aesculus hippocastanum*), Spanish Chestnut (*Castanea sativa*) and a variety of maples (*Acer* spp.) and their cultivars, as well as non-native conifers such as cypresses (Cupressaceae). None of these are assessed in O'Flynn *et al.* (2014) or restricted under the Habitats Regulations or the EU IAS Regulation.



**Figure 3-14 - Japanese Knotweed (*Fallopia japonica*) north of the farm overpass (18/04/2023).**

### 3.5.2. Fauna

The NBDC database for W87 contains records 17 no. invasive alien animal species, as listed in Table 3-11 below, along with their impact ratings as per O’Flynn et al. (2014) and whether or not they are on the EU IAS Regulation or the Third Schedule to the Habitats Directive. In addition, certain species are also protected under the Wildlife Act and assessed in the relevant Irish Red List, as indicated in Table 3-11.

**Table 3-11 - NBDC records for invasive alien animal species in hectad W87.**

Common Name	Scientific Name	Status
American Mink	<i>Neovison vison</i>	High-impact; Third Schedule
Brown Rat	<i>Rattus norvegicus</i>	High-impact; Third Schedule
Feral Ferret	<i>Mustela furo</i>	High-impact
Sika Deer	<i>Cervus nippon</i>	High-impact; Third Schedule; Wildlife Act
Fallow Deer	<i>Dama dama</i>	High-impact; Third Schedule; Wildlife Act; Irish Red List: Least Concern
House Mouse	<i>Mus musculus</i>	High-impact; Irish Red List: Least Concern
Bank Vole	<i>Myodes glareolus</i>	Medium-impact
Greater White-toothed Shrew	<i>Crocidura russula</i>	Medium-impact
Rabbit	<i>Oryctolagus cuniculus</i>	Medium-impact; Irish Red List: Least Concern
Ruddy Duck	<i>Oxyura jamaicensis</i>	High-impact; EU IAS Reg; Third Schedule
Canada Goose	<i>Branta canadensis</i>	High-impact; Third Schedule; Wildlife Act
Pheasant	<i>Phasianus colchicus</i>	Wildlife Act
Wrinkled Snail	<i>Candidula intersepta</i>	Medium-impact
Common Garden Snail	<i>Cornu aspersum</i>	Medium-impact
Jenkins’ Spire Snail	<i>Potamopyrgus antipodarum</i>	Medium-impact
Budapest Slug	<i>Tandonia budapestensis</i>	Medium-impact
Harlequin Ladybird	<i>Harmonia axyridis</i>	High-impact; Third Schedule

The only invasive animal species directly observed during the field surveys were a single dead Greater White-toothed Shrew (*Crocidura russula*), several Rabbits (*Oryctolagus cuniculus*) and a Harlequin Ladybird (*Harmonia axyridis*) larva. Brown Rat and Pheasant, and evidence of deer, have also been observed in the wider study area during surveys for other projects, while Mink, House Mouse and Bank Vole are also considered very likely to be present.

## 3.6. Hydrology and Hydrogeology

### Surface Waters

The proposed development is within the Water Framework Directive (WFD) Catchment No. 19 ‘Lee, Cork Harbour and Youghal Bay’, with the western part of the route in the ‘Tibbotstown’ sub-catchment and the eastern part in the ‘Owenacurra’ sub-catchment.

There are no EPA surface waterbodies in the study area. West of Ballyadam Road, the proposed development crosses the Poulaniska stream and on Ballyrichard More Road it crosses the Water Rock stream. These small streams are described in more detail below. The route also crosses 1 no. isolated drainage ditch which appears to be dry apart from after heavy rain.

### *Poulaniska Stream*

The Poulaniska stream is situated in the western part of the study area and flows in a southerly and south-westerly direction in the vicinity of Poulaniska townland. It is crossed by the proposed development at Ch. 200. It flows south until it is culverted under the railway. It then flows in a south-westerly direction for c. 650m. Ordnance Survey Ireland (OSi) maps show the stream ending in the vicinity of a karst system located in the north-east of Carrigtwohill (east of Station Road). It is presumed that the stream enters this karst system, which ultimately discharges to Cork Harbour. During the field surveys for the Carrigtwohill URDF Infrastructure Project in February 2023, this stream and its associated ditches were noted to have been subject to recent re-grading and re-profiling.

West of Ballyadam Road, a drainage ditch runs along the northern boundary of the railway corridor and connects to the Poulaniska stream to the south of the proposed route. This ditch is parallel to the cycleway but outside of the development footprint.

### *Water Rock Stream*

The Water Rock stream is crossed by the proposed development at Ch. 3335, at an existing concrete box culvert carrying the Ballyrichard More Road and associated footpaths across the stream. The stream rises c. 3km north-west of this culvert, near where the townlands of Ballyleary, Lysaghtstown and Woodstock meet and flows in a generally south-easterly direction through Glounamuck Wood and under the Carrigane Road and Ballyrichard More Road before meeting a large limestone outcrop at Water Rock c. 200m downstream from the culvert under Ballyrichard More Road. At this point, the stream enters a karst system and re-emerges c. 600m to the south-east, on the far side of the N25 road. It then flows mostly overground for another c. 1.5km before discharging to the Owenacurra Estuary in the vicinity of the Midleton wastewater Treatment Plant.

Water quality status in the Water Rock stream is not monitored in its own right, but as part of the Owenacurra river waterbody, the WFD status of which is currently 'Moderate' and 'At risk' of not achieving its objectives by 2027. Similarly, the Owenacurra Estuary transitional waterbody has a WFD status of 'Moderate' is also 'At risk' of not achieving its objectives by 2027.

### *Groundwater*

The proposed development is situated over the Midleton groundwater body. Groundwater vulnerability in the study area varies between 'Moderate' and 'Rock at or near surface or karst'. Water Framework Directive (WFD) groundwater quality status was assessed as 'Good' for the monitoring period 2013-2018.

Karstification is widespread in the Midleton groundwater body and diffuse recharge occurs via rainfall. Shallow groundwater is expected within <10m below the surface, according to the GSI map viewer.

## 4. Summary of Key Ecological Receptors

Based on the description given in the preceding section of the biodiversity and baseline ecological conditions in the receiving environment of the proposed development, Key Ecological Receptors (KERs) have been defined as set out in Table 4-1 below. These KERs have been selected on the basis that they are all of Local Importance (Higher Value) or above and that there are pathways for potential impacts from the proposed development to those receptors. All of the other receptors described in Section 3 are either of Local Importance (Lower Value) or below or they are not sufficiently connected the proposed development to be at any risk of negative impacts.

**Table 4-1 - Key Ecological Receptors (KERs) for the proposed development.**

No.	Description and connectivity	Evaluation
KER 1	<p><b>Great Island Channel SAC, Cork Harbour SPA, Great Island Channel pNHA, intertidal mudflats and sandflats, saltmarshes, wetlands and waterbirds</b></p> <p>This KER encompasses the subtidal, intertidal and saltmarsh habitats of the Great Island Channel, including the Slatty Water and Owenacurra Estuary, i.e. the entirety of the Great Island Channel SAC/pNHA and part of the Cork Harbour SPA. It also encompasses the qualifying interests of those sites, including 'Mudflats and sandflats not covered by seawater at low tide' (1140), 'Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)' (1330), bird species of special conservation interest in the Cork Harbour SPA and wetlands for waterbirds.</p> <p>This KER is located c. 2.4km south-west and c. 1.8km south-east of the proposed development. While this KER is not within the footprint of the proposed development or directly connected to it, there is a degree of hydrological connectivity via the Poulaniska and Water Rock streams, which ultimately discharge to the Great Island Channel via karst systems. As such, there are potential pathways for water quality impacts from the proposed development.</p>	<p><b>International Importance</b>, on the basis of the Natura 2000 designations which cover this KER, the presence of the qualifying interests of an SAC, and the occurrence of internationally important assemblages of migratory birds.</p>
KER 2	<p><b>Ballynaclashy House, North of Midleton pNHA, Leamlara Wood pNHA, connected woods (Curragh, Ballynaclashy, Ballyedmond, Glounamuck and Pheasant's) and watercourses (especially Owenacurra, Leamlara and Water Rock)</b></p> <p>Taken together, the above woodlands form a complex of large and small, semi-natural and highly-modified/non-native woodlands which are well connected to one another, both directly and via treelines, hedgerows and watercourses. They are also well connected to other woodlands, such as Lisgoold, Templenacarriga and Oldcourt, further up along the Owenacurra valley. This KER encompasses the Whiskered Bat nursery roost at Ballynaclashy House and the oak-birch-holly woodland (WN1) in Leamlara Wood, which may correspond to the Annex I habitat 'Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles' (91A0). The overall size and high-canopy continuity of this woodland complex and its situation within the steep-sided valleys of the Owenacurra, Leamlara and Water Rock rivers provides good foraging and commuting habitat, as well as breeding and resting places, for a wide range of fauna, particularly bats, badgers, red squirrel, pine marten and other mammals. These woodlands also provide a riparian buffer between the rivers and surrounding agricultural lands (although the operations associated with commercial conifer plantations in the woodlands represent a risk to water quality in these rivers).</p> <p>This KER is located north of the proposed development, c. 1.5km away at its closest point and extended to c. 5km away at its furthest. While it is not within the footprint of the proposed development or directly connected to it, there is some connectivity via treelines, hedgerows and the Water Rock stream. Fauna, particularly bats, from this KER may commute or forage through the study area. As such, there is some potential for ex-situ impacts.</p>	<p><b>National Importance</b>, on the basis of the 2 no. pNHAs, presence of good examples of semi-natural habitats, including likely Annex I old oak woods, a bat nursery roost (breeding place of a strictly protected species), and significant areas of suitable habitat for other protected species. Some of the components of this KER might be better described as being of County Importance or Local Importance (Higher Value). However, when taken as a coherent whole, National Importance is considered appropriate as the KER may fulfil the criteria for designation as an NHA.</p>

No.	Description and connectivity	Evaluation
KER 3	<p><b>Poulaniska stream and associated drainage ditches, wet grassland, small woodlands, dry grasslands and scrub</b></p> <p>At the western end of the proposed development, the Poulaniska stream and its connected drainage ditches are associated with a mosaic of wet grassland (currently suffering attempts at drainage and fertilisation), small willow copses which have been left to overmature and are gradually succeeding to wet willow woodland, and areas of dry meadows with patches of scrub. Many of these habitats do not occur elsewhere in the study area and occur here as part of a diverse mix of habitats which grade into one another. This creates niches for a wide range of species, including a diversity of invertebrates, which in turn provides prey for protected species such as frogs, bats and birds. The presence of slow-flowing drainage ditches and large puddles also provides suitable spawning habitat for frogs, while woodland and scrub provide cover and nesting habitat for birds. As such, this area is of relatively high biodiversity value in a local context.</p> <p>This KER is within the footprint of the proposed development, at the western end of the cycleway, and is also directly connected via the drainage design. Therefore, there is potential for direct impacts.</p>	<p><b>Local Importance (Higher Value)</b>, on the basis that this area is of relatively high ecological value compared with other parts of the study area due to the diversity of habitats occurring here, which include semi-natural habitat types not found elsewhere in the study area, as well as the presence of suitable for protected species, including breeding habitat for frogs, cover and forage for wild birds and feeding habitat for bats.</p>
KER 4	<p><b>Margins of arable field west of Ballyadam Road</b></p> <p>Immediately west of Ballyadam Road, ac. 10m-wide corridor along the southern and eastern edges of an arable field was fenced off after the area was tilled but before it could be sown. This area now supports a diversity of species often termed “arable weeds”, including Common Field-speedwell, Pineappleweed, Common Ramping Fumitory, Changing Forget-me-not, Wall Speedwell, Wild Pansy, Spear-leaved Orache, Fat Hen, Lesser Swinecress, Field Pansy, Sun Spurge, Common Orache, Black Bindweed, Black Nightshade and many others. This area represents a good example of an annual wildflower community and is also relatively large for this type of habitat, which typically occurs only in the narrow margins and corners of arable fields. The quantity and diversity of native wildflowers here makes it of value for pollinators such as bees, hoverflies, butterflies and moths, and also provides forage for farmland birds, as well as rodents which are prey for Barn Owl.</p> <p>This KER is within the footprint of the proposed development, immediately west of Ballyadam Road. Therefore, there is potential for direct impacts.</p>	<p><b>Local Importance (Higher Value)</b>, on the basis that this area represents a significant example of an annual wildflower community, which likely supports comparatively rich assemblages of pollinators and farmland birds relative to other similar habitats in the locality.</p>
KER 5	<p><b>Hedgerows, treelines, scrub and field margins</b></p> <p>Fields in the study area are enclosed by a network of hedgerows and treelines dominated by native species including Ash (<i>Fraxinus excelsior</i>), Oak (<i>Quercus</i> spp.), Elm (<i>Ulmus</i> spp.), Hawthorn (<i>Crataegus monogyna</i>) and occasional Elder (<i>Sambucus nigra</i>) and Willow (<i>Salix</i> spp.). The field margins adjoining these boundaries vary in width and species-richness depending on the nature and intensity of land use in the fields concerned, as well as the height and species mix in the boundary hedgerow/treeline. In some areas, where land use is less intensive, scrub has developed, sometimes as an extension of boundary hedgerows/treelines, but also in other locations which have been left undisturbed, e.g. where rock is at or just below ground level. The railway corridor is also encompassed by this KER. Hedgerows, treelines, field margins and scrub provide connectivity in the landscape and potential feeding, shelter and nesting habitat for birds, including Yellowhammer. These habitats also provide feeding and commuting habitat for non-volant mammals, including rodents which are prey for Barn Owl, as well as bats. One tree has been noted by local residents as a being used by Barn Owl. Some individual trees may also provide roosting opportunities for bats.</p> <p>This KER is within the footprint of the proposed development throughout the cycleway route and connects to these same features in the wider landscape. Therefore, there is potential for impacts.</p>	<p><b>Local Importance (Higher Value)</b>, on the basis that these habitats provide forage, cover and nesting habitats for birds, foraging and commuting corridors for bats (and potentially roost sites in some trees) and habitats for other fauna, as well as their function in providing ecological connectivity between areas of higher ecological value in the wider landscape.</p>

No.	Description and connectivity	Evaluation
KER 6	<p><b>Stone walls and other stonework</b></p> <p>A number of roads in the study area are lined by stone walls and the complex of buildings at Ballyadam House are also good examples of this habitat. These stone walls can provide habitat for a range of calcicolous flora (e.g. spleenworts, polypodies, Ivy-leaved Toadflax and Shining Crane's-bill), as well as refugia for fauna, particularly invertebrates. Stone walls can also act as linear features for commuting bats, in the absence of hedgerows, treelines or watercourses.</p> <p>This KER is adjacent to the proposed development on the southern side of Carrigane Road (Ballyadam House and associated buildings and walls) and also for a short stretch along Ballyrichard More Road. Therefore, there is potential for impacts.</p>	<p><b>Local Importance (Higher Value)</b>, on the basis that the stone walls and other stone works in the study area represent good examples of this habitat type and support species of flora and fauna not found in the other habitats present.</p>
KER 7	<p><b>Water Rock stream</b></p> <p>As described in Section 3.6, the Water Rock stream rises c. 3km north-west of the proposed development and flows in a generally south-easterly direction through Glounamuck Wood and under the Carrigane Road and Ballyrichard More Road, where it is crossed by the proposed development at an existing concrete box culvert, before meeting a large limestone outcrop at Water Rock, where it enters a karst system and re-emerges on the far side of the N25, flowing overground again and discharging to the Owenacurra Estuary. While the stream is extremely unlikely to support any fish, it is likely to support some aquatic invertebrates and provides a commuting and foraging corridor for bats, as well as connectivity to habitats of higher ecological value in the wider landscape, particularly KER 2.</p> <p>The proposed development crosses the Water Rock stream using an existing culvert. Therefore, there is potential for indirect impacts.</p>	<p><b>Local Importance (Higher Value)</b>, on the basis that this stream provides a commuting and feeding corridor for bats and other fauna and connectivity between habitats of higher ecological value in the wider landscape.</p>
KER 8	<p><b>Bats roosts</b></p> <p>In addition to the bat roost and foraging habitats covered by KER 2 and the commuting and foraging habitats covered by KER 5 and KER6, a farm outbuilding at Ballyadam House supports a small Common and Soprano Pipistrelle roost. Structures of 'Moderate' suitability for roosting bats include a disused building and outbuildings associated with Ballyadam House and, potentially, domestic dwellings in Ballyrichard More. While there are currently no trees with potential roost features within the study area, features may develop over the course of time (as trees mature and develop cavities, splits etc.).</p> <p>The confirmed and potential bat roosts in structures are situated outside the footprint of the proposed development. Therefore, there is no potential for direct impacts. However, artificial lighting in close proximity to these features presents a risk of indirect negative impacts.</p>	<p><b>Local Importance (Higher Value)</b>, on the basis that there is currently one confirmed roost (small numbers of relatively common and widespread bat species) and other suitable structures in the study area, as well as trees with potential to develop roost features over time.</p>
KER 9	<p><b>Invasive alien plant species (IAPS)</b></p> <p>Several IAPS listed as 'High-impact' in O'Flynn et al. (2014) and legally restricted under the Habitats Regulations and the EU IAS Regulation occur within or adjoining the planning boundary of the proposed development. In particular, Himalayan Balsam and Three-cornered Leek are present within the development footprint and Japanese Knotweed is present in close proximity. Cherry Laurel also occurs within the development footprint, but this species is not legally restricted. Given the risks associated with construction works near these species, they are selected as a KER.</p> <p>As none of the invasive animal species which were identified in the desk study and field surveys are likely to be introduced or spread by the construction or operation of the proposed development, they are not selected as a KER.</p>	<p><b>n/a</b>, on the basis that these species themselves negatively impact on biodiversity in the study area.</p>
KER 10	<p><b>Woodland on Ballyrichard More Road</b></p>	<p><b>Local Importance (Higher Value)</b>, on the basis that this habitat provides</p>

No.	Description and connectivity	Evaluation
	<p>South of the Ballyrichard More Road/farm access track, from about Ch. 2940 to Ch. 2990, there is a small area of broadleaved woodland. The canopy is dominated by mature Ash (<i>Fraxinus excelsior</i>) and Sycamore (<i>Acer pseudoplatanus</i>). The understorey includes Elder (<i>Sambucus nigra</i>), Hawthorn (<i>Crataegus monogyna</i>), Honeysuckle (<i>Lonicera periclymenum</i>) and Ivy (<i>Hedera helix</i>). The ground layer includes Wood Avens (<i>Geum urbanum</i>), Tutsan (<i>Hypericum androsaemum</i>), Variegated Yellow Archangel (<i>Lamium galeobdolon</i> subsp. <i>argentatum</i>), Himalayan Balsam (<i>Impatiens glandulifera</i>), Herb-Robert (<i>Geranium robertianum</i>), Greater Periwinkle (<i>Vinca major</i>), Ground-ivy (<i>Glechoma hederacea</i>), Wild Raspberry (<i>Rubus idaeus</i>), Enchanter's Nightshade (<i>Circaea lutetiana</i>) and (<i>Asplenium scolopendrium</i>). As such, the vegetation composition conforms to the Irish Vegetation Classification (IVC) community 'Ash-Sycamore woodland' (WL2C). However, given its small size (c. 1,650m<sup>2</sup>), the high proportion of Sycamore in the canopy and high cover of several IAPS and other non-native garden escapes in the understorey and ground layer, it is considered to be closer to the Fossitt (2000) habitat 'Mixed broadleaved woodland' (WD1) rather than 'Oak-ash-hazel woodland' (WN2) and is not considered to be of high conservation value. Furthermore, Historic 25" OS mapping for this location indicates the presence of a disused lime kiln and possible rock outcrop within this woodland and that the area was previously open grassland.</p> <p>The proposed development will necessitate the removal of the northern corner of this woodland. Therefore, there are impacts requiring assessment and mitigation.</p>	<p>forage, cover and nesting habitats for birds, foraging and commuting corridors for bats (and potentially roost sites in some trees) and habitats for other fauna.</p>

## 5. Assessment of Impacts

This section provides an examination and analysis of the likely impacts of the construction and operation of the proposed development (in the absence of any mitigation or enhancement measures) and evaluates their effects on the KERs. In accordance with NRA (2009a), the significance of these effects is assessed empirically, without reference to the importance of the KERs in question.

Mitigation for these impacts is provided subsequently (in Section 6) and the significance of any impacts remaining after the inclusion of mitigation is assessed at the end of that section.

### 5.1. Types of Impacts

This section describes the types of impacts likely to arise during the construction and operation of the proposed development, their sources and general pathways and effects. More detailed analysis of the impacts and effects specific to each KER is provided in Section 5.2.

#### 5.1.1. Habitat Loss and Fragmentation

The total area within the red line boundary of the proposed development is c. 4.77ha, of which c. 3.42ha (c. 72%) is intensively managed agricultural land, c. 0.41ha (c. 9%) is roads and other artificial surfaces/bare ground, and c. 0.94ha (c. 20%) is less-intensively managed or semi-natural habitats of relatively higher ecological value. During construction of the proposed development, existing vegetation, trees and structures within the red line boundary will be cleared, except where marked for retention. This represents a direct loss of these habitats within the red line boundary and fragmentation or loss of connectivity between habitats on either side. Fragmentation or reduction in habitat connectivity or continuity is of particular concern for linear habitats, such as hedgerows and treelines. The quality of adjoining habitats may also be reduced through edge effects.

Habitat loss and fragmentation arise directly from the removal of the existing habitats during site clearance and fencing prior to commencement of construction. The effects of these impacts include reductions in the area and distribution of the habitats concerned, as well as reduced habitat connectivity and quality in the wider area. These can also lead to indirect negative impacts on fauna, such as loss of forage, cover or breeding places and reduced feeding ranges due to loss of commuting corridors. The significance of the effects of these impacts depends on their extent, duration and availability of alternative habitats. This is assessed with regard to each KER in Section 5.2 below.

#### 5.1.2. Water Quality

##### Construction Phase

Potential water quality impacts arising from construction activities (including site preparation) include pollution of surface waters and groundwater by sediment, cementitious materials (e.g. concrete), hydrocarbons (e.g. diesel, hydraulic oils and lubricating oils) and other deleterious matter. In the case of the proposed development, these include fine sediment from excavations and earthworks, fuels and other hydrocarbons from vehicles, plant and machinery, concrete and other construction materials, and waste from on-site welfare facilities.

As outlined in Section 1.2.3 above, it is anticipated that generally the maximum excavation depth will be 500mm. Excavation of the top soil and road verge will largely be undertaken by mechanical means with any spoil arisings to be removed off site or reused locally where testing confirms its suitability. The cycleway will be a 4m wide asphalt path with concrete kerb restraints and will be constructed using a bituminous pavement construction in accordance with the TII Specification for Road Works Series 900 – Road Pavements. A 150mm layer of imported stone will be placed and compacted, followed by asphalt layers.

Given this relatively shallow depth of excavation, absence of any known contaminated soil, absence of significant earthworks other than for the new underpass at Ch. 2050, and type of construction, the quantities of potentially polluting material to be used during construction are limited. As such, the overall risk of significant water quality impacts is very low. Furthermore, drainage works will run in tandem with the route construction phase and natural buffer areas on existing watercourses outside of the infrastructure area will be maintained and protected during construction.



A new culvert will be required where the route crosses the Poulaniska stream. Construction of this crossing will necessitate in-stream works, which will likely include a temporary or permanent realignment of the stream. This element represents the highest risk to water quality from the proposed development. However, the magnitude of any potential impacts is limited by the nature of the construction type and the short duration of the works.

Where the route crosses the Water Rock Stream, the existing culvert structure will be used, thus eliminating the need for additional construction works or in-stream works associated with a new crossing, although some works in close proximity to the stream will be necessary.

Given the nature and scale of the proposed development, and the overall works sequence and methodology, the magnitude of any negative water quality impacts from the construction phase will be low, their extent limited to watercourses in the immediate vicinity, and their duration brief or temporary. The probability of any significant pollution event occurring is very low.

### Operational Phase

Potential water quality impacts from the operation of the proposed development relate to run-off from the new cycleway. The impermeability of the bituminous pavement can result in increased run-off rates. Run-off from cycleways can be contaminated by hydrocarbons such as greases and micro-plastics such as tyre dust, as well as general litter and fine sediments. Increased run-off rates and contaminants from can negatively impact on water quality and hydrological regime in receiving waterbodies.

The proposed drainage design for the new cycleway is summarised as follows: -

- Section 1 - A combination of over-the-edge drainage and swales. Run-off will be directed to the grassed verge on one or both sides of the cycleway, where water will infiltrate to ground. This will include a planted swale in the northern verge. A collector pipe will convey excess water from the swale and to an existing drainage ditch. Discharge will be limited to greenfield run-off rates via check dams in the swale and a flow control device, if required. The drainage ditch discharges to the Poulaniska stream north of the railway line.
- Section 2 - North of Carrigane Road: combination of over-the-edge drainage and swales. Run-off will be directed to a grassed verge on one or both sides of the cycleway, where water will infiltrate into the ground via a linear planted swale. South of Carrigane Road: over-the-edge drainage. Again, a planted swale with check dams will collect water in the verge and allow it to infiltrate to ground. Excess water will be conveyed to an additional SuDS feature such as a rain garden i.e. a planted depression provided at the lowest point on the field.
- Section 3 - As per Section 2 south of Carrigane Road.
- Section 4 - Shared-use section: existing over-the-edge drainage system retained. Parallel to Ballyrichard More Road: grassed verge on the southern side with a large, perforated collector pipe to collect and attenuate excess run-off in the verge. This pipe will connect to the existing drainage system on Ballyrichard More Road. Discharge will be limited to greenfield run-off rates. The road drainage system connects to the Water Rock Stream. East of Water Rock Road: grassed verge with filter drain on the northern side of the cycleway. This filter drain will discharge attenuated flows to the surface water drainage system within the Water Rock Local Infrastructure Housing Activation Fund (LIHAF) Initiative.
- The planting specification for swales and other SuDS features will be prepared at the detailed design stage by a landscape architect, with the assistance of a suitably qualified and experienced ecologist.

The design of the proposed drainage systems is based on the following guidance: -

- Cork County Development Plan 2022-2028:
  - *Objective WM 11-10: Surface Water, SuDS and Water Sensitive Urban Design.*
  - *Objective WM 11-11: River Channel Protection.*
  - *Objective WM 11-12: Surface Water Management.*

- *Objective GI 14-1: Countywide Green and Blue Infrastructure Objectives.*
- CIRIA (2015) *C753 - The SuDS Manual*. Construction Industry Research and Information Association, London.

Based on the nature and scale of the proposed development, and the design of the proposed drainage system, it is concluded that any negative impacts on surface waters due to the quantity or quality of run-off from the new cycleway will be imperceptible and limited to watercourses and groundwater in the immediate vicinity.

### 5.1.3. Invasive Alien Species

Given the nature and extent of the proposed development, activities associated with its construction, particularly the excavation, storage and movement of soil, stone and other materials, as well as the movement of vehicles, pose a risk of importing IAPS to the site, spreading IAPS already present locally, or exporting IAPS from the site.

Species of particular concern in this case include the following, all of which are restricted under Regulation 49 of the Habitats Directive:

- Himalayan Balsam and Three-cornered Leek - both present within the construction footprint, so these plants or their roots, seeds or bulbs will arise in excavations and need to be disposed of in accordance with the Habitats Directive.
- Japanese Knotweed - present within c. 20m of earthworks for the proposed underpass at Ch. 2050, so there is a risk that dormant rhizomes may be present in closer proximity or vehicle movements in this field may move fragments of this plant.

All of these species can have negative impacts on native habitats and species, most notably through competition with and displacement of native species, as well as by altering the physical and chemical properties of the soil. These species can also negatively affect water quality. For example, where Himalayan Balsam occurs on riverbanks, it excludes all other vegetation, leaving bare soil when it dies back in winter. This soil is very vulnerable to erosion, contributing to increased sediment loads in the adjoining watercourse, which reduces the substrate suitability for a range of aquatic flora and fauna. As such, these species can significantly alter the character of the habitats and ecosystems which they invade, including those which have been selected as KERs for the proposed development. Furthermore, they also represent a project risk as negligence with regard to biosecurity during construction could constitute an offence under Regulation 49 of the Habitats Regulations.

The High-impact Cherry Laurel is also present at numerous locations in the vicinity of the proposed development. While this species is not legally restricted, it still represents a risk to the integrity of the other KERs of the proposed development.

Overall, the effects of any spread of IAPS associated with the construction of the proposed development would likely be moderate to significant, localised in extent and persist long-term. Owing to the nature of the proposed development, there is not considered to be any significant risk of the introduction or spread of IAPS arising from its operation.

### 5.1.4. Disturbance to Fauna

Disturbance can stimulate a number of different responses from individuals, ranging from heightened vigilance (refocussing energy from feeding or breeding-related activities to active awareness of threats) to avoidance (physically moving away from the stimulus or source of disturbance). These responses cause physiological stress which impacts the energy budgets of the species concerned. At the upper end of the scale, avoidance responses can lead to the displacement of species from the area, which reduces their access to feeding and/or breeding and resting habitats. This can also represent an effective barrier to connectivity where the affected area extends across a commuting corridor, e.g. a hedgerow. When the impacts occur over a longer period, survival and breeding success may be negatively affected. As such, the degree to which a receptor is affected depends on the intensity of the disturbance at its source, the duration of the disturbance, the sensitivities of the receptors and availability of suitable alternative habitats and commuting corridors.

## Construction Phase

During the construction phase, the physical presence, movement, sound and vibration from vehicles, machinery and personnel will give rise to some disturbance to fauna, particularly mammals and birds. Given the nature of the construction activities, the impacts are likely to be moderate-intensity but very localised, with any noise and vibration unlikely to affect fauna beyond c. 100m from active works. The affected area for visual disturbance to fauna is very variable depending on the sensitivities of the species concerned and presence of existing screening in the form of hedgerows or treelines to be retained during construction.

The overall duration of the construction phase is expected to be c. 12 months, which will avoid impacts on more than 2 no. breeding seasons of any sensitive receptors. Furthermore, the duration of high-intensity works at any one location will likely be significantly less than this. Therefore, it is very unlikely that there would be any effects at the population level. In addition, as works will be undertaken during normal working hours, disturbance will be focussed outside of the hours of greatest sensitivities of mammals in the study area, which are predominantly nocturnal. Site clearance will also be undertaken outside of the period from 1<sup>st</sup> March to 31<sup>st</sup> August, inclusive, avoiding the peak nesting season for birds.

## Operational Phase

Disturbance during the operational phase will be limited to use of the cycleway by cyclists and pedestrians and periodic maintenance of the facility. Disturbance from these activities is considered to be low-intensity and also very localised (to within c. 50m). Any disturbance from the operation of the proposed development is likely to be imperceptible above the baseline levels of disturbance in the areas concerned.

### 5.1.5. Artificial Lighting

While nocturnal mammals such as badgers, as well as birds, invertebrates and plants are all sensitive to some degree to the effects of artificial lighting, bats are considered to be by far the most sensitive. As such, assessment and mitigation of such impacts on bats provides effective umbrella consideration for these other receptors with regard to the effects of artificial lighting.

As noted in the bat study in Appendix A, bats emerging from roosts tend not to echolocate but rely on eyesight to fly from the roost to adjoining linear features. As bats' eyesight works best in dim light conditions, excessive luminance can reduce bats' vision, resulting in disorientation. This can ultimately cause bats to desert a roost. Light falling on a roost exit point can delay bats from emerging, reducing the total feeding period and missing peak levels of insect activity at dusk. As such, excessive artificial lighting at night can effectively exclude bats, effectively fragmenting their commuting or feeding corridors. In addition, artificial lighting can alter the behaviour and population status of the night-flying insects on which bats feed, further reducing feeding opportunities.

The significance of the effects of artificial lighting on bats depends on a number of factors, including the proximity to roosts and important feeding and commuting corridors, the intensity and wavelength of light emitted, the hours during which the lights are on, and the specific sensitivities of the bat species concerned.

During both the construction and operation of the proposed development, there will be a requirement for artificial lighting. During construction, lighting of works areas will be required during working hours (from 07:00 to 17:00). It is not expected that there will be any lighting of the construction site outside of these hours. As such, lighting of the construction site will only likely be required during the months of October to March, inclusive, which avoids the main bat activity season (April to September). During operation, lighting of the cycleway will be required for the safety of pedestrians and cyclists. The details of the lighting design are not yet known. Therefore, following a precautionary approach, it is considered that there is potential for significant permanent negative impacts on bats and other light-sensitive receptors in the locality, as described above.

## 5.2. Assessment by Key Ecological Receptor

Table 5-1 below analyses the likely impacts of the construction and operation of the proposed development on each of the KERs and evaluates the significance of their effects.

**Table 5-1 - Assessment of the ecological impacts of the proposed development on the Key Ecological Receptors (KERs).**

No.	Analysis of impacts and their effects	Evaluation
KER 1	<p><b>Great Island Channel SAC, Cork Harbour SPA, Great Island Channel pNHA, intertidal mudflats and sandflats, saltmarshes, wetlands and waterbirds</b></p> <p>Habitat loss and fragmentation - There will be no direct loss or fragmentation of habitats in this KER, which is remote from the proposed development footprint. There are no habitats within the development footprint which are important for the integrity of the features for which this KER was selected. Therefore, there will be no effect of ex-situ impacts.</p> <p>Water quality - As explained in the preceding sections, there is some hydrological connectivity between the proposed cycleway and this KER. However, given the magnitude, extent and duration of potential water quality impacts described in Section 5.1.2, and the length and complexity of the hydrological pathways concerned, there is not considered to be any risk of water quality impacts affecting the features of interest encompassed by this KER.</p> <p>IAPS - This KER is considered to be well beyond the likely extent of any inadvertent spread of IAPS associated with the proposed development.</p> <p>Disturbance - The receptors encompassed by this KER which are sensitive to disturbance are the waterbirds of special conservation interest in Cork Harbour. Given the distance between the proposed development and this KER, there is no potential for direct disturbance. As the habitats in the zone of impact for disturbance are not considered to be of importance for these receptors, any significant ex-situ impacts are also considered to be unlikely.</p> <p>Artificial lighting - There is not considered to be any potential for direct, indirect or ex-situ impacts of artificial lighting from the proposed development to this KER.</p>	<p>Permanent imperceptible effects (local level) due to indirect impacts on water quality.</p>
KER 2	<p><b>Ballynaclashy House, North of Midleton pNHA, Leamlara Wood pNHA, connected woods (Curragh, Ballynaclashy, Ballyedmond, Glounamuck and Pheasant's) and watercourses (especially Owenacurra, Leamlara and Water Rock)</b></p> <p>Habitat loss and fragmentation - There will be no direct loss or fragmentation of habitats in this KER, which is remote from the proposed development footprint. However, hedgerows, treelines, scrub, field margins and watercourses within the development footprint are connected to this KER and may provide some habitat connectivity and forage for fauna associated with this KER, particularly bats and other terrestrial mammals, e.g. badgers. As such, there is potential for ex-situ habitat loss and fragmentation for such species. These impacts are analysed in more detail under KERs 3, 4, 5, 7 and 8. Given the distance between the proposed development and this KER, the effects of these impacts are considered to be slight during construction and gradually reducing to imperceptible as the proposed landscaping becomes established.</p> <p>Water quality - There are no pathways for water quality impacts from the proposed development to this KER.</p> <p>IAPS - The current status of IAPS in this KER is unknown. As explained in Section 5.1.3, construction of the proposed development poses a risk of the further spread of IAPS in the locality. Given the distance and nature of the pathways between the proposed development and this KER, the risk of IAPS spread is considered to be low.</p> <p>Disturbance - While this KER does support a wide range of fauna which are sensitive to noise and visual disturbance from human activity, given the distance between the distance between this KER and the proposed development, there is no risk of direct impacts. However, the connectivity for terrestrial mammals, which are sensitive to such disturbance, presents a risk of ex-situ impacts. Given the scale of the proposed development, duration of construction, expected use of the cycleway and baseline levels of disturbance in</p>	<p>Slight to imperceptible effects (local level) on mobile species via ex-situ impacts on foraging and commuting habitats.</p>

No.	Analysis of impacts and their effects	Evaluation
	<p>the vicinity, any effects from ex-situ disturbance on this KER would likely be imperceptible.</p> <p>Artificial lighting - As above, there will be no direct impacts, but there is potential for ex-situ impacts on sensitive species, particularly bats. Given the distance between the proposed development and this KER and its connectivity to suitable alternative habitat, any indirect effect on bats and other lighting-sensitive receptors from the KER would be slight to imperceptible.</p>	
KER 3	<p><b>Poulaniska stream and associated drainage ditches, wet grassland, small woodlands, dry grasslands and scrub</b></p> <p>Habitat loss and fragmentation - The footprint of the proposed development includes c. 0.45ha of wet grassland, dry meadows and grassy verges, scrub and recently-felled woodland encompassed by this KER, as well as a new crossing of the Poulaniska stream. During site clearance, these habitats will be lost. As the proposed landscaping and SuDS features become established, c. 0.28ha of these habitats will be replaced by new semi-natural habitats, the ecological value of which will depend on the final drainage design and landscape specification. The area of new artificial surfaces within this KER will be c. 0.17ha. There will be no fragmentation of linear features. Therefore, the effects of habitat loss on this KER will not be significant.</p> <p>Water quality - The Poulaniska stream and associated drainage ditches are within the likely extent of potential water quality impacts from the proposed development. As explained in Section 5.1.2, such impacts are associated with the construction phase only and are of low magnitude and brief or temporary duration. Therefore, such impacts are unlikely to have a significant effect on the ecological value of these watercourse.</p> <p>IAPS - In the absence of appropriate biosecurity measures, there is a risk the IAPS may be spread into this KER during construction. The species of greatest risk in this regard are Himalayan Balsam and Japanese Knotweed. The effects of these species on this KER are potentially significant and long-lasting.</p> <p>Disturbance - Mammals and farmland birds within this KER are considered to be vulnerable to disturbance from the construction of the proposed development. However, given the proposed sequencing and methodology of the works, any effects are likely to be slight to moderate and fully recoverable in the short term.</p> <p>Artificial lighting - This KER encompasses receptors such as nocturnal mammals, particularly bats, and other fauna which are light-sensitive. As explain in Section 5.1.5, artificial lighting of the cycleway during the operational phase is of particular concern as, if not designed sensitively with regard to these receptors, could have permanent and significant negative impacts on the quality and connectivity of habitats for those species.</p>	<p>Slight temporary effects (local level) due to minor habitat loss, construction-phase water quality and disturbance impacts and IAPS risk.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>
KER 4	<p><b>Margins of arable field west of Ballyadam Road</b></p> <p>Habitat loss and fragmentation - The area of this KER has been mapped as approximately 0.2ha and is entirely within the footprint of the proposed development, about 50% of which is within the footprint of the new artificial surface of the cycleway. During site clearance, this habitat will be removed. As this habitat seasonally present in the margins of arable fields, its temporary removal is an annual occurrence. Its permanent removal would be significant at a local level.</p> <p>Water quality - This KER is a terrestrial habitat and is not sensitive to the water quality impacts associated with the proposed development.</p> <p>IAPS - Cherry Laurel is present in the treeline on the eastern side of this KER and Japanese Knotweed was previously present on the opposite side of the junction to the south-east, but has been treated. Cherry Laurel is unlikely to spread into the area of interest. However, there greater risk associated with both Japanese Knotweed and Himalayan Balsam. These species could have long-lasting significant effects if spread into this area.</p> <p>Disturbance - Mammals and farmland birds within this KER are considered to be vulnerable to disturbance from the construction of the proposed development. However, given the proposed sequencing and methodology of the works, any effects are likely to be slight to moderate and fully recoverable in the short term.</p>	<p>Potentially permanent significant effects (local level) due to habitat loss, depending on landscape specification.</p> <p>Significant construction-related IAPS risk (local level).</p> <p>Slight to moderate short-term effects (local level) due to disturbance of fauna.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>

No.	Analysis of impacts and their effects	Evaluation
	Artificial lighting - As per KER 3, there is potential for permanent and significant negative impacts on the quality of this habitat for nocturnal species. In this case, the potential for effects on insects and other invertebrates is notable.	
KER 5	<p><b>Hedgerows, treelines, scrub and field margins</b></p> <p>Habitat loss and fragmentation - Given the proposed route of the cycleway along existing roads, railway and field boundaries, there is a significant length of these habitats within and immediately adjacent to the development footprint. The design principles have led to the avoidance of removing long sections of hedgerows/treelines or cutting through areas of scrub and the number of boundary crossings has been minimised. This has reduced the loss of quantity and connectivity of these habitats. The only long gaps created are for 50m either side of the cycleway along existing roads to provide adequate sightlines for safe crossings. However, the design includes for new hedgerows along the required sightlines, leaving only the c. 10m gap for the cycleway itself once established. In total, c. 891m of hedgerows and treelines will be removed. The total length of replacement and new hedgerows is c. 2,281m, representing a net increase of c. 1,390m (i.e. for every 100m of existing hedgerows/treelines being removed, 256m of new/replacement hedgerow is proposed). In addition, new treelines are proposed from Ch. 1350 to 2780 (i.e. 1,430m in length) and from Ch. 3500 to 3746 (i.e. 246m in length), totalling approximately 89 no. trees, pending the detailed landscape specification. Habitat loss and fragmentation during construction will be significant at the local level. However, as the new hedgerows and treelines become established, there will be a net increase in the quantity and connectivity of these habitats. In particular, the proposed hedgerow from Ch. 1350 to 1485 will provide new connectivity across an existing open field from the Carrigane Road hedgerow to the railway corridor, while the proposed hedgerow from Ch. 3510 to 3746 will provide new connectivity across an existing open field from the Water Rock Road treelines to the Water Rock LIHAF Initiative landscaping. Field margins will be replaced by the verges of the new cycleway, which will be of similar ecological function and value to the existing field margins, and new field margins will develop adjoining the new hedgerows on the sides returned to agricultural use. As such, there will be a slight increase in the area of field margin and similar habitat, with greater connectivity between these habitats provided by the verges of the cycleway.</p> <p>Water quality - This KER is a terrestrial habitat and is not sensitive to the water quality impacts associated with the proposed development.</p> <p>IAPS - Himalayan Balsam, Japanese Knotweed, Three-cornered Leek and Cherry Laurel all represent a significant threat to the quality of these habitats.</p> <p>Disturbance - Mammals and farmland birds within this KER are considered to be vulnerable to disturbance from the construction of the proposed development. However, given the proposed sequencing and methodology of the works, any effects are likely to be slight to moderate and fully recoverable in the short term.</p> <p>Artificial lighting - This KER encompasses receptors such as nocturnal mammals, particularly bats, and other fauna which are light-sensitive. As explain in Section 5.1.5, artificial lighting of the cycleway during the operational phase is of particular concern as, if not designed sensitively with regard to these receptors, could have permanent and significant negative impacts on the quality and connectivity of habitats for those species.</p>	<p>Significant short-term effects (local level) due to construction-phase habitat loss and fragmentation, eventually becoming a moderate positive effect once new landscaping established.</p> <p>Significant construction-related IAPS risk (local level).</p> <p>Slight to moderate short-term effects (local level) due to disturbance of fauna.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>
KER 6	<p><b>Stone walls and other stonework</b></p> <p>Habitat loss and fragmentation - Construction of the proposed development will create a gap of c. 10m in the c. 265m length of stone wall along the Carrigane Road for the new crossing here. The c. 95m length of low stone wall along Ballyrichard More Road immediately adjacent to the proposed route will be retained. Thus, there will be no significant reduction in the quantity or connectivity of stone walls and other stonework in the locality.</p> <p>Water quality - This KER is a terrestrial habitat and is not sensitive to the water quality impacts associated with the proposed development.</p> <p>IAPS - This KER is not considered to be at risk from the IAPS present on site or those which could potentially be introduced during construction.</p> <p>Disturbance - This KER does not support any features which are sensitive to noise or visual disturbance from human activity.</p>	<p>Imperceptible effects (local level) of habitat loss and fragmentation.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>

No.	Analysis of impacts and their effects	Evaluation
	<p>Artificial lighting - The function of this KER in providing habitat for invertebrates and habitat connectivity for bats could suffer permanent and significant negative impacts, if the proposed lighting is not designed sensitively with regard to these receptors.</p>	
KER 7	<p><b>Water Rock stream</b></p> <p>Habitat loss and fragmentation - There will be no loss or fragmentation of the Water Rock stream, nor any in-stream works.</p> <p>Water quality - The Water Rock stream and associated drainage ditches are within the likely extent of potential water quality impacts from the proposed development. As explained in Section 5.1.2, such impacts are associated with the construction phase only and are of low magnitude and brief or temporary duration. Therefore, such impacts are unlikely to have a significant effect on the ecological value of this watercourse.</p> <p>IAPS - Himalayan Balsam poses a particular threat along watercourses, as does Japanese Knotweed. There is a significant risk that these species could be spread to the banks of the Water Rock stream during construction of the proposed development, the effects of which would be significant and long-lasting for this watercourse, particularly in combination with existing pressures from agricultural activities (including access to the stream by livestock).</p> <p>Disturbance - This KER does not support any features which are sensitive to noise or visual disturbance from human activity.</p> <p>Artificial lighting - The function of this KER in providing habitat for invertebrates and habitat connectivity for bats could suffer permanent and significant negative impacts, if the proposed lighting is not designed sensitively for these receptors.</p>	<p>Slight brief or temporary effects (local level) from potential construction-related water quality impacts.</p> <p>Potentially significant long-term effects (local level) due to construction-related IAPS risk.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>
KER 8	<p><b>Bats roosts</b></p> <p>Habitat loss and fragmentation - The bat studies carried out for this EclA did not find any bat roosts or potential roost features within the footprint of the proposed development. Thus, there will be no loss of any known bat roosts. However, pre-construction surveys will be required to ensure that no bat roosts have developed in trees within the development footprint between the 2023 bat surveys and the commencement of site clearance. Foraging and commuting habitat in the vicinity of the small pipistrelle roost at Ballyadam House will incur some habitat loss and fragmentation during construction, as assessed under KER5 above.</p> <p>Water quality - This KER is a terrestrial habitat and is not sensitive to water quality impacts.</p> <p>IAPS - This KER is not considered to be at risk from the IAPS present on site or those which could potentially be introduced during construction.</p> <p>Disturbance - The known bat roost at Ballyadam House is within the zone of impact for disturbance from the construction of the proposed development. However, given the proposed sequencing and methodology of the works, there are not considered to be any effects of disturbance on this roost. As described above, there is a risk of disturbance to roosts in trees which may become established within the works area between the surveys which informed this EclA and commencement of site clearance.</p> <p>Artificial lighting - As explained in Section 5.1.5 and under KERs 2 to 7 above, the effects of artificial lighting near bat roosts, if not designed appropriately, can be significant and permanent. This is of particular concern with regard to the known pipistrelle roost of local importance at Ballyadam House, as well as potential future roosts in the study area.</p>	<p>Significant short-term effects (local level) due to construction-phase impacts on adjoining commuting and foraging habitat, eventually becoming a moderate positive effect once new landscaping established.</p> <p>Potentially significant short-term effects (local level) due to construction-related disturbance to any future tree roosts in or adjoining the works area.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>
KER 9	<p><b>Invasive alien plant species (IAPS)</b></p> <p>As explained in Section 5.1.3, the IAPS present in the vicinity of the proposed development represent a threat to the integrity of the other KERs. In the absence of mitigation, there is a risk that the construction of the proposed development could lead to the introduction and/or further spread of IAPS in the locality, negatively affecting habitats and species of ecological value and presenting a project risk in terms of a potential breach of Regulation 49 of the Habitats Directive.</p>	<p>Moderate to significant long-term effects (local level).</p>
KER 10	<p><b>Woodland on Ballyrichard More Road</b></p>	<p>Permanent moderate negative effect (local level)</p>

No.	Analysis of impacts and their effects	Evaluation
	<p>Habitat loss and fragmentation - A total of c. 215m<sup>2</sup> of this KER is within the red line boundary of the proposed development, accounting for c. 13% of the total area (c. 1,650m<sup>2</sup>). All of this loss occurs in the northern corner of this woodland, i.e. the habitat will not be fragmented itself nor will it be separated from connected hedgerows, treelines or scrub. This habitat loss will be permanent, not is not likely to have a significant effect on the structure or function of the woodland. A new hedgerow along the southern side of the new cycleway will connect to this woodland.</p> <p>Water quality - This KER is a terrestrial habitat and is not sensitive to water quality impacts.</p> <p>IAPS - Several IAPS and other non-native garden escapes are present in this woodland, particularly along the road edge. These include Himalayan Balsam, Variegated Yellow Archangel and Greater Periwinkle. Species such as Wilson's Honeysuckle or Cotoneaster are also likely present. During construction, many of these species will be removed as they are concentrated in the northern part of the woodland. However, in the absence of appropriate IAPS management, construction-related disturbance could cause them to spread further within the woodland.</p> <p>Disturbance - Mammals and woodland birds within this KER are considered to be vulnerable to disturbance from the construction of the proposed development. However, given the proposed sequencing and methodology of the works, any effects are likely to be slight to moderate and fully recoverable in the short term.</p> <p>Artificial lighting - This KER encompasses receptors such as nocturnal mammals, particularly bats, and other fauna which are light-sensitive. As explain in Section 5.1.5, artificial lighting of the cycleway during the operational phase is of particular concern as, if not designed sensitively with regard to these receptors, could have permanent and significant negative impacts on the quality and connectivity of habitats for those species.</p>	<p>due to habitat loss and slight to imperceptible positive permanent effect (local level) by connection to hew hedgerow.</p> <p>Significant construction-related IAPS risk (local level).</p> <p>Slight to moderate short-term effects (local level) due to disturbance of fauna.</p> <p>Potentially permanent significant effects (local level) due to artificial lighting.</p>



## 6. Mitigation and Enhancement

### 6.1. Landscape Specification

A detailed landscape specification will be developed by a Landscape Architect to maximise the biodiversity value of the final design. In particular, the landscape plan/specification will maximise the quantity, quality, diversity and connectivity of habitats within the finished cycleway corridor. To that end, the development of the landscape specification will be overseen by a suitably qualified and experienced ecologist and have regard to the following guidance documents: -

- All-Ireland Pollinator Plan 2021-2025. *National Biodiversity Data Centre Series 25*. National Biodiversity Data Centre, Waterford. March 2021.
- *Cork County Council Recommended List of Native Tree and Shrub Species for Residential & Industrial Developments*, Version 2. CCC Ecology Office, Cork County Council, Cork. June 2022.
- Lundy, M.G., Aughney, T., Montgomery, W.I. and Roche, N. (2011) *Landscape conservation for Irish bats & species specific roosting characteristics*. Bat Conservation Ireland.
- TII (2006) *A Guide to Landscape Treatments for National Road Schemes in Ireland*. GE-ENV-01102. February 2006. Transport Infrastructure Ireland, Dublin.

#### 6.1.1. Preservation In-situ

The extent of vegetation clearance will be limited to the area required to facilitate construction. All vegetation, including hedgerows/treelines and other semi-natural habitats, not required to be cleared should be fenced off as part of site preparations and protected/managed as per the landscape specification during construction.

In particular, mature trees shall be retained and protected wherever possible, with felling being a last resort only to be used where absolutely necessary to facilitate construction. This will minimise the risk to roosting bats and nesting birds and retain important habitat for a wide range of invertebrates.

#### 6.1.2. Salvage and Temporary Removal

Topsoil arising on site from areas of different grassland habitats shall be stockpiled separately for re-use on site as part of the landscaping. The locations, heights etc. of stockpiles for topsoils will be detailed in the landscape specification. The objective of this measure is to minimise the export and import of soil and to preserve as much as possible the local seedbank and soil conditions on site. Soils contaminated with IAPS or hazardous materials shall not be re-used.

Topsoil reused on site will be from appropriate habitat types. For example, topsoil from wet grasslands should be used in areas to be returned to wet grassland, as well as in new swales or SuDS features, e.g. "rain gardens", while soils from arable margins, e.g. the field immediately west of Ballyadam Road, will be reused in sections of the cycleway corridor adjoining arable fields. Where possible, topsoil should be reused in the same fields from which it was excavated, and otherwise in the nearest appropriate area.

#### 6.1.3. Habitat Replacement and Creation

##### General

The methodology for establishing all new or replacement landscaping, including topsoils, grasslands, hedgerows, treeline and swales/SuDS feature, will be established in the landscape specification, following the principles set out below.

## Grasslands and Swales/SuDS Features

Priority shall be given to re-use of topsoil generated on site, with importation of new topsoil kept to a minimum. Where it is necessary to import new topsoil, this shall be carefully selected to ensure that it is appropriate to the receiving lands in terms of its structure, organic content, pH, nutrient status etc., as advised by the Landscape Architect.

Priority shall also be given to natural colonisation of new topsoil by soil biota and flora from adjoining habitats, minimising the use of imported seed. Where new seeding is required, e.g. due to the time of year of landscaping works, the Contractor shall ensure that it is of local provenance and that the species mix is appropriate to each specific location, as per the landscape specification.

## Hedgerows, treelines and stone walls

As detailed in Section 5.2 above, a total of c. 891m of hedgerows and treelines will be removed and c. 2,281m of replacement and new hedgerows will be planted, representing a net increase of c. 1,390m (i.e. for every 100m of existing hedgerows/treelines being removed, 256m of new/replacement hedgerow is proposed). A total of c. 1,676m of new treelines, of approximately 89 no. trees, is also proposed.

Where gaps of up to 50m in existing hedgerows/treelines will be created to provide sightlines for safety at 3 no. road crossings, new hedgerows will be created along the required sightlines. This will reduce habitat loss and fragmentation to the 10m width of the cycleway corridor, or as little as 4m (i.e. the width of the cycleway itself) wherever possible.

Where the route crosses field boundaries, the gaps created in the existing boundaries should only be as wide as necessary to facilitate construction. On completion, the remaining boundaries should be continued up to the edge of the cycleway or as close as possible to minimise the effects of fragmentation. This includes rebuilding the ends of the stone wall at the Carrigane Road crossing back up the edge of cycleway. As such, the gaps in boundaries in the finished state will be closer to 4m rather than 10m.

The proposed hedgerow from Ch. 1350 to 1485 will provide new connectivity across an existing open field from the Carrigane Road hedgerow to the railway corridor, while the proposed hedgerow from Ch. 3510 to 3746 will provide new connectivity across an existing open field from the Water Rock Road treelines to the Water Rock LIHAF Initiative landscaping.

The species mix, establishment and ongoing management of each new and replacement hedgerow and the new treelines will be as per the landscape specification, which shall take into account the following guidance:

- *Cork County Council Recommended List of Native Tree and Shrub Species for Residential & Industrial Developments*, Version 2. CCC Ecology Office, Cork County Council, Cork. June 2022.

All planting shall utilise specimens of local provenance.

### 6.1.4. Post-construction

The implementation of the landscape specification will continue into the operational phase with the establishment and ongoing management of landscaping. Ongoing management will focus in particular on preserving and, where possible, enhancing the quality and diversity of habitats present in the cycleway corridor. This will have regard to the following guidance and example: -

- All-Ireland Pollinator Plan 2021-2025. *National Biodiversity Data Centre Series 25*. National Biodiversity Data Centre, Waterford. March 2021.
- *Midleton Pollinator Plan*. East Cork Municipal District, Cork County Council, Cork. February 2020.

Particular attention should be paid to the requirement for annual management of annual wildflower communities of arable field margins, in order to maintain and, where possible, enhance these communities, for their inherent botanical interest and also for their ecological provisioning function for invertebrates and birds and supporting ecosystem services for agriculture.

As explained in more detail in Section 6.4 below, the IAPS Management Plan will continue to be implemented for at least 2 years post-construction to ensure complete removal of high-impact and legally restricted IAPS from the cycleway corridor and adjoining areas.

## 6.2. Protection of Fauna

### 6.2.1. Mammals

Based on the results of the desk studies and field surveys undertaken to inform this EclA, there are no bat roosts or any breeding or resting places of other protected mammals within or immediately adjacent to the proposed development and, therefore, there is no requirement for any licences under either Section 23 of the Wildlife Act or Regulation 54 of the Habitats Regulations.

However, due to the mobility of such species and consequent potential for changes in their distribution in the time between the surveys which informed this EclA, the granting of any planning permission and commencement of construction, the following pre-construction surveys will be undertaken in advance of any works commencing on site (including preparatory works):

- Identification of any breeding or resting places of protected non-volant mammals, e.g. badgers; and,
- Inspections for roosting bats at trees with potential bat roost features.

These surveys will be undertaken by a suitably qualified and experienced ecologist (appointed by the Contractor) and in the appropriate survey seasons. Inspections of potential bat roost features must be undertaken no more than 1-2 days prior to proposed felling (see bat report in Appendix A for more detail).

The results of these surveys will determine the need or otherwise for any licences to disturb these species. Where present, the treatment of these species during construction will be in accordance with the terms and conditions of any licence granted and the following guidance:

- NRA (undated) *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes*. National Roads Authority, Dublin.
- NRA (2006) *Guidelines for the Treatment of Bats during the Construction of National Roads Schemes*. National Roads Authority, Dublin.

The Contractor will be responsible for applying for and executing any licences required, and will be assisted by their own suitably qualified and experienced ecologist.

In order to minimise the impact of disturbance and artificial lighting on mammals, construction activities should be limited to normal working hours (07:00 to 17:00), with the site being secured and lighting being switched off outside of these hours. More detail on artificial lighting is provided below.

Where appropriate, artificial roost features for bats should be incorporated into the design, e.g. the proposed underpass at Ch. 2050. The types, numbers and positions of such features will be determined during the detailed design process, on the advice of a suitably qualified ecologist and following the guidelines in the bat report in Appendix A.

In order to minimise the effects of habitat fragmentation on non-volant mammals, especially Badger, mammal-proof fencing will not be specified. During the detailed design stage, a suitably qualified and experienced ecologist will be consulted with regard to the specification of an appropriate fence which shall provide permeability for movement of badgers and other mammals.

## 6.2.2. Artificial Lighting

The text in this section has been taken largely from the bat study presented in Appendix A.

### Construction Phase

To minimise impacts on bats and other nocturnal fauna, works during hours of darkness will be kept to a minimum. If construction lighting is required during the bat activity period (April to September), lighting shall be directed away from all known roosts (i.e. the outbuilding at Ballyadam House and any others identified during the pre-construction surveys) and woodland/scrub to be retained. This can be achieved by using directional lighting to avoid light spill or trespass, which requires the use of an appropriate luminaire and/or accessories such as hoods, cowls, louvres and shields.

### Operational Phase

The detailed lighting design shall ensure that the proposed development does not create barriers for commuting and foraging bats, while maintaining a safe environment for cyclists and pedestrians. This is particularly important for bat foraging/commuting habitat near roosts and at the edge of woodland/scrub. The following principles will be followed in relation to the detailed lighting design (see Appendix A for more detail): -

- Lighting design will be flexible and fully take into account the presence of protected species. Appropriate lighting shall be used, with more sensitive lighting regimes deployed in wildlife-sensitive areas.
- Dark zones will be used to separate habitats or features such as hedgerows, treelines and scrub from lighting by forming a dark perimeter around them.
- Buffers will be used to protect dark zones and rely on ensuring light levels within a certain distance of a feature do not exceed defined limits.

The following, which is taken from ILP (2023) guidelines, will be considered when choosing luminaires: -

- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component.
- Luminaires should feature peak wavelengths higher than 550nm.
- Way-marking in-ground markers (low output with cowls or similar to minimise upward light spill) may be used to delineate path edges.
- Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- The use of bollard or low-level downward-directional luminaires is strongly discouraged. This is due to a considerable range of issues, such as unacceptable glare, poor illumination efficiency, unacceptable upward light output, increased upward light scatter from surfaces and poor facial recognition which makes them unsuitable for most sites. Therefore, they should only be considered in specific cases where the lighting professional and project manager are able to resolve these issues.
- Only luminaires with an upward light ratio of 0% and with good optical control will be used.
- Luminaires will always be mounted on horizontally with no light output above 90° and/or no upward tilt.

- As a last resort, accessories such as baffles, hoods or louvres may be used to reduce light spill and direct it only to where it is needed.

The guidelines referred to in the bat study in Appendix A will be following in the detailed slighting design. Particular regard shall be had to the following: -

- Marnell, F., Kelleher, C. and Mullen, E. (2022) Bat mitigation guidelines for Ireland – V2. *Irish Wildlife Manuals* 134. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.
- Reason, P.F. and Wray, S. (2023) *UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats*. Chartered Institute of Ecology and Environmental Management, Ampfield.

These guidelines will also inform the design, placement and maintenance of artificial roost features incorporated as per the previous section.

### 6.2.3. Birds

The mature ash tree noted as a possible barn owl roost near the junction of Ballyrichard More Road and Castle Rock Avenue should be retained and protected during construction.

In order to protect nesting birds and other wildlife, Section 40 of the Wildlife Act makes it an offence to “*cut, grub, burn or otherwise destroy, during the period beginning on the 1<sup>st</sup> day of March and ending on the 31<sup>st</sup> day of August in any year, any vegetation growing on any land not then cultivated*”. However, this does not apply to “*the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided*”. Notwithstanding this, every effort shall be made to avoid cutting/felling trees or clearing vegetation during this period.

Where tree felling or vegetation clearance is necessary between 1<sup>st</sup> March and 31<sup>st</sup> August, a suitably qualified and experienced ecologist will inspect the trees/vegetation and identify any active bird nests present. Any active nests will be protected and surrounding cover not cleared until such time as the nest is no longer active, as advised by the ecologist.

### 6.2.4. Amphibians

Every effort shall be made to avoid interference with areas of standing water during construction, particularly in KER3 (Poulaniska) and during the months of January, February and March, when frogs are likely to utilise these areas for spawning. Should works be required in these areas during this period, the Contractor’s ecologist shall inspect them for evidence of breeding frogs. Any areas of standing water in use or likely in use by breeding frogs will be protected until the tadpoles have left or the pools are otherwise no longer in use.

## 6.3. Aquatic Habitats

### 6.3.1. Drainage Design

As the design process so far has followed the principles of *The SuDS Manual* (CIRIA, 2015) and the relevant policies and objectives of the Cork County Development Plan 2022-2028, the detailed drainage design will also be guided by the principles and standards set out in these documents.

Surface water swales and SuDS features will encourage biodiversity through the creation of new aquatic and wetland habitats. Planting in these areas will also be specified by a Landscape Architect, with the assistance of a suitably qualified and experienced ecologist. These areas will also have amenity value and provide surface water pollution prevention measures.

### 6.3.2. Watercourse Crossings

The design of all watercourse crossings for the proposed development shall meet the requirements of *Guidelines for the Crossing of Watercourses during the construction of National Road Schemes* (NRA, 2008b). The only streams/ivers to be crossed are the Water Rock and Poulaniska streams. The Water Rock stream will be crossed using the existing culvert at Ch. 1335, so no new structure is required. It is recommended that the crossing of the Poulaniska stream be a 1500mm wide pre-cast concrete box culvert, subject to verification by a drainage engineer during detailed design.

Construction of the Poulaniska stream crossing will require either temporary diversion, over-pumping or fluming of the stream, or a permanent diversion, depending on whether it is to an on-line or off-line. Whichever method is selected, the guidelines in the following section will be followed to control the risk of any accidental pollution event or sedimentation during these works in and adjacent to the stream.

Works in close proximity to the Water Rock stream will also follow the guidelines in the following section in order to control the risk of accidental pollution or sedimentation. The Contractor's method statement will pay particular attention to the prevention of pollution and sedimentation at all watercourse crossings.

### 6.3.3. General Construction Measures

The development lands and construction activities shall be managed following routine practices and procedures for the control of pollution from construction sites, including the relevant, well-established guidelines, including but not limited to the following:

- CIRIA (2001) *C532 - Control of water pollution from construction sites: guidance for consultants and contractors*. Construction Industry Research and Information Association, London.
- CIRIA (2006) *C648 - Control of water pollution from linear construction projects: technical guidance*. Construction Industry Research and Information Association, London.
- NRA (2008b) *Guidelines for the Crossing of Watercourses during the construction of National Road Schemes*. National Roads Authority, Dublin.
- TII (2017) *The Management of Waste from National Road Construction Projects. GE-ENV-01101. December 2017*. Transport Infrastructure Ireland, Dublin.

These include controls on the phasing of works, waste management, location of site compounds, and surface water management.

One or more construction compounds will be established within the red line boundary and shall not be located in close proximity to any drains or surface water or karst features through which sediment or pollutants could be discharged.

Culverts and other concrete structural elements, e.g. kerbs, should be brought to site pre-cast, avoiding the risks to water quality arising from the pouring of wet concrete on site, which should be kept to a minimum.

## 6.4. Management of Invasive Alien Plant Species

As detailed in Section 5 above, in the absence of appropriate controls, IAPS pose a risk of moderate to significant long-term effects locally. Therefore, following a pre-construction survey to determine the precise locations and extents of all IAPS on site, the Contractor's ecologist will map the distribution and extents of all IAPS within and adjoining the red-line boundary and prepare an IAPS Management Plan, taking into account: -

- The specific IAPS present and the scale and extent of infestation,
- The sensitivity of the local environment,
- The growth stage/season of the plants, and

- The construction sequence/programme.

The IAPS Management Plan will be prepared in agreement with the Employer or the Employer's Representative and in accordance with the following:

- TII (2020a) *The Management of Invasive Alien Plant Species on National Roads – Standard. GE-ENV-01104. December 2020.* Transport Infrastructure Ireland, Dublin.
- TII (2020b) *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance. GE-ENV-01105. December 2020.* Transport Infrastructure Ireland, Dublin.

The following shall be implemented during the construction stage (including advance works): -

1. The IAPS Management Plan will be implemented by the Contractor with the advice and assistance of their ecologist.
2. The 'toolbox talk' for all persons entering the site will include an overview of the IAPS present on site, their identification, the importance of controlling them/preventing their spread, and the responsibilities of site staff in avoiding any spread of IAPS.
3. The Contractor will ensure that all vehicles, plant, equipment and PPE intended for use on site are dry, clean and free from debris and plant material prior to being brought to site.
4. A dedicated and clearly marked cleaning facility/wash-down area will be strategically placed in a contained area on site for use by staff, vehicles and machinery.
  - a. All vehicles and equipment that have been used in a contaminated zone will be thoroughly pressure-washed in the wash-down area each time they leave site and once work in that zone is complete. This includes footwear, personal protective equipment (PPE), tools, and other light equipment.
  - b. This facility will be located at least 20m from any watercourse and be appropriately bunded to prevent run-off.
  - c. Material gathered in this facility will be appropriately stockpiled and treated along with other contaminated material.
5. Soil management during the works will be in accordance with Section 5.5 of TII (2006).
6. All imported materials (e.g. fill and topsoil) will be sourced from licensed suppliers who shall certify that in advance of delivery that any such materials are free from IAPS material, especially propagules such as seeds or rhizome fragments.
7. The Contractor will implement appropriate controls on the movement of machinery and materials in IAPS-contaminated zones.
  - a. Where it is necessary to work in contaminated zones, every effort will be made not to use vehicles with caterpillar tracks.
  - b. Vehicles leaving contaminated zones will be confined to marked haulage routes protected by root barrier membranes or be pressure-washed before leaving the zone.
8. Any Ash trees or fallen Ash branches or leaf litter to be removed will be assumed to be infected with *Hymenoscyphus fraxineus*, the causal agent of 'Ash dieback disease'. Any Ash material arising will be stockpiled appropriately and disposed to a licenced landfill, along with all other IAPS-contaminated material.
9. In relation to stockpiling of IAPS-contaminated material: -

- a. Any such material will be stockpiled separately from other material and clearly marked as contaminated.
  - b. The length of time for which such material is stored on site will be kept to a minimum.
  - c. Measures will be implemented to prevent any run-off from stockpiles of contaminated material which could convey IAPS propagules to watercourses.
10. Only vehicles that are deemed to be biosecure (i.e. sealed so that no soil can escape) will be used to transport IAPS-contaminated material and will be thoroughly pressure-washed in the wash-down area before leaving site.
11. The Contractor's ecologist will oversee and keep a record of the implementation of the IAPS Management Plan and all works relating to IAPS, as per TII (2020a,b). In particular, they will: -
- a. Inspect the demarcation and signage of contaminated zones, the cleaning/wash-down facility and IAPS material stockpiling area prior to their use,
  - b. Directly supervise and document all IAPS removal works,
  - c. Carry out weekly inspections of the site for compliance with the biosecurity measures detailed in the IAPS Management Plan, and
  - d. Provide monthly updates to the Employer or the Employer's Representative on the implementation of the IAPS Management Plan.

In addition, the proposed development and adjoining areas will be monitored for regrowth of IAPS for a minimum of 2 years. Any regrowth of treated IAPS will be accurately mapped and reported to Cork County Council. The removal of IAPS may be considered successful after two consecutive growing seasons with no sign of regrowth from the removed stands.



## 6.5. Residual Effects

Table 6-1 below evaluates the residual effects of the construction and operation of the proposed development on each of the KERs following the inclusion of the mitigation and enhancement measures in this section.

**Table 6-1 - Evaluation of residual effects following the inclusion of mitigation and enhancement.**

No.	KER Name	Residual Effects
KER 1	<b>Great Island Channel SAC, Cork Harbour SPA, Great Island Channel pNHA, intertidal mudflats and sandflats, saltmarshes, wetlands and waterbirds</b>	No measurable effects.
KER 2	<b>Ballynaclashy House, North of Midleton pNHA, Leamlara Wood pNHA, connected woods (Curragh, Ballynaclashy, Ballyedmond, Glounamuck and Pheasant's) and watercourses (especially Owenacurra, Leamlara and Water Rock)</b>	Imperceptible effects (local level) on mobile species via ex-situ impacts on foraging and commuting habitats.
KER 3	<b>Poulaniska stream and associated drainage ditches, wet grassland, small woodlands, dry grasslands and scrub</b>	Slight temporary effects (local level) due to minor habitat loss, construction-phase water quality and disturbance impacts, imperceptible during the operational phase. Permanent slight effects (local level) due to artificial lighting.
KER 4	<b>Margins of arable field west of Ballyadam Road</b>	Slight to imperceptible long-term effects (local level). Temporary slight effects (local level) of disturbance to fauna. Permanent slight effects (local level) due to artificial lighting.
KER 5	<b>Hedgerows, treelines, scrub and field margins</b>	Significant short-term effects (local level) due to construction-phase habitat loss and fragmentation, eventually becoming a moderate positive effect once new landscaping established. Temporary slight effects (local level) of disturbance to fauna. Permanent slight effects (local level) due to artificial lighting.
KER 6	<b>Stone walls and other stonework</b>	Imperceptible effects (local level) of habitat loss and fragmentation. Permanent slight effects (local level) due to artificial lighting.
KER 7	<b>Water Rock stream</b>	Slight temporary effects (local level) from potential construction-related water quality impacts. Permanent slight effects (local level) due to artificial lighting.
KER 8	<b>Bats roosts</b>	Significant short-term effects (local level) due to construction-phase impacts on adjoining commuting and foraging habitat, eventually becoming a moderate positive effect once new landscaping established. Permanent slight effects (local level) due to artificial lighting.
KER 9	<b>Invasive alien plant species (IAPS)</b>	Ecological and project risks effectively controlled.
KER 10	<b>Woodland on Ballyrichard More Road</b>	Permanent moderate negative effect (local level) due to habitat loss and slight to imperceptible positive permanent effect (local level) by connection to hew hedgerow. Significant positive effect (local level) by removal of IAPS. Temporary slight effects (local level) of disturbance to fauna. Permanent slight effects (local level) due to artificial lighting.

## 7. Biodiversity Net Gain

The Cork County Development Plan 2022-2028 enshrines the principle of Biodiversity Net Gain into Cork County Council's policies for sustainable development in the county through Objective BE 15-6, as shown in Figure 8-1 below.

County Development Plan Objective BE 15-6: Biodiversity and New Development	
Provide for the protection and enhancement of biodiversity in the development management process and when licensing or permitting other activities by:	
a)	Providing ongoing support and guidance to developers on incorporating biodiversity considerations into new development through preplanning communications and the Council's guidance document 'Biodiversity and the Planning Process – guidance for developments on the management of biodiversity issues during the planning process' and any updated versions of this advice;
b)	Encouraging the retention and integration of existing trees, hedgerows and other features of high natural value within new developments;
c)	Requiring the incorporation of primarily native tree and other plant species, particularly pollinator friendly species in the landscaping of new developments;
d)	Fulfilling Appropriate Assessment and Environmental Impact Assessment obligations and carrying out Ecological Impact Assessment in relation to development and activities, as appropriate;
e)	Ensuring that an appropriate level of assessment is completed in relation to wetland habitats subject to proposals which would involve drainage or reclamation. This includes lakes and ponds, watercourses, springs and swamps, marshes, heath, peatlands, some woodlands as well as some coastal and marine habitats;
f)	Ensuring that the implementation of appropriate mitigation (including habitat enhancement, new planting or other habitat creation initiatives) is incorporated into new development, where the implementation of such development would result in unavoidable impacts on biodiversity - supporting the principle of biodiversity net gain.

**Figure 7-1 - Cork County Development Plan Objective BE 15-6: Biodiversity and New Development.**

As shown in Section 2.3.1 of the Part 8 Planning Report for the proposed development, the Cork County Development Plan 2022-2028 Objective BE 15-6 on biodiversity enhancement of new development informed the route selection and design process for the proposed development. As demonstrated in Sections 1 and 6 of this EclA, the route selection and design have minimised potential biodiversity losses from the proposed development and sought out opportunities for biodiversity gains. Thus, the principle of Biodiversity Net Gain has been followed in the planning of the proposed development.

The principals and outline measures established in Section 6 of this EclA will be followed during the detailed design phase to achieve a measurable Biodiversity Net Gain from the proposed development. This next phase will be guided by Section 6 of this EclA to maximise the biodiversity gains from the proposed development, particularly through the landscape plan and specification for passive green space and SuDS features. Once that stage is complete, a detailed account of biodiversity losses and gains can be prepared.

## 8. Conclusion

This EclA has examined the biodiversity and baseline ecological conditions of the receiving environment within the site of the proposed Carrigtwohill to Midleton Inter-urban Cycleway Phase 2 and its Zone of Influence, assessed the likely effects of the proposed development, individually and in combination with other plans and projects, on the sites, habitats, species and other ecological features of Local Importance (Higher Value) or above which were identified within the footprint of the proposed development and its Zone of Influence. This report has also proposed suitable measures to avoid or reduce the likely effects on those features and evaluated any residual effects. These measures, as well as further ecological enhancements of the proposed development, were developed in line with Cork County Council's policy in relation to Biodiversity Net Gain.

On the basis of that assessment, it is concluded that the Carrigtwohill to Midleton Inter-urban Cycleway Phase 2, provided that it is implemented in accordance with the measures proposed in this EclA, will not give rise to any significant negative effects on the biodiversity or ecology of the receiving environment and will be aligned with the principle of Biodiversity Net Gain.

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# Appendices



# Appendix A. Bat Survey Report

## Appendix B. Species Lists

### B.1. Flora recorded during the field surveys in 2023.

Common Name	Scientific Name
Sycamore	<i>Acer pseudoplatanus</i>
Maples (other than Sycamore)	<i>Acer</i> spp.
Yarrow	<i>Achillea millefolium</i>
Horse Chestnut	<i>Aesculus hippocastanum</i>
Creeping Bent	<i>Agrostis stolonifera</i>
Three-cornered Leek	<i>Allium triquetrum</i>
Alder	<i>Alnus glutinosa</i>
Scarlet Pimpernel	<i>Anagallis arvensis</i>
Silverweed	<i>Argentina anserina</i>
Lords and Ladies	<i>Arum maculatum</i>
Rustyback	<i>Asplenium ceterach</i>
Wall-rue	<i>Asplenium ruta-muraria</i>
Hart's-tongue	<i>Asplenium scolopendrium</i>
Maidenhair Spleenwort	<i>Asplenium trichomanes</i>
Common Orache	<i>Atriplex patula</i>
Spear-leaved Orache	<i>Atriplex prostrata</i>
Common Daisy	<i>Bellis perennis</i>
Lesser Water-parsnip	<i>Berula erecta</i>
Oilseed Rape	<i>Brassica napus</i> subsp. <i>napus</i>
Hedge Bindweed	<i>Calystegia sepium</i>
Shepherd's Purse	<i>Capsella bursa-pastoris</i>
Wavy Bittercress	<i>Cardamine flexuosa</i>
Remote Sedge	<i>Carex remota</i>
Spanish Chestnut	<i>Castanea sativa</i>
Common Knapweed	<i>Centaurea nigra</i>
Common Centaury	<i>Centaureum erythraea</i>
Red Valarian	<i>Centranthus ruber</i>
Common Mouse-ear	<i>Cerastium fontanum</i>
Lawson's Cyprus	<i>Chamaecyparis lawsoniana</i>
Rosebay Willowherb	<i>Chamaenerion angustifolium</i>
Fat Hen	<i>Chenopodium album</i>
Enchanter's Nightshade	<i>Circaea lutetiana</i>
Creeping Thistle	<i>Cirsium arvense</i>
Meadow Thistle	<i>Cirsium dissectum</i>
Marsh Thistle	<i>Cirsium palustre</i>
Spear Thistle	<i>Cirsium vulgare</i>

Common Name	Scientific Name
Traveller's Joy	<i>Clematis vitalba</i>
Field Bindweed	<i>Convolvulus arvensis</i>
New Zealand Cabbage Tree	<i>Cordyline australis</i>
Hazel	<i>Corylus avellana</i>
Cotoneaster	<i>Cotoneaster</i> sp.
Hawthorn	<i>Crataegus monogyna</i>
Foxglove	<i>Digitalis purpurea</i>
Teasel	<i>Dipsacus fullonum</i>
Giant Bugloss	<i>Echium pininana</i>
Viper's Bugloss	<i>Echium vulgare</i>
Great Willowherb	<i>Epilobium hirsutum</i>
Short Fruited Willowherb	<i>Epilobium obscurum</i>
Hoary Willowherb	<i>Epilobium parviflorum</i>
Horsetail	<i>Equisetum</i> sp.
Sun Spurge	<i>Euphorbia helioscopia</i>
Beech	<i>Fagus sylvatica</i>
Black Bindweed	<i>Fallopia convolvulus</i>
Japanese Knotweed	<i>Fallopia japonica</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Ash	<i>Fraxinus excelsior</i>
Common Ramping-fumitory	<i>Fumaria muralis</i>
Cleavers	<i>Galium aparine</i>
Common Marsh Bedstraw	<i>Galium palustre</i>
Lady's Bedstraw	<i>Galium verum</i>
Cut-leaved Cranesbill	<i>Geranium dissectum</i>
Shining Cranesbill	<i>Geranium lucidum</i>
Dove's-foot Cranesbill	<i>Geranium molle</i>
Herb-Robert	<i>Geranium robertianum</i>
Wood Avens	<i>Geum urbanum</i>
Ground-ivy	<i>Glechoma hederacea</i>
Marsh Cudweed	<i>Gnaphalium uliginosum</i>
Ivy	<i>Hedera hibernica</i>
Common Hogweed	<i>Heracleum sphondylium</i>
Barley	<i>Hordeum vulgare</i>
Tutsan	<i>Hypericum androsaemum</i>
Rose of Sharon	<i>Hypericum calycinum</i>
Square-stalked St John's-wort	<i>Hypericum tetrapterum</i>
Holly	<i>Ilex aquifolium</i>
Himalayan Balsam	<i>Impatiens glandulifera</i>
Silver Ragwort	<i>Jacobaea maritima</i>

Common Name	Scientific Name
Common Ragwort	<i>Jacobaea vulgaris</i>
Variiegated Yellow Archangel	<i>Lamium galeobdolon</i> subsp. <i>argentatum</i>
Red Dead-nettle	<i>Lamium purpureum</i>
Nipplewort	<i>Lapsana communis</i>
Larch	<i>Larix</i> sp.
Meadow Vetchling	<i>Lathyrus pratensis</i>
Lesser Swinecress	<i>Lepidium didymum</i>
Perennial Rye-grass	<i>Lolium perenne</i>
Honeysuckle	<i>Lonicera periclymenum</i>
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>
Greater Bird's-foot-trefoil	<i>Lotus pedunculatus</i>
Apple	<i>Malus domestica</i>
Common Mallow	<i>Malva sylvestris</i>
Pineappleweed	<i>Matricaria discoidea</i>
Corn Mint	<i>Mentha arvensis</i>
Field Forget-me-not	<i>Myosotis arvensis</i>
Changing Forget-me-not	<i>Myosotis discolor</i>
Creeping Forget-me-not	<i>Myosotis secunda</i>
Redshank	<i>Persicaria maculosa</i>
Winter Heliotrope	<i>Petasites fragrans</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Great Plantain	<i>Plantago major</i>
Common Polypody	<i>Polypodium vulgar</i>
Black Poplar	<i>Populus nigra</i>
Creeping Cinquefoil	<i>Potentilla reptans</i>
Barren Strawberry	<i>Potentilla sterilis</i>
Primrose	<i>Primula vulgaris</i>
Self-heal	<i>Prunella vulgaris</i>
Cherry Laurel	<i>Prunus laurocerasus</i>
Blackthorn	<i>Prunus spinosa</i>
Cherry	<i>Prunus</i> spp.
Bracken	<i>Pteridium aquilinum</i>
Oak	<i>Quercus</i> spp.
Meadow Buttercup	<i>Ranunculus acris</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Dog Rose	<i>Rosa canina</i>
Rose	<i>Rosa</i> sp.
Bramble	<i>Rubus fruticosus</i> agg.
Raspberry	<i>Rubus idaeus</i>
Clustered Dock	<i>Rumex conglomeratus</i>

Common Name	Scientific Name
Water Dock	<i>Rumex hydrolapathum</i>
Broad-leaved Dock	<i>Rumex obtusifolius</i>
Willow	<i>Salix</i> spp.
Elder	<i>Sambucus nigra</i>
Autumn Hawkbit	<i>Scorzoneroides autumnalis</i>
Common Figwort	<i>Scrophularia nodosa</i>
Groundsel	<i>Senecio vulgaris</i>
Charlock	<i>Sinapis arvensis</i>
Hedge Mustard	<i>Sisymbrium officinale</i>
Bittersweet	<i>Solanum dulcamara</i>
Black Nightshade	<i>Solanum nigrum</i>
Perennial Sowthistle	<i>Sonchus arvensis</i>
Prickly Sowthistle	<i>Sonchus asper</i>
Smooth Sowthistle	<i>Sonchus oleraceus</i>
Rowan	<i>Sorbus aucuparia</i>
Marsh Woundwort	<i>Stachys palustris</i>
Hedge Woundwort	<i>Stachys sylvatica</i>
Common Chickweed	<i>Stellaria media</i>
Dandelion	<i>Taraxacum vulgaria</i>
Lesser Trefoil	<i>Trifolium dubium</i>
Red Clover	<i>Trifolium pratense</i>
White Clover	<i>Trifolium repens</i>
Scentless Mayweed	<i>Tripleurospermum inodorum</i>
Wheat	<i>Triticum aestivum</i>
Gorse	<i>Ulex europaeus</i>
Elm	<i>Ulmus</i> sp.
Nettle	<i>Urtica dioica</i>
Wall Speedwell	<i>Veronica arvensis</i>
Germander Speedwell	<i>Veronica chamaedrys</i>
Common Field-speedwell	<i>Veronica persica</i>
Broad Bean	<i>Vicia faba</i>
Common Vetch	<i>Vicia sativa</i>
Bush Vetch	<i>Vicia sepium</i>
Greater Periwinkle	<i>Vinca major</i>
Field Pansy	<i>Viola arvensis</i>
Wild Pansy	<i>Viola tricolor</i>
Maize	<i>Zea mays</i> subsp. <i>mays</i>

## B.2. NBDC records for bird species in hectad W87. BD-I = Birds Directive: Annex I; BoCCI = status as per Gilbert et al. (2021).

Common Name	Scientific Name	Status
Arctic Tern	<i>Sterna paradisaea</i>	BD-I; BoCCI-Amber
Barnacle Goose	<i>Branta leucopsis</i>	BD-I; BoCCI-Amber
Kingfisher	<i>Alcedo atthis</i>	BD-I; BoCCI-Amber
Common Tern	<i>Sterna hirundo</i>	BD-I; BoCCI-Amber
Great Northern Diver	<i>Gavia immer</i>	BD-I; BoCCI-Amber
Greenland White-fronted Goose	<i>Anser albifrons flavirostris</i>	BD-I; BoCCI-Amber
Mediterranean Gull	<i>Larus melanocephalus</i>	BD-I; BoCCI-Amber
Merlin	<i>Falco columbarius</i>	BD-I; BoCCI-Amber
Short-eared Owl	<i>Asio flammeus</i>	BD-I; BoCCI-Amber
Little Egret	<i>Egretta garzetta</i>	BD-I; BoCCI-Green
Peregrine	<i>Falco peregrinus</i>	BD-I; BoCCI-Green
Bar-tailed Godwit	<i>Limosa lapponica</i>	BD-I; BoCCI-Red
Golden Plover	<i>Pluvialis apricaria</i>	BD-I; BoCCI-Red
Leach's Storm Petrel	<i>Hydrobates leucorhous</i>	BD-I; BoCCI-Red
Slavonian Grebe	<i>Podiceps auritus</i>	BD-I; BoCCI-Red
Barn Swallow	<i>Hirundo rustica</i>	BoCCI-Amber
Black Guillemot	<i>Cephus grylle</i>	BoCCI-Amber
Black-headed Gull	<i>Larus ridibundus</i>	BoCCI-Amber
Brambling	<i>Fringilla montifringilla</i>	BoCCI-Amber
Coot	<i>Fulica atra</i>	BoCCI-Amber
Linnet	<i>Linaria cannabina</i>	BoCCI-Amber
Common Sandpiper	<i>Actitis hypoleucos</i>	BoCCI-Amber
Shelduck	<i>Tadorna tadorna</i>	BoCCI-Amber
Starling	<i>Sturnus vulgaris</i>	BoCCI-Amber
Teal	<i>Anas crecca</i>	BoCCI-Amber
Wigeon	<i>Mareca penelope</i>	BoCCI-Amber
Greenfinch	<i>Chloris chloris</i>	BoCCI-Amber
Gadwall	<i>Mareca strepera</i>	BoCCI-Amber
Goldcrest	<i>Regulus regulus</i>	BoCCI-Amber
Cormorant	<i>Phalacrocorax carbo</i>	BoCCI-Amber
Great Crested Grebe	<i>Podiceps cristatus</i>	BoCCI-Amber
Herring Gull	<i>Larus argentatus</i>	BoCCI-Amber
House Martin	<i>Delichon urbicum</i>	BoCCI-Amber
House Sparrow	<i>Passer domesticus</i>	BoCCI-Amber
Lesser Black-backed Gull	<i>Larus fuscus</i>	BoCCI-Amber
Little Ringed Plover	<i>Charadrius dubius</i>	BoCCI-Amber
Mallard	<i>Anas platyrhynchos</i>	BoCCI-Amber
Mew Gull	<i>Larus canus</i>	BoCCI-Amber

Common Name	Scientific Name	Status
Mute Swan	<i>Cygnus olor</i>	BoCCI-Amber
Northern Goshawk	<i>Accipiter gentilis</i>	BoCCI-Amber
Pintail	<i>Anas acuta</i>	BoCCI-Amber
Red-breasted Merganser	<i>Mergus serrator</i>	BoCCI-Amber
Ringed Plover	<i>Charadrius hiaticula</i>	BoCCI-Amber
Turnstone	<i>Arenaria interpres</i>	BoCCI-Amber
Sand Martin	<i>Riparia riparia</i>	BoCCI-Amber
Skylark	<i>Alauda arvensis</i>	BoCCI-Amber
Spotted Flycatcher	<i>Muscicapa striata</i>	BoCCI-Amber
Spotted Redshank	<i>Tringa erythropus</i>	BoCCI-Amber
Tufted Duck	<i>Aythya fuligula</i>	BoCCI-Amber
Willow Warbler	<i>Phylloscopus trochilus</i>	BoCCI-Amber
Grasshopper Warbler	<i>Locustella naevia</i>	BoCCI-Green
Greenshank	<i>Tringa nebularia</i>	BoCCI-Green
Woodpigeon	<i>Columba palumbus</i>	BoCCI-Green
Great Black-backed Gull	<i>Larus marinus</i>	BoCCI-Green
Little Grebe	<i>Tachybaptus ruficollis</i>	BoCCI-Green
Rock Dove	<i>Columba livia</i>	BoCCI-Green
Water Rail	<i>Rallus aquaticus</i>	BoCCI-Green
Barn Owl	<i>Tyto alba</i>	BoCCI-Red
Black-tailed Godwit	<i>Limosa limosa</i>	BoCCI-Red
Goldeneye	<i>Bucephala clangula</i>	BoCCI-Red
Kestrel	<i>Falco tinnunculus</i>	BoCCI-Red
Quail	<i>Coturnix coturnix</i>	BoCCI-Red
Redshank	<i>Tringa totanus</i>	BoCCI-Red
Snipe	<i>Gallinago gallinago</i>	BoCCI-Red
Swift	<i>Apus apus</i>	BoCCI-Red
Dunlin	<i>Calidris alpina</i>	BoCCI-Red
Curlew	<i>Numenius arquata</i>	BoCCI-Red
Oystercatcher	<i>Haematopus ostralegus</i>	BoCCI-Red
Woodcock	<i>Scolopax rusticola</i>	BoCCI-Red
Turtle Dove	<i>Streptopelia turtur</i>	BoCCI-Red
Greater Scaup	<i>Aythya marila</i>	BoCCI-Red
Grey Plover	<i>Pluvialis squatarola</i>	BoCCI-Red
Grey Wagtail	<i>Motacilla cinerea</i>	BoCCI-Red
Long-tailed Duck	<i>Clangula hyemalis</i>	BoCCI-Red
Meadow Pipit	<i>Anthus pratensis</i>	BoCCI-Red
Lapwing	<i>Vanellus vanellus</i>	BoCCI-Red
Shoveler	<i>Spatula clypeata</i>	BoCCI-Red
Knot	<i>Calidris canutus</i>	BoCCI-Red



Common Name	Scientific Name	Status
Redwing	<i>Turdus iliacus</i>	BoCCI-Red
Stock Dove	<i>Columba oenas</i>	BoCCI-Red
Yellowhammer	<i>Emberiza citrinella</i>	BoCCI-Red

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