ATKINS

Member of the SNC-Lavalin Group

Carrigtwohill URDF Initiative

Ecological Impact Assessment

Cork County Council

May 2023

Notice

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Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 0	Draft for Comment	OOK	OOK	POD	JOC	18/04/2023
Rev 1	Revised following Review	OOK	OOK	POD	JOC	20/04/2023
Rev 2	Final Report	OOK	OOK	POD	JO'C	12/05/2023

Client signoff

Client	Cork County Council
Project	Carrigtwohill URDF Initiative
Job number	5194601
Client signature / date	

Contents

1. Introduction

1.1. Background & Scope

WS Atkins Ireland Ltd ("Atkins") was appointed by Cork County Council to undertake, on its behalf, an Ecological Impact Assessment (EcIA) of the proposed Carrigtwohill Urban Regeneration and Development Fund (URDF) – Urban Expansion Area (UEA) Infrastructure Project ("the proposed development"). The proposed development comprises infrastructure to facilitate and accelerate future housing delivery in the Carrigtwohill UEA and to support regeneration, compact growth and sustainable development in Carrigtwohill.

This report comprises the EcIA 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, asses the likely effects of the proposed development on key ecological features and proposes appropriate measures to avoid or reduce those effects. Furthermore, this EcIA 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. 5194601DG0191), which assesses the potential for the proposed development to significantly affect Natura 2000 sites.

1.2. Project Description

1.2.1. Location & Context

The proposed development is located to the north of the town of Carrigtwohill, Co. Cork. The new Western and Eastern Services Corridor Link Roads connect the existing Wise's Road in the west to the Ballyadam Road in the east, and run to the north of the Cork to Midleton railway line. The new Northern Services Corridor Link Road, upgrades of existing roads and new cycling/pedestrian paths include some sections to the south of the railway line. The location of the proposed development in the context on Carrigtwohill is illustrated in Figure 1-1 below.

The main land use in the vicinity of the proposed development is agriculture (a mixture of arable and pasture). The proposed development does not cross any rivers or streams large enough to be mapped by the Environmental Protection Agency (EPA), but it does cross a number of drainage ditches and small streams which drain either to the Tibbotstown or Anngrove streams or to karst systems and ultimately to Cork Harbour. The inner parts of Cork Harbour to the north of Great Island are designated as part of the Great Island Channel Special Area of Conservation (site code: 001058) and the Cork Harbour Special Protection Area (site code: 004030). These Natura 2000 sites are designated for their intertidal mudflats, saltmarshes and waterbirds.

Figure 1-1 - Location of the proposed Carrigtwohill URDF Infrastructure Project.

1.2.2. Design & Ecological Principles

The Cork County Development Plan 2022-2028 sets out the policies and objectives of Cork County Council for the proper planning and sustainable development of the county for the period from 2022 to 2028. The most relevant policies and objectives are extracted below. These informed the design of the proposed development, mitigation of ecological impacts, and ecological enhancement (as demonstrated in the detailed description of the design, construction methods and operation of the proposed development, assessment of potential ecological impacts, and ecological mitigation and enhancement throughout this report).

Policy	Relevant text
WM 11-2	***Surface Water Protection*** • *Protect and improve the status and quality of all surface waters throughout the County, including transitional and coastal waters.* • *At least secondary treatment should be provided to all wastewater discharges from any new development to surface waters.*
WM 11-10	***Surface Water, SuDS and Water Sensitive Urban Design*** • *Require that all new developments incorporate sustainable drainage systems (SuDS). Efforts should be taken to limit the extent of hard surfacing and impermeable paving.* • *Encourage the application of a Water Sensitive Urban Design approach in the design of new development or other urban interventions. Opportunities to contribute to, protect or re-enforce existing green infrastructure corridors or assets should be maximised.* • *Optimise and maximise the application of Sustainable Urban Drainage Systems (SuDS) to mitigate flood risk, enhance biodiversity, protect and enhance visual and recreational amenity; all in the most innovative and creative manner appropriate and in accordance with best practices. Proposals should demonstrate that due consideration has been given to nature based solutions in the first instance in arriving at the preferred SuDS solution for any development.* • *Provide adequate storm water infrastructure in order to accommodate the planned levels of growth expected for the County.* • *Where surface water from a development is discharging to a waterbody, appropriate pollution control measures (e.g. hydrocarbon interceptors, silt traps) should be implemented.*
WM 11-11	***River Channel Protection*** • *Ensure adequate protection measures along watercourses, keeping them free from development by ensuring development is kept 10m or other appropriate distance from stream and river banks is line with best practice for riparian corridors. Development altering the hydromorphology of a watercourse will not normally be permitted, where it may result in the deterioration in the status of a water body through for example, impacts on water quality, quantity or flow rate, riparian habitat or protected species.* • *There will be a presumption against the use of culverts and opportunities to actively remove existing culverts and re-naturalise/ daylighting watercourses will be encouraged in development proposals.* • *Where river crossings are considered necessary, clear span river crossing structures shall be used on fisheries waters where possible. The Council will consult with Inland Fisheries Ireland in relation to any such proposals.*
WM 11-12	***Surface Water Management*** *Manage surface water catchments and the use and development of lands adjoining streams, watercourses and rivers in such a way as to minimise damage to property by instances of flooding and with regard to any conservation objectives of European sites within the relevant catchments and floodplains.*
WM 11-13	***Flood plains and Wetlands*** • *Protect the County's floodplains, wetlands and coastal areas subject to flooding as vital green infrastructure which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reducing the need to provide flood defences in the future.* • *Ensure that development does not impact on wetland sites within river / stream catchments and seek the restoration of degraded wetlands.*
GI 14-1	***Countywide Green and Blue Infrastructure Objectives*** • *Create an integrated and coherent green infrastructure for the County by encouraging the retention and strengthening of substantial networks of green space in urban, urban fringe and the wider countryside to serve the needs of communities now and in the future and as a key contributor to climate mitigation and climate adaptation.*

Policy	Relevant text
	• *Develop the green infrastructure network (including green corridors) to ensure the conservation and enhancement of biodiversity, including the protection of Natura 2000 European Sites, the provision of accessible parks, open spaces and recreational facilities (particularly within settlements), the sustainable management of water, the maintenance of landscape character and the protection and enhancement of architectural and archaeological heritage.* • *Capitalise on and highlight the multifunctional benefits/opportunities (ecosystem services) that green and blue infrastructure can present. Seek to advance the use of nature based solutions as an alternative to traditional infrastructure. Seek to advance an ecosystem services approach and ecosystem services valuation as a decision-making tool in plans and projects.* • *Recognise rivers and streams (and their wider riparian corridors) as one of the natural foundations for multi-functional green and blue infrastructure corridors. Seek to strengthen ecological linkages which watercourses have with other water dependent habitats as well as with hedges/treelines, woodland and scrub in the wider landscape.* • *Ensure that all settlements have an adequate level of quality green and recreational infrastructure (active and passive) taking into account existing deficits, planned population growth as well as the need to serve their surrounding hinterlands.* • *Achieve a net gain in green infrastructure through the protection and enhancement of existing assets and through the provision of new green infrastructure as an integral part of the planning process. Encourage the provision of different green infrastructure elements, such as trees in urban areas and green roofs in town centres, so that a net gain in green infrastructure is achieved over the lifetime of this Development Plan.* • *Integrate the provision of green infrastructure with infrastructure provision and replacement, including walking and cycling routes, as appropriate, while protecting biodiversity and other landscape resources.*
GI 14-2	***Green Infrastructure Objectives for Main Towns and Settlements*** • *Ensure that all main towns have an adequate level of quality green and recreational infrastructure (active and passive) taking account of existing deficits, planned population growth as well as the need to serve their surrounding hinterlands. To ensure where possible that this green and blue infrastructure maximises its multifunctional capacity (ecosystem services).* • *Promote the corridor concept, in particular using rivers and streams as one of the natural foundations for multi-functional green and blue infrastructure corridors.* • *Seek to create new and improved connections (physical/ecological corridors) between open spaces/ green infrastructure and other important destinations as part of the enhancement of the overall network.*
BE 15-2	***Protect sites, habitats and species*** • *Protect all natural heritage sites which are designated or proposed for designation under European legislation, National legislation and International Agreements. Maintain and where possible enhance appropriate ecological linkages between these. This includes Special Areas of Conservation, Special Protection Areas, Marine Protected Areas, Natural Heritage Areas, proposed Natural Heritage Areas, Statutory Nature Reserves, Refuges for Fauna and Ramsar Sites. These sites are listed in Volume 2 of the Plan.* • *Provide protection to species listed in the Flora Protection Order 2015, to Annexes of the Habitats and Birds Directives, and to animal species protected under the Wildlife Acts in accordance with relevant legal requirements. These species are listed in Volume 2 of the Plan.* • *Protect and where possible enhance areas of local biodiversity value, ecological corridors and habitats that are features of the County's ecological network. This includes rivers, lakes, streams and ponds, peatland and other wetland habitats, woodlands, hedgerows, tree lines, veteran trees, natural and semi-natural grasslands as well as coastal and marine habitats. It particularly includes habitats of special conservation significance in Cork as listed in Volume 2 of the Plan.* • *Encourage, pursuant to Article 10 of the Habitats Directive, the protection and enhancement of features of the landscape, such as traditional field boundaries, important for the ecological coherence of the Natura 2000 network and essential for the migration, dispersal and genetic exchange of wild species*
BE 15-4	***Local Authority development and projects*** • *Ensure that biodiversity protection is considered at design stage for works and development planned and progressed by Cork County Council and that all such projects comply with nature conservation legislation and policy as required: -* • *Fulfil Appropriate Assessment and Environmental Impact Assessment requirements and carry out Ecological Impact Assessment in relation to Local Authority plans and projects as appropriate.*

Policy	Relevant text
BE 15-5	***Biodiversity on Council owned and managed land and property*** • *Protect biodiversity and support the principle of biodiversity net gain on land and property owned and managed by Cork County Council.* • *Support the implementation of positive conservation management on lands and property which are owned or managed by Cork County Council.* • *Support and implement best practice in the management of roadside boundaries including tree lines and hedgerows managed by Council.* • *Support the use of natural approaches to flood management and control on lands owned or managed by or on behalf of Cork County Council.* • *The Council will incorporate primarily native planting into new landscaping schemes within its own developments.*
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: -* • *Encouraging the retention and integration of existing trees, hedgerows, and other features of high natural value within new developments.* • *Requiring the incorporation of primarily native tree and other plant species, particularly pollinator friendly species in the landscaping of new developments.* • *Fulfilling Appropriate Assessment and Environmental Impact Assessment obligations and carrying out Ecological Impact Assessment in relation to development and activities, as appropriate.* • *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.*
BE 15-7	***Control of Invasive Alien Species*** *Implement best practice to minimise the risk of spread of invasive alien species, on Council owned or managed land, and require the development and implementation of Invasive Alien Species Management Plans for new developments where required.*

The County Development Plan also sets out objectives which apply to all development proposals in Carrigtwohill, which are applicable to the proposed development: -

- *CT-GO-03: The green infrastructure, biodiversity and landscape assets of Carrigtwohill include its hedgerows, mature trees, woodlands, wetlands (adjoining Cork Harbour Special Protection Area and Great Island Chanel Special Area of Conservation), and other habitats. New development should be sensitively designed and planned to provide for the protection of these features and will only be permitted where it is shown that it is compatible with the requirements of nature conservation directives and with environmental, biodiversity and landscape protection policies.*

- *CT-GO-16: All new development will need to make provision for Sustainable Urban Drainage Systems (SuDS) and provide adequate storm water infrastructure. Surface water management and disposal should be planned in an integrated way in consideration with land use, water quality, amenity and habitat enhancements as appropriate.*

Ecological considerations have been key factors in the route selection and design of the UEA Infrastructure. The routes of new roads are such that areas which were identified as being of 'Higher Species Richness' in the western and eastern UEA were avoided. Where possible the routes of new roads were chosen to run parallel and offset from existing hedgerows and treelines so that they can be preserved. New roads will only require existing hedgerows to be removed at field boundary crossings. Existing road upgrades have generally been limited to widening on one side only so that treeline/hedgerow removal is limited to one side of the road upgrade only. In total, it will be necessary to remove approximately 1,960m of hedgerows/ treelines to construct the infrastructure. This will be mitigated by the replacement of this with a minimum of 1,960m of new hedgerows/ treelines aligned to the new infrastructure as well as new areas of planting at various locations of 'passive green space' throughout the UEA.

There is a total of c. 5.5ha of passive green space, located in different areas of the UEA, included in the proposals. This space has been designated as passive to enhance local biodiversity value as appropriate for each area.

This will be done through the retention and integration of existing trees and hedgerows, landscaping through the planting of native trees and other suitable plant species and the planting of pollinator-friendly species. Planting in each area will be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist so that it is most appropriate for the characteristics of that area and to retain connectivity to the wider green infrastructure network.

Surface water detention ponds, stream overflow channels and low-lying areas will encourage biodiversity through the creation of new aquatic and wetland habitats. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas. Planting in these areas will also be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas.

No works are proposed to the south of the existing Leamlara Road boundary; i.e. the Woodstock Stream side of the road. No works on the south side of this road will extend into the roadside verge, treeline or hedgerow and the existing buffer between the road and the stream will be maintained. Natural buffer areas on existing watercourses outside of the infrastructure area will be maintained and protected during the construction of the proposed infrastructure. Where proposed drains cross below watercourses/ ditches the methods used to install them will allow for maintaining existing buffer areas where possible. An ecological buffer area between the Eastern Services Corridor Link Road and the Poulaniska Stream has been maintained in the design where the road runs parallel to the stream.

Any development on adjacent lands in the future will need to recognise the importance of green infrastructure and particularly the ecological corridor along the road and connectivity to the wider green infrastructure network. Through the planning process and development management adjacent developments will be required by the Local Authority to contribute to this on their lands to be permitted to develop and connect to the road.

The development of ecological mitigation and enhancement in this EcIA has followed the above policies and objectives from the County Development Plan, and also had regard to 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.

1.2.3. Project Layout

With reference to Figure 1-2 below, the infrastructure which makes up the proposed development comprises: -

A. Western (A1) and Eastern (A2) Services Corridor Link Roads connecting Wise's Road (L3616-0) on the western side of the UEA with Carrigane Road (L3617-25) on the eastern side of the UEA. The roads will also provide connectivity to Station Road (L3603-0), Leamlara Road (L3607-37) and the Ballyadam Road (L7640-0) and includes the realignment of the Carrigane Road near Ballyadam Bridge.

B. Northern Services Corridor Link Road connecting the Western Services Corridor Link Road with the new Northern Schools Link Road via an existing vehicular underpass below the Cork to Midleton railway line.

C. Upgrade/ re-alignment of Wises Road (C1) from north of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/cycle bridge (C2) across the railway line providing connectivity to Wises Road south of the railway.

D. Upgrade/ re-alignment of Station Road (D1) from south of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/cycle bridge (D2) across the railway line providing connectivity to Station Road south of the railway line.

E. Upgrade/ re-alignment of Leamlara Road from its junction with Station Road to its new western junction with the Eastern Services Corridor Link Road and from north of the UEA to its new eastern junction with the Eastern Services Corridor Link Road.

F. Upgrade/re-alignment of Ballyadam Road from its new junction with the Eastern Services Corridor Link Road to the L7639-0 north of the UEA including the permanent closure of the existing Ballyadam Road between the Eastern Services Corridor Link Road and Carrigane Road to vehicular traffic including the junction of the existing Ballyadam Road and Carrigane Road.

The infrastructure will also include shared cycling/pedestrian paths connecting the new road network with the planned Carrigtwohill to Midleton Inter-urban Cycle Route, areas of green open space, underground services including surface water drainage networks including detention ponds and attenuation, foul water networks, electrical and fibre-optic/telecoms ducting and water and gas supply. Services will be connected to existing services/infrastructure in Carrigtwohill as required.

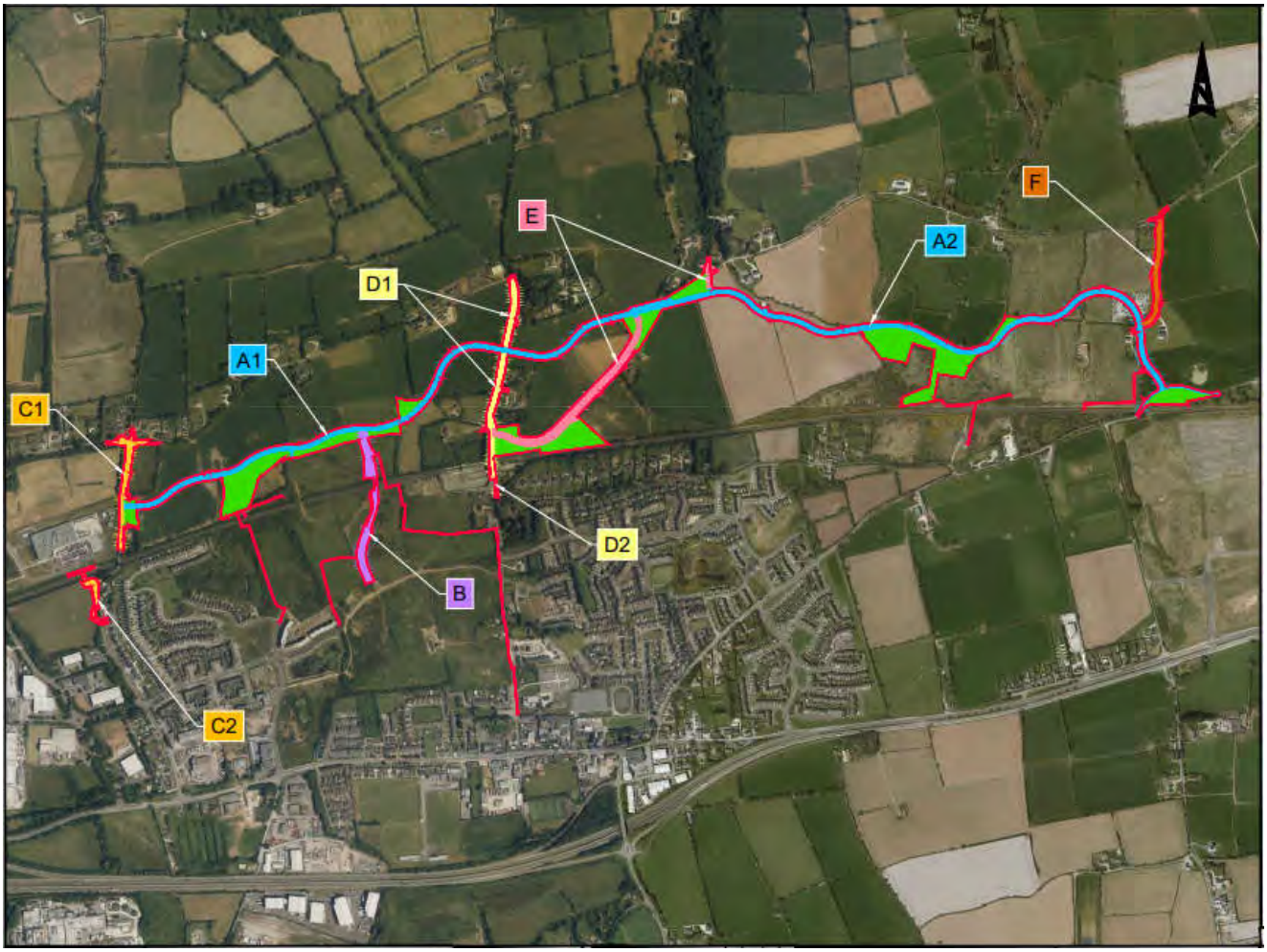

Figure 1-2 - Overall layout of the Carrigtwohill URDF Initiative Infrastructure.

1.3. Detailed Description

The following detailed description of the proposed development is taken from Section 4 of the *Part 8 Planning Application Report* (Atkins Doc. Ref. 5194601DG0195).

1.3.1. Eastern and Western Services Corridor Link Roads

Overview

The proposed Western and Eastern Services Corridor Link Roads will connect the existing Wises Road (L3161-0) on the western side of Carrigtwohill UEA to the existing Carrigane Road (L3617-25) on the eastern side of the UEA. These roads will also have connectivity to Station Road (L3603-0) and Leamlara Road (L3607-37) within the UEA. The aim of these roads is to provide pedestrian, cyclist and vehicular access to development lands in the Carrigtwohill UEA to facilitate the commencement of development within the UEA. The roads will include all ducts and services to facilitate the future development of housing and associated public infrastructure in the UEA. Water supply and wastewater pipework will also be included within the roads. A segregated cycle track and footpath and bus stops will be provided along both sides of the road. Provision has also been made along the services corridor link roads for from the adjacent lands in the UEA.

Description

Cross-Section

The proposed cross-section of the Services Corridor Link Roads is described in Table 1-1 and a typical section is shown in Figure 1-3.

Table 1-1 - Proposed Eastern and Western Services Corridor Link Road cross-section parameters.

Element	Width	Description
Carriageway	6.5m	This is based on a preferred lane width of 3.25 metres as per DMURS guidance.
Verge	2 x 2m	A verge is to be provided on both sides of the carriageway to act as a buffer between vehicular traffic and pedestrians/ cyclists. Trees/ planting and underground services/ public lighting will be located in the verges.
Cycle Track	2 x 2.0m	Off-road cycle tracks are proposed on both sides of the road behind the verges. This will provide easy access to the cycle track from future residential developments on both sides of the Western / Eastern Link Road without excessive crossing of the road for cyclists.
Footpaths	2 x 2m	Footpaths are proposed outside each of the cycle tracks on both sides of the road. A 1 m wide verge is proposed outside each footpath and stock proof boundary fencing or other required boundary treatment.
Services	-	Below ground services are proposed outside of the carriageway, where possible, for health and safety and ease of maintenance reasons. Any future maintenance should not require lane closures or restrictions due to excavation of the carriageway. Maintenance workers will be able to undertake works on the services away from traffic.

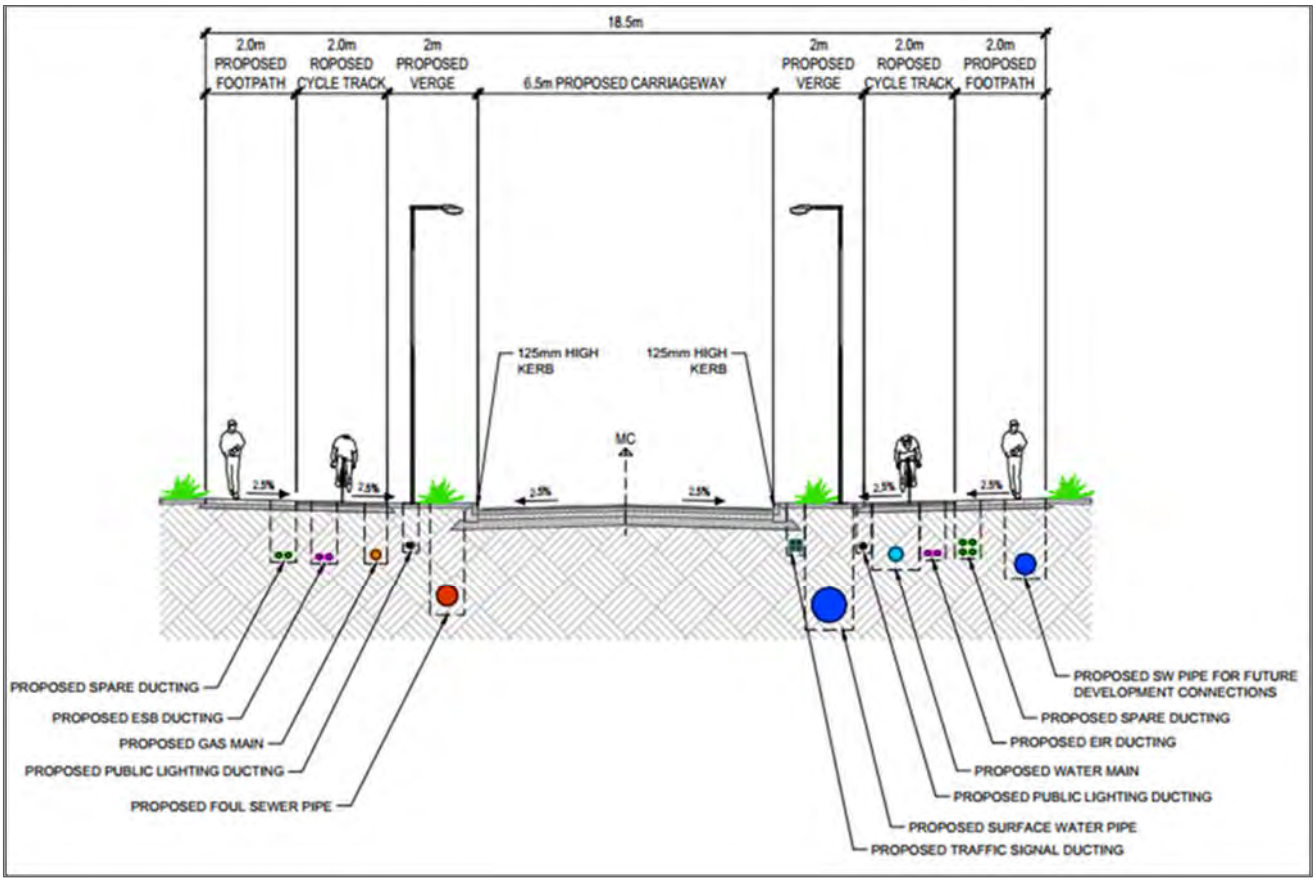

Figure 1-3 - Typical Cross-Section of Eastern and Western Services Corridor Link Roads.

Junctions

New main road junctions are proposed along the Western and Eastern Services Corridor Link Road . These are at the roads' junctions with Wises Road, the Northern Services Corridor Link Road, Station Road, Leamlara Road (upgraded and existing) and Carrigane Road. These junctions are proposed to be raised tables with traffic signals including crossing facilities for pedestrians and cyclists to prioritise safe pedestrian and cyclist movements over vehicular traffic.

It is proposed that the junctions of minor roads with the Services Corridor Link Road will be priority junctions. Traffic travelling east to west along the Services Corridor Link Road will have priority. Raised table crossing facilities for pedestrians and cyclists will be provided at all minor junctions.

The locations of signalised and priority junctions are shown in drawings 5194601-HTR-UEA-DR-0010 to 0038.

Pavement

The pavement will be designed in compliance with TII standards. The process will start with a ground investigation and a consideration of the cumulative traffic loading which the pavement is required to carry followed by the design of the road foundations and the base and surface layers. A change of surface will be provided at raised tables.

Drainage and Services

Refer to Section 1.3.5 of this report.

Public Lighting

New public lighting will be provided along the extents of the Services Corridor Link Road. The road lighting will be designed to the correct lux levels for the road carriageway, cycle lanes, footpaths and public spaces. The

lighting shall be designed in accordance with Cork County Council's *Public Lighting Manual and Product Specification 2020* and BS 5489:2013.

Signage and Road Markings

Traffic signs and road markings will be provided in accordance with the Department of Transport *Traffic Signs Manual*.

1.3.2. Northern Services Corridor Link Road

Overview

The Northern Services Corridor Link Road is a proposed road connecting the connecting the Western Services Corridor Link Road with the new Northern Schools Link Road via an existing vehicular underpass below the Cork to Midleton railway line.

The aim of the road is to provide pedestrian, cyclist and vehicular access to development lands in the Carrigtwohill UEA to facilitate the commencement of development within the UEA. The road will include ducts, services pipework and the provision of surface water drainage, drinking water pipework and wastewater services pipework.

A segregated pedestrian/cycle track will be provided at the existing underpass. Generally segregated footpaths and cycle tracks will be provided along both sides of the road. At the underpass the footpath and cycle track will join the route of the planned Carrigtwohill to Midleton Inter-urban Cycle Route which is being developed as part of a separate project.

Description

Cross-Section

The proposed cross-section of the Northern Services Corridor Link Road is described in Table 1-2 and a typical section is shown in Figure 1-4.

Table 1-2 - Proposed Northern Services Corridor Link Road cross-section parameters.

Element	Width	Description
Carriageway	6.5m generally except at the existing underpass where road width reduces to 5m	This is based on a preferred lane width of 3.25 metres as per DMURS guidance. The road cross-section will reduce to 5 metres at the existing underpass to allow the road to pass through the 6 metre wide clearance of the existing underpass structure.
Verge	2 x 2m minimum	A verge is to be provided on both sides of the carriageway to act as a buffer between vehicular traffic and pedestrians/ cyclists. Trees/ planting and underground services/ public lighting will be located in the verges.
Cycle Track	2 x 2.0m generally except at the underpass	Off-road cycle tracks are proposed on both sides of the road behind the verges generally except where the road crosses below the railway line.
Footpaths	2 x 2.0m generally except at the underpass	Footpaths are proposed on both sides of the road behind the verges generally except where the road crosses below the railway line. A 1 m wide verge is proposed outside each footpath and stock proof boundary fencing or other required boundary treatment.
Services	-	Below ground services are proposed outside of the carriageway, where possible, for health and safety and ease of maintenance reasons. Any future maintenance should not require lane closures or restrictions due to excavation of the carriageway. Maintenance

Element	Width	Description
		workers will be able to undertake works on the services away from traffic.

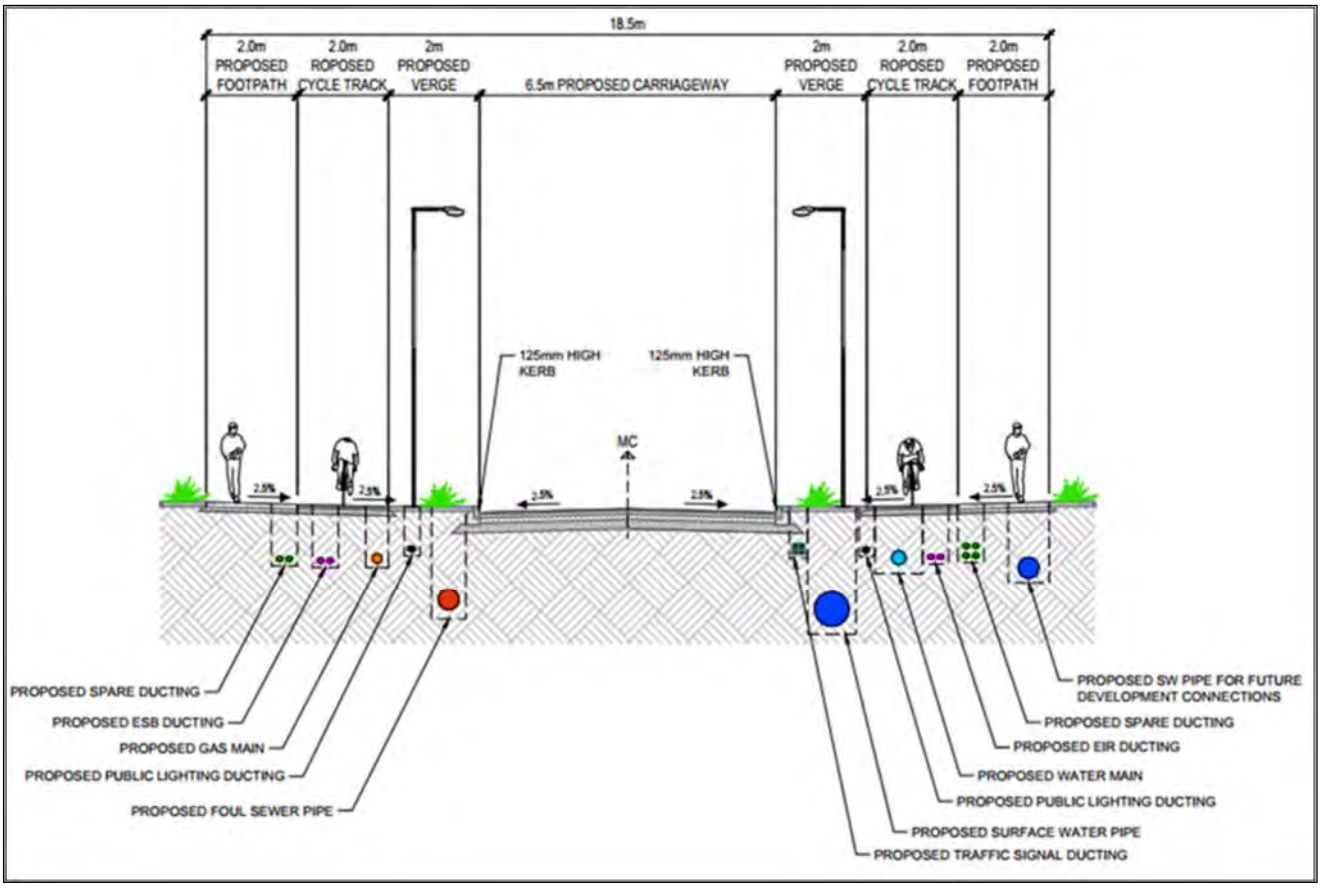

Figure 1-4 - Typical Cross-Section of Northern Services Corridor Link Road.

Junctions

Two major junctions along the Northern Services Corridor Link Road junctions are proposed. These are at the roads' northern junction with the Western Services Corridor Link Road and at its southern junction with the new Northern Schools Link Road. The northern junction is proposed to be a raised tables with traffic signals including crossing facilities for pedestrians and cyclists. The southern junction will tie into the existing signalised T-junction which also includes crossing facilities for pedestrians and cyclists.

Pavement

The pavement will be designed in compliance with TII standards. The process will start with a ground investigation and a consideration of the cumulative traffic loading which the pavement is required to carry followed by the design of the road foundations and the base and surface layers. A change of surface will be provided at raised tables.

Drainage and Services

Refer to Section 1.3.5 of this report.

Public Lighting

New public lighting will be provided along the extents of the proposed upgrade of Main Street and Station Road. The road lighting will be designed to the correct lux levels for the road carriageway, cycle lanes, footpaths and

public spaces. The lighting shall be designed in accordance with Cork County Council's *Public Lighting Manual and Product Specification 2020* and BS 5489:2013.

Signage and Road Markings

Traffic signs and road markings will be provided in accordance with the Department of Transport *Traffic Signs Manual*.

1.3.3. Upgrade/Re-alignment of Wises Road, Station Road, Leamlara Road and Ballyadam Road

Overview

The upgrade of the above roads is proposed as follows: -

- Wises Road from north of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/ cycle bridge across the railway line providing connectivity to Wises Road south of the railway line.
- Station Road from south of its crossing of the Cork to Midleton Railway Line to the L3615-0 to the north of the UEA. The upgrade will also include a pedestrian/ cycle bridge across the railway line providing connectivity to Station Road south of the railway line.
- Leamlara Road from from its junction with Station Road to its new western junction with the Eastern Services Corridor Link Road and from north of the UEA to its new eastern junction with the Eastern Services Corridor Link Road. It is noted that no works are proposed to the south of the existing Leamlara Road boundary, i.e., the Woodstock Stream side of the road. No works on the south side of this road will extend into the roadside verge, treeline or hedgerow and the existing buffer between the road and the stream will be maintained.
- Ballyadam Road from its new junction with the Eastern Services Corridor Link Road to the L7639-0 north of the UEA including the permanent closure of the existing Ballyadam Road between the Eastern Services Corridor Link Road and Carrigane Road to vehicular traffic including the junction of the existing Ballyadam Road and Carrigane Road.

Description

Cross-Section

The proposed cross-sections for the road upgrades Wises Road, Station Road, Leamlara Road and Ballyadam Road are described in Table 1-3 and a typical section along Wises Road is shown in Figure 1-5.

Table 1-3 - Proposed Services Corridor Link Road cross-section parameters

Element	Width	Description
Carriageway	6m	A 6-metre carriageway is proposed generally. This is within the range noted in DMURS for 'Arterial and Link streets' with low to moderate design speeds.
Verge and Planting	2 x 1m minimum except at pinch points	A verge is generally to be provided on both sides of the carriageway to act as a buffer between vehicular traffic and pedestrians/ cyclists. Trees/ planting and underground services/ public lighting will be located in the verges.
Cycle Track	2 x 2m generally except for	Segregated off-road cycle tracks will be provided on both sides of the upgraded roads generally. On Wises Road there is an existing 3 metre wide shared cycle/ pedestrian path on the western side of the road. This will be retained as part of the proposals with a 2m wide segregated cycle

Element	Width	Description
	Wises Road	track to be provided on the eastern side of the road from its junction with the Inter-urban cycle route northwards.
Footpath	2 x 2m minimum	Footpaths will be provided on both sides of the upgraded roads generally. As above on Wises Road the 3 metre wide shared cycle/ pedestrian path on the western side of the road will retained as part of the proposals with a 2m wide footpath be provided on the eastern side of the road from its junction with the Inter-urban cycle route northwards. A 0.5m to 1 m wide verge is proposed outside footpaths and stock proof boundary fencing or other required boundary treatment.

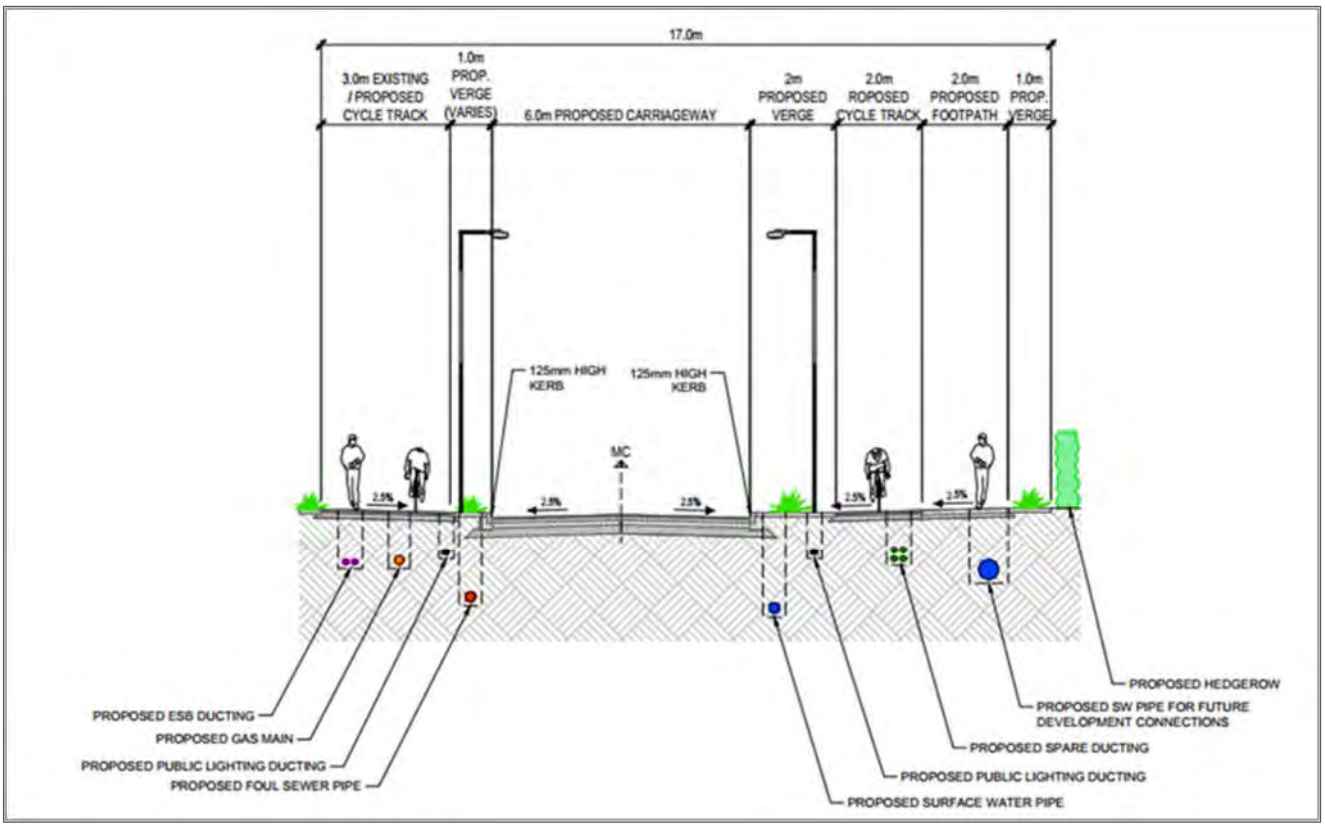

Figure 1-5 - Typical Cross-Section of Wises Road upgrade.

Junctions

The following junction are proposed to be signalised junctions with raised tables and crossing facilities for pedestrians and cyclists: -

- Wises Road/ L3615-0
- Wises Road/ Western Services Corridor Link Road
- Station Road/ Western Services Corridor Link Road
- Station Road/ Leamlara Road
- Leamlara Road/ Western Services Corridor Link Road
- Leamlara Road/ Eastern Services Corridor Link Road
- Ballyadam Road/ Carrigane Road

It is proposed that the junctions of the above roads with minor roads will be priority junctions with traffic on the minor roads giving way. Raised table crossing facilities for pedestrians and cyclists shall be provided at all minor junctions.

Pavement

The pavement will be designed in compliance with TII standards. The process will start with a ground investigation and a consideration of the cumulative traffic loading which the pavement is required to carry followed by the design of the road foundations and the base and surface layers. A change of surface will be provided at raised tables.

Drainage

Refer to Section 1.3.5 of this report.

Public Lighting

New public lighting will be provided along the extents of the proposed upgrade of Main Street and Station Road. The road lighting will be designed to the correct lux levels for the road carriageway, cycle lanes, footpaths and public spaces. The lighting shall be designed in accordance with Cork County Council's *Public Lighting Manual and Product Specification 2020* and BS 5489:2013.

Signage and Road Markings

Traffic signs and road markings will be provided in accordance with the Department of Transport *Traffic Signs Manual*.

Wises Road Pedestrian/ Cycle Bridge

The proposed additional pedestrian/cycle bridge immediately west of Wises Road Bridge over the railway line will facilitate the connection of the UEA, Wises Road and the existing shared cycle/ pedestrian path in IDA lands across the railway line with the existing pedestrian/ cycling facilities on Wises Road south of the railway line.

The bridge will provide a vertical clearance of 5.3m to the existing track. The maximum horizontal span of the bridge will be 28m. The bridge will be a reinforced concrete structure built on concrete columns. The bridge will be 4m in width between bridge parapets and will run on the western side of the existing bridge. The bridge abutments will be outside the Irish Rail corridor including lands required for proposed dual tracking of the railway line. The bridge parapets will match the parapets of the existing bridge in terms of height.

Station Road Pedestrian/ Cycle Bridge

The proposed additional pedestrian/cycle bridge immediately east of Barry's Bridge will facilitate the connection of the junction of Station Road/ Leamlara Road (north of the railway line) across the railway with Station Road (south of the railway line). This will provide pedestrian/ cycling connectivity along Station Road between the UEA and the existing settlement located to the south of the railway line.

The bridge will provide a vertical clearance of 5.3m to the existing track. The maximum horizontal span of the bridge will be 25m. The bridge will be a reinforced concrete structure built on concrete columns. The bridge will be 4m in width between bridge parapets and will run on the eastern side of the existing Barry's Bridge. The bridge abutments will be outside the Irish Rail corridor including lands required for proposed dual tracking of the railway line. The bridge parapets will match the parapets of the existing bridge in terms of height and materials.

1.3.4. UEA Community and Open Space Development

Community and Open Space will be provided in the western and eastern UEA comprising of shared cycling/pedestrian paths connecting the new roads, footpaths and cycle tracks with the planned Inter-urban Cycle Route. The Community and Open Space will largely be Passive Open Space.

There is a total of approximately 5.5 hectares of passive green space, located in different areas of the UEA, included in the proposals. This space has been designated as passive to enhance local biodiversity value as

appropriate for each area. This will be done through the retention and integration of existing trees and hedgerows, landscaping through the planting of native trees and other suitable plant species and the planting of pollinator-friendly species. Planting in each area will be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist so that it is most appropriate for the characteristics of that area and to retain connectivity to the wider green infrastructure network.

Surface water detention ponds, stream overflow channels and low-lying areas will encourage biodiversity through the creation of new aquatic and wetland habitats. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas. Planting in these areas will also be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas.

Any development on adjacent lands in the future will need to recognise the importance of green infrastructure and particularly the ecological corridor along the road and connectivity to the wider green infrastructure network. Through the planning process and development management adjacent developments will be required by the Local Authority to contribute to this on their lands to be permitted to develop and connect to the road.

1.3.5. Drainage and Services

Surface Water Drainage

A surface water drainage system is proposed to accommodate surface water run-off from the Services Corridor Link Roads and the proposed road upgrades. The proposed system is also designed to accommodate attenuated surface water design flows that would be generated by future UEA development.

The UEA is located within a “Karst” area and the proposed system has been designed to manage the associated risk but also having regard to the potential for nature-based solutions and the objectives within the County Development Plan 2022. While systems of gullies/pipes are proposed in the road pavement for the management of the “Karst” risk, road verges will be used for retention/treatment of surface water run-off upstream and the attenuation/treatment of the flows downstream is being proposed and managed in open ponds/basins situated within open space area/network.

The overall flow attenuation design approach is based on limiting surface water discharge to greenfield run-off rates, based on QBAR (or mean annual peak flow) from existing permeable areas where this does not require significant diversion of watercourses/removal of hedgerows. The current run-off rates from existing impermeable road areas will also be reduced post-construction. This will result in a reduction in the total discharge rates, and associated impacts, following the construction of the proposed infrastructure to the Woodstock and Poulaniska Streams respectively.

There will be several surface water networks serving infrastructure in the western and eastern UEA as summarised below.

1. In the western UEA the main surface water network will comprise of road gullies, pipes and manholes within the road corridors of Wises Road, the western Services Corridor Link Road and the most northern part of Station Road. The run-off will pass through the network into a large detention pond which will remove pollutants and which will provide attenuation. Attenuated flows from the pond will discharge to the existing drainage ditch running along the northern boundary of the Cork to Midleton railway line. The drainage ditch connects to the Woodstock Stream at a location south of the railway line.

2. A drainage network is required for the northern part of the Northern Services Corridor Link Road north of its crossing of the railway line. This will consist of gullies, pipes and manholes. The surface water will pass through a by-pass separator and on to an attenuation tank. It will discharge to a new piped crossing of the railway line before discharging to a 600mm diameter sewer which will be extended from an existing 1050mm surface water sewer at the southern end of Station Road to the railway crossing. Discharge will again be limited to greenfield run-off rates (QBAR).

3. A drainage network is required for the lowest part of the Northern Services Corridor Link Road including the northern approach to the underpass below the Cork to Midleton railway line. This will consist of pipes, gullies, channel drains and manholes. The drainage route will run below the route of the Inter-urban Cycle

Route as it passes below the Cork to Midleton railway line and below the Northern Services Corridor Link Road south of the railway line. It will then connect to an existing surface water drainage network in Castlelake.

4. A separate drainage network will be provided for the southern part of Station Road, Leamlara Road and the Western Services Corridor Link Road between Station Road and Leamlara Road. This will consist of gullies, pipes and manholes. The run-off will pass through the network into a detention pond south of Leamlara Road which will remove pollutants and which will provide attenuation. Discharge from the attenuation/ treatment pond will be to Woodstock Stream north of the Cork to Midleton railway line.

5. In the eastern UEA the main surface water network will comprise of road gullies, pipes and manholes within the corridors of Leamlara Road and the eastern Services Corridor Link Road. The run-off will pass through surface water networks into detention/ treatment ponds which will remove pollutants and which will provide attenuation. Discharge from the ponds will be to the Poulaniska Stream north of the railway line.

6. A separate drainage network will be provided in the eastern UEA for the upgrade of the Ballyadam Road and the Ballyadam Road/ Carrigane Road junction. This network will comprise of road gullies, pipes and manholes within the road corridors. This network will discharge to an attenuation tank via a by-pass separator which will be used to remove hydrocarbons. Discharge from the tank will be to an existing drainage ditch to the west of Ballyadam Road. This drainage ditch discharges to the Poulaniska Stream north of the railway line.

Nature-based drainage solutions as per '*Nature-based solutions to the Management of Rainwater and Surface Water Runoff – Water Sensitive Urban Design – Best Practice Interim Guidance Document*' will be implemented upstream of the main drainage network during the detailed design. There are generous verges proposed along the new roads as well as pockets of green open space. They will be used where possible for the planting of trees and low growing planted area which will retain and treat surface water run-off from adjacent hard standing areas before discharge to the downstream drainage network.

Foul Drainage

Two separate foul gravity sewer pipe networks are proposed to facilitate future development in the Carrigtwohill UEA. It is noted that no wastewater flows will be generated as part of the infrastructure development described in this document.

In the western part of the UEA a foul sewer pipeline, comprising of manholes and pipes, will be laid within the upgraded Wises Road and the Western Services Corridor Link Road. The sewer pipeline will connect to an existing sewer pipe crossing of the railway line in the western part of the UEA which was laid during the re-construction of the Midleton to Glounthaune railway line (in 2009) to allow for wastewater connectivity from the UEA to the existing sewer network south of the railway line. South of the railway line crossing the sewer will connect to the existing Irish Water foul sewer. A response to a pre-connection enquiry to Irish Water states that this connection is feasible subject to identified upgrades being implemented.

In the eastern part of the UEA a foul sewer pipeline will be laid within the Eastern Services Corridor Link Road. The sewer pipeline will connect to an existing sewer pipe crossing of the railway line which was laid to allow for wastewater connectivity from the UEA to the existing Irish Water wastewater pumping station (which is located south of the railway line). A response to a pre-connection enquiry to Irish Water states that this connection is feasible subject to identified upgrades being implemented.

Stub pipework will be provided from the proposed foul sewer network along the Services Corridor Link Road and Wises Road to allow for future connections to accommodate development in the UEA. While sufficient flow capacity will be provided in the pipework, any connections will be subject to Irish Water approval.

Other Services

All new roads and road upgrades will also include ducting and services that would be normally required for the commencement of development within the Urban Expansion Area. This will include but not be limited to ESB ducting, Eir ducting, gas mains, water mains, public lighting ducting and Cork County Council spare ducting. All services and ducts will be provided within the new/ upgraded road corridors.

1.3.6. Project Delivery

Project Phasing

The Cork County Development Plan (2022) notes that infrastructure, necessary for housing development to commence within the UEA, will be delivered in two phased bundles namely 'Bundle A' and 'Bundle B' (subject to funding).

Bundle A, construction of which would be estimated to take 18 months, includes: -

- Western Services Corridor Link Road (from Wises Road to Leamlara Road)
- Northern Services Corridor Link Road
- Upgrade of Station Road
- Upgrade of Leamlara Road
- Small Park in western UEA (Community and Open Space development)
- Surface water management and other services e.g. water supply, wastewater etc. for western UEA

The County Development Plan also notes that the early phases of development are also likely to require the modification of Barry's Bridge (Station Road) to provide for cyclists and pedestrians.

The upgrade of Wises Road is included in special development objective CT-U-04 and linked to development in western UEA. The provision of segregated pedestrian/cycle link across the railway at Wises Road is included in Phase 2 of the "Core Off-Site Infrastructure".

Bundle B infrastructure, construction of which is likely to take 12 months, includes: -

- Eastern Services Corridor Link Road
- Small Park in eastern UEA (Community and Open Space development)
- Surface water management and other services e.g. water supply, wastewater etc. for eastern UEA

The upgrade of Ballyadam Road is included in special development objective CT-U-20 and is linked to development in the eastern UEA.

The County Development plan proposes to deliver Bundle A first. It also however notes that the phasing arrangements are flexible and in the event that it proves possible to commence development on the eastern part of the UEA, then Infrastructure Bundle 'B' (together with the measures proposed for Station Road Bridge and Leamlara Road Upgrade) will be required at the outset.

Works Methods

For each phase of infrastructure development, the works will commence with site clearance/ accommodation works. Temporary traffic management including measures for pedestrians and cyclists will be put in place. Pre-construction demolition surveys of buildings/ boundary walls necessary for the construction of the works will be undertaken followed by the demolition of these structures. Trees/vegetation to be retained will be marked/ protected. Natural buffer areas on existing watercourses outside of the infrastructure area will be maintained and protected during the construction of the proposed infrastructure. The site will be cleared of redundant fencing and road signage, street lighting to be replaced and existing vegetation to be removed. Vegetation clearance will be done in the appropriate season, i.e. outside the bird nesting season (1st March to 31st August, inclusive).

Underground utilities which conflict with the main works will be uncovered using mechanical excavators and hand digging. 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. Any service diversions or protection

works that are required will be commenced at this stage. This will include the diversion of all overhead lines to underground ducts and chambers on Wises Road, Station Road, Leamlara Road and Ballyadam Road as necessary for that phase of development.

The routes of new roads to be constructed (Western/ Eastern and Northern Services Corridor Link Roads) and roads to be upgraded (Wises Road, Station Road, Leamlara Road, Ballyadam Road) will be excavated to formation/ sub-formation level. It is anticipated that generally the maximum excavation depth for the road build up will be 1 metre. Excavations will be undertaken by mechanical means with any spoil arisings to be removed off site or reused locally where testing confirms its suitability. The new roads, cycle tracks and footpaths will then be constructed.

Generally, the roads will have asphalt surfacing with road widths varying by location as outlined earlier in this report. Sub-base and base layers will be compacted stone materials and asphalt layers respectively. Footpaths will be a mixture of concrete and natural stone finishes. The roads and cycle tracks will have asphalt surfacing.

Drainage works will run in tandem with earthworks and road construction. There is a north to south fall across the site and interceptor filter drains will be installed on the northside of the road prior to the earthworks commencing to prevent overland flows from impacting upon the earthworks. These drains will drain to ground directly or to existing drainage ditches/ streams via the detention ponds which are to be excavated as part of the surface water drainage network. Gullies will be connected to a new surface water drainage sewer, consisting of pipes and manholes, to be installed below the new alignment. The maximum anticipated trench excavation depths for the surface water network is 4m. The detention ponds will be an anticipated maximum depth of 2m.

The foul drainage, consisting of a network of manholes and pipes, will be installed at the same time as the surface water drainage network. The drainage will connect to existing foul sewers south of the railway line. Maximum trench excavation depths for the foul water network will be 4 metres. Other services i.e. gas mains, ESB ducting, Eir ducting etc. will also be installed at the same time.

Road crossings of existing field drains and streams will also run in tandem with earthworks. Smaller culverts of field drains will be pipe culverts up to a diameter of 900mm. Culverts of field drains larger than this will be box culverts with the maximum width to be 1500mm. Crossings of the Woodstock Stream will be small bridge crossings with abutments constructed outside of the stream embankments. All culverts, headwalls and bridge beams/ decks will be pre-cast concrete. The bed level of the culverts will meet the requirements of '*Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*'. Where proposed drains cross below watercourses/ ditches the methods used to install them will allow for maintaining existing buffer areas where possible.

New road signs, road markings, public lighting columns, traffic signals and bollards will be installed and commissioned where required. Areas of soft landscaping (verges, open space areas) will be top-soiled, seeded and planted following specification by a Landscape Architect working with a suitably qualified and experienced ecologist. Permanent accommodation works will be completed, including the erection of permanent fencing and boundary walls and other required boundary treatments. Temporary traffic management measures will be removed when appropriate.

The new cycle/pedestrian bridges at the existing Barry's and Wise's Bridges will be constructed on piled foundations and will span across the railway. Necessary clearances, protection, and monitoring measures, as required by Irish Rail, will be put in place for the construction of the bridges.

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 (3rd 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* (NPWS, 2022b). Information on the qualifying interests and the structures and functions of the relevant 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: Water* (EPA, 2022). 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. Irish Wetland Bird Survey (I-WeBS) data for Cork Harbour (0L403) and the Glounthane Estuary/Slatty Water (0L489) subsite were also received for the seasons 2011/12 to 2020/21, inclusive.

2.3. Field Surveys

Habitat surveys of the full Carrigtwohill UEA site were carried out by Lesley Lewis of Limosa Environmental in December 2014 and January 2015. These surveys were part of a Preliminary Ecological Appraisal (PEA) of the site to inform the masterplan and identify the need for further specialist surveys for future planning applications. Full details of the methodology and results are available in: -

- Limosa (2015) *Preliminary Ecological Appraisal for the Carrigtwohill North Masterplan Site. RP15-GW102-02.* Report by Limosa Environmental.

The main surveys of the UEA were undertaken by Karen Banks of Greenleaf Ecology from 30th June to 3rd July 2020. These surveys included flora and habitat survey and mapping, invasive alien species survey, targeted survey for protected mammals, and breeding bird survey, as well as noting habitat for other mammals, reptiles, amphibians and invertebrates. These surveys provided the basis for the evaluation of receptors carried out by Greenleaf Ecology. Full details of the methodology and results are available in: -

- 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.

Bat activity transects were undertaken by Karen Banks of Greenleaf Ecology on 21st July and 5th August 2020 and dusk emergence surveys (for bats) were undertaken at structures on 16th, 25th and 27th July 2020 and at trees in the grounds of the Parochial House on 5th August 2020. Full details of the methodology and results are available in:

- Greenleaf Ecology (2020b) *Bat Survey, Carrigtwohill URDF Initiative, Carrigtwohill, Co. Cork.* Report by Greenleaf Ecology for WS Atkins Ireland Ltd and Cork County Council.

Wintering bird surveys covering the proposed development site were undertaken by Tom Gittings during the winter 2022/23 season. Full details of the methodology and results are available in: -

- 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.

Additional walkover surveys were carried out by Atkins ecologists Niamh Sweeney in February 2020, Emma Nickelsen in June 2021, and Owen O'Keefe and Caroline Downey on 28th February 2023. The purpose of the first was to identify the need for specialist surveys described above and the purpose of the second and third were to identify any significant changes since the main surveys were undertaken.

2.4. Ecological Impact Assessment

The overall methodology followed in the preparation of this report was informed by the most recent guidelines for EcIA in the UK and Ireland, i.e. the CIEEM (2018) guidelines, as updated in April 2022. In additional, 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.

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	• European (Natura 2000) sites or sites which fulfil the criteria for such a designation. • Features essential to the coherence of the Natura 2000 network. • Best examples of natural habitat types listed on Annex I to the Habitats Directive ("Annex I habitats"). • 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). • Wetlands of International Importance (under the Ramsar Convention). • UNESCO World Heritage Sites or Biosphere Reserves.
National Importance	• Designated or proposed Natural Heritage Areas (NHA/pNHA), statutory Nature Reserves or sites fulfilling the criteria for such a designation. • 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). • Viable examples of Annex I habitats.
County Importance	• Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity. • Resident or regularly occurring populations of protected or threatened species (in numbers significant at the county level, e.g. >1% of the county population). • Examples (not of National or International Importance) of Annex I habitats. • Other features of ecological interest identified in relevant local or national biodiversity action plans. • Sites or habitats of high biodiversity value or degree of naturalness in a county context or species which are uncommon in the county. • Sites containing habitats or species which are in decline nationally.
Local Importance (Higher Value)	• Ecological features identified in the relevant local biodiversity action plan. • Resident or regularly occurring populations of protected or threatened species (in numbers significant at the local level). • Sites habitats of high biodiversity value or degree of naturalness in a local context or species which are uncommon locally. • Sites or features containing common or lower value habitats which provide connectivity between features of higher ecological value.

Level	Examples (non-exhaustive)
Local Importance (Lower Value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife. • Sites or features containing non-native species that are of some importance in maintaining habitat links.

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, and
- 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, and
    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, and
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.

As explained in Section 1.2.2 above, the ecological enhancements of the proposed development outlined in this report have been developed in line with Cork County Council’s policies and objectives in relation to sustainable drainage systems (SuDS), green and blue infrastructure, biodiversity on Council lands, and Biodiversity Net Gain. 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 Caroline Downey and Owen O’Keefe, and peer-reviewed by Paul O’Donoghue.

Caroline Downey is a Graduate Environmental Consultant holding a BSc (Hons) in Ecology and Environmental Biology from University College Cork. Caroline has worked in ecological consultancy since 2023. The focus of Caroline's work to date has been assisting with the preparation of Ecological Impact Assessments, AA Screening Reports and NIS, as well as assisting with site visits. Caroline collated the information from the previous surveys and reporting and assisted with the 2023 site walkover.

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 7 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 site walkover 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 18 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, including upstream and downstream stretches, and the full extent of transitional waters within the Great Island Channel SAC, and

- 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 the remainder of Cork Harbour and connected wetlands and waterbodies.

Publicly available spatial data for river, transitional and coastal waterbodies (sourced from *EPA Maps*) were used in conjunction with aerial imagery to identify pathways and zones of impact for disturbance and water quality impacts from the proposed development (see Figure 3-2 below). In addition, the Zone of Influence was examined to identify any other ecological features with potential ecological connections to these zones of impact.

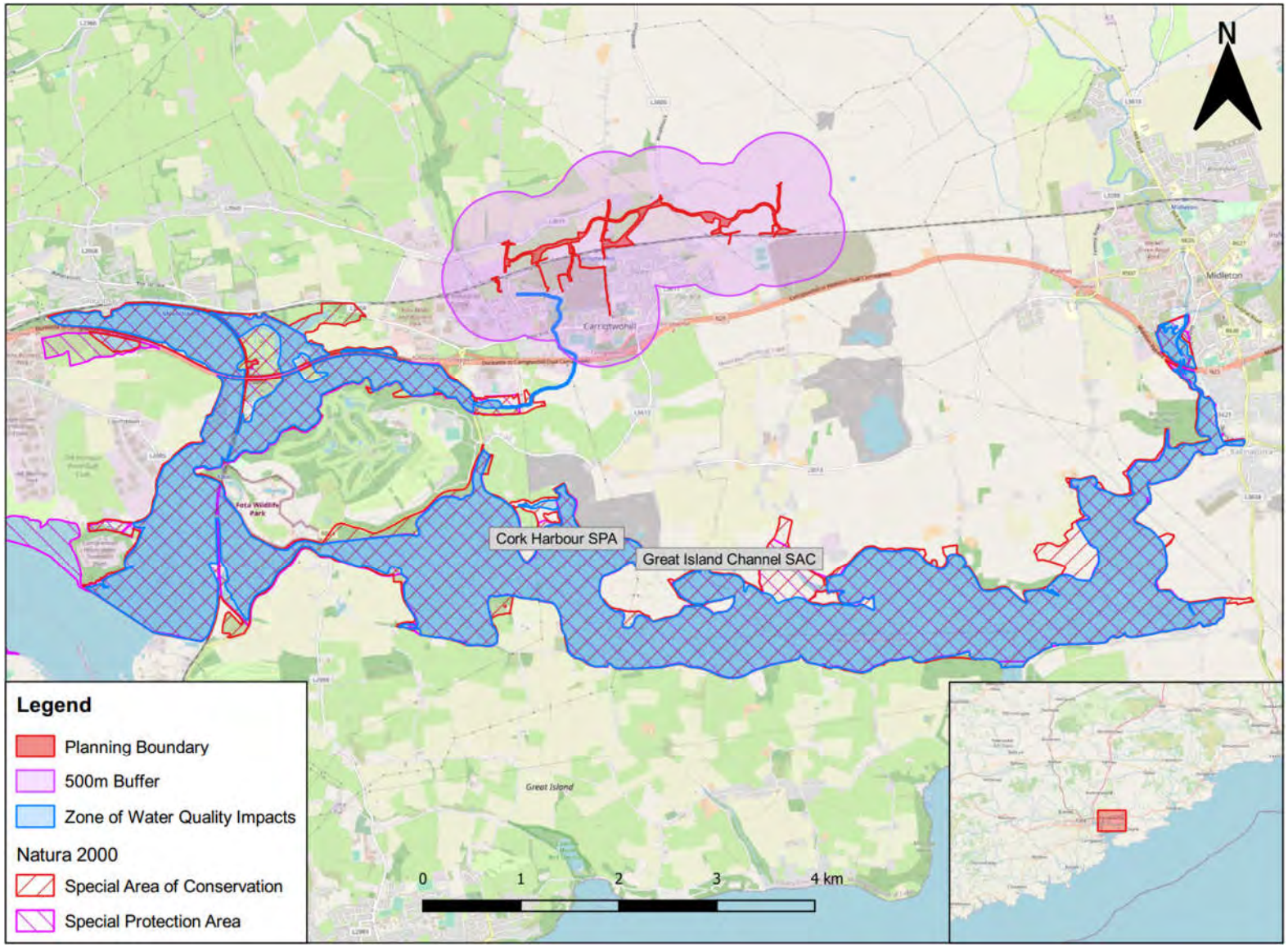

Figure 3-2 - Zones of impact from the proposed development.

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. The proposed development is connected to these sites via surface water pathways and there is also potential for ex-situ impacts on field-feeding waders, e.g. Black-tailed Godwit (*Limosa limosa*) and Curlew (*Numenius arquata*), which may leave these sites to feed in the fields along the proposed URDF Infrastructure alignment. Cork Harbour is also a Ramsar Site (No. 837) under the Ramsar Convention (https://rsis.ramsar.org/ris/837).

There are no UNESCO World Heritage or 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: 002170) and Cork Harbour SPA (site code: 004030). Both of these sites include Slatty Water and Great Island Channel, which are within the likely zone of impact for water quality impacts from the proposed development. In addition, some waders for which the SPA were selected (e.g. Black-tailed Godwit and Curlew) have been recorded feeding occasionally in the footprint of the proposed URDF Infrastructure.

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 maritimae*) (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. 5194601DG0191) 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 19 No. pNHAs (see Table 3-2). The Great Island Channel pNHA is connected to the proposed development via surface water pathways and is 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 3-2 – Proposed Natural Heritage Areas in the Zone of Influence of the proposed development.

Site code	Name	Location (relative to the proposed development) and connectivity
000094	Lee Valley	c. 16.8km west, upstream of the tidal limit of the River Lee, weak indirect connectivity via mobile aquatic species and birds
000099	Ballynaclashy House, North of Midleton	c. 3.1km north-east, weak connectivity via hedgerow and treeline network for bats
000107	Templebreedy National School, Crosshaven	c. 12.5km south, near Crosshaven, no connectivity
000371	Fountainstown Swamp	c. 14.9km south, near Fountainstown, no connectivity
001042	Carrigshane Hill	c. 5.8km east, on the opposite side of Midleton, no connectivity
001046	Douglas River Estuary	c. 6.1km south-west, includes parts of Lough Mahon, connectivity via mobile aquatic species and birds
001054	Glanmire Wood	c. 8.2km west, near Glanmire, no connectivity
001058	Great Island Channel	c. 900m south-west, connectivity via surface water pathways and mobile species, especially birds
001064	Leamlara Wood	c. 2.4km north, weak connectivity via hedgerow and treeline network
001066	Lough Beg (Cork)	c. 9.7km south, in Lower Cork Harbour, indirect connectivity via mobile aquatic species and birds
001074	Rockfarm Quarry, Little Island	c. 4.9km south-west of the proposed development, potential connectivity via mobile species (birds)
001076	Rostellan Lough, Aghada Shore and Poulnabibe Inlet	c. 7.0km south, in Lower Cork Harbour, indirect connectivity via mobile aquatic species and birds
001081	Cork Lough	c. 14.4km west, in Cork City, potential connectivity via birds
001082	Dunkettle Shore	c. 6.9km west, indirect connectivity via mobile aquatic species and birds
001084	Whitegate Bay	c. 8.5km south, in Lower Cork Harbour, potential connectivity via mobile aquatic species and birds
001408	Carrigacrump Caves	c. 10.6km south-east, no connectivity
001979	Monkstown Creek	c. 8.7km south-west, in Lower Cork Harbour, indirect connectivity via mobile aquatic species and birds
001987	Cuskinny Marsh	c. 5.2km south, near Cobh, potential connectivity via birds
001990	Owenboy River	c. 12km south-west, near Carrigaline, indirect connectivity via mobile aquatic species and birds

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. The Lough, Cork (site code: WFS-12) also supports some birds from Cork Harbour/the Zone of Influence.

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, ecological walkover surveys of the proposed development footprint were carried out in December 2014 and January 2015 (Limosa, 2015), February 2020 (Atkins), June and July 2020 (Greenleaf Ecology, 2020a), and June 2021 and February 2023 (Atkins) and these surveys included recorded of Fossitt (2000) habitat types in the study area, following Smith *et al*. (2011). Correspondence to natural habitat types listed on Annex I to the Habitats Directive ("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. Semi-natural habitats (after Fossitt, 2000)

The study area is dominated by agricultural grassland and arable crops in large fields separated by hedgerows, treelines and drainage ditches, with some areas of more species-rich grasslands, as well as streams. There are also roads, buildings and other artificial surfaces, as well as scrub. Habitats identified in the study area are listed in and described in Table 3-3 below and illustrated in the Habitat Map which is included in Figures 3-3a, 3-3b and 3-3c below.

Table 3-3 - Fossitt (2000) habitat types identified in the study area. Source: Limosa (2015); Greenleaf Ecology (2020a); Atkins field surveys.

Habitat	Comment	Value
Non-linear habitats		
BC3	'Tilled land' – During the February 2023 site visit, tilled land was present across the UEA in the townlands of Terry's-Land, Fahydorgan, Ballyadam and Carrigtwohill. These are of low botanical importance but do provide forage area for some farmland birds. Later in the year, these areas will likely all correspond to 'Arable crops' (BC1).	Local Importance (Lower Value)
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.	Mostly Negligible, but some structures of Local Importance (Higher Value)
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.	Mostly Local Importance (Lower Value), some gardens of Higher Value
ED2	'Spoil and bare ground' - Areas under construction in Carrigtwohill 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.	Negligible
ED3	'Recolonising bare ground' - Areas of cleared land recolonising with ruderal species. Areas of bare ground in UEA are re-vegetating with a range of species that are of limited botanical interest.	Local Importance (Lower Value)
GA1	'Improved agricultural grassland' - Dominant across UEA in the townlands of Terry's-Land, Gortnamucky and Poulaniska. The agricultural fields within the study area are of low botanical importance but do provide some limited habitat for fauna and avifauna.	Local Importance (Lower Value)

Habitat	Comment	Value
GA1/WS1	In Poulaniska, there is one small field which represents a mosaic of 'Improved agricultural grassland' (GA1) and Gorse-dominated 'Scrub' (WS1) and also has several mature trees. Given the structural diversity of this area, it is of higher value to fauna and avifauna than other areas of GA1. However, it remains botanically species-poor and small in extent.	Local Importance (Lower Value)
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.	Local Importance (Lower Value)
GS1	'Dry calcareous and neutral grassland' - Present and represented by areas of grazed semi-natural grassland in the western part of the study area, particularly south of the railway line. These examples are, however, relatively species-poor but do provide some limited habitat for fauna and avifauna. They include small patches of 'Scrub' (WS1) in places. Dry calcareous and neutral grassland in the study area does not correspond to any Annex I habitat.	Local Importance (Lower Value)
GS1/WS1	Mosaic of 'Dry calcareous and neutral grassland' and 'Scrub' - One area of grassland which is less intensively grassland in the south-western part of the study area has been colonised by large areas of Gorse-dominated scrub. This area provides cover for mammals, nesting birds and potentially other species.	Local Importance (Higher Value)
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. 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.	Local Importance (Lower Value)
GS2/GS4	A field at the centre of the UEA, between the railway line and the Leamlara Road, supported relatively species-rich areas of 'Dry meadows and grassy verges' (GS2) transitional to 'Wet grassland' (GS4). Other, smaller areas of similar habitat are present at other locations in the study area. These areas are of higher botanical diversity and also provide suitable habitat for fauna, avifauna and invertebrates.	Local Importance (Higher Value)
GS4	'Wet grassland' - The largest and most significant area of this habitat type in the study area (while still being relatively species-poor examples) occur at Poulaniska, north of the railway line. 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.	Local Importance (Lower Value)
WD1	'(Mixed) broadleaved woodland' - This habitat type borders the planning boundary at the northern end of Station Road and at the southern end of Ballyadam Road, but is not within the footprint of the proposed development at any point. These habitats include mature woodlands with both native and introduced tree species and provide suitable habitats for a range of fauna.	Local Importance (Higher Value)
WD2	'Mixed broadleaved/conifer woodland' - An area of mature broadleaved and coniferous trees is present within the ground of the Parochial House. This area will not be affected by the proposed development.	Local Importance (Higher Value)
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. It provides cover and forage for fauna and avifauna and if left undisturbed can succeed to woodland.	Local Importance (Higher Value)
WS1/ED3 and WS1/GS4	Scrub dominated by species such as Bramble and Gorse frequently forms mosaics with 'Recolonising bare ground' (ED3) and 'Wet grassland' (GS4) in the study area. These habitats provide cover for nesting birds but are otherwise of limited biodiversity value.	Local Importance (Lower Value)

Habitat	Comment	Value
WS1/WD1	In Poulaniska, an area of scrub is succeeding to '(Mixed) broadleaved woodland' (WD1). This area provides habitat for fauna and avifauna and is also connected to the surrounding landscape by hedgerow/treelines and watercourses.	Local Importance (Higher Value)
WS2	'Immature woodland' - This habitat is present in a narrow strip alongside the new cycleway which runs along the western side of Wyse's Road. It includes a variety of broadleaved and coniferous tree species. It is currently of limited biodiversity value, but its value will increase as the planting matures.	Local Importance (Higher Value)
WS4	'Short rotation coppice' – In the western part of the study area, there are two small areas of densely planted and uniformly aged willow. These trees were likely planted to assist in drying out fields to improve grazing. Given the absence of other trees/shrubs and the low diversity of the ground flora, these habitats are best described as short-rotation coppices, which are of limited value to biodiversity.	Local Importance (Lower Value)
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).	Local Importance (Higher Value)
WS5	'Recently-felled woodland' - Much of the WS4/WN6 north of the railway line in Poulaniska has recently been cleared/felled and, as such, is mapped as WS5. Many of the 'Hedgerows' (WL1) and 'Treelines' (WL2) in Poulaniska 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.	Negligible
*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 through Carrigtwohill, a cross-section from railway centreline to edge may be generalised as follows: rails and 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.	Local Importance (Higher Value)
Linear habitats		
BL1	'Stone walls and other stonework' - A number of roads in the study area are lined by stone walls, often in associated with treelines. These stone walls can provide habitat for a range of calcicolous flora, as well as refugia for fauna, particularly invertebrates.	Local Importance (Lower Value)
FW1, FW2 and FW4 (.c)	'Eroding/upland rivers' (FW1) and 'Depositing/lowland rivers' (FW2) both represent flowing waters, the main distinction being whether erosion or deposition is the dominant process. As such, a single stretch of a river or stream may comprise multiple small sections of both habitat classes. These classes 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", "FW2.c" etc. The proposed development crosses the Anngrove stream, Woodstock stream and Poulaniska stream, and their associated drainage ditches. 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	Local Importance (Higher Value)

Habitat	Comment	Value
	other fauna. The Woodstock stream also supports a relatively diverse aquatic fauna, compared to the other watercourses in the study area.	
GA2/GS1	For c. 300m along the western side of Wyse's Road, between the road and the recently constructed cycleway/footpath, there is a verge of newly created 'Amenity grassland (improved)' (GA2) which appears to be transitional to 'Dry calcareous and neutral grassland' (GS1). Due to the time of year at which this was surveyed, it was not possible to catalogue the species present. However, it is likely of greater botanical interest than other areas of intensively managed GA2 in the study area. As this habitat is only c. 1.5m wide but c. 300m long, it is mapped as a linear habitat.	Local Importance (Higher Value)
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, Oak, Elm, Hawthorn and occasional Elder and Willow. 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.	Local Importance (Higher Value)

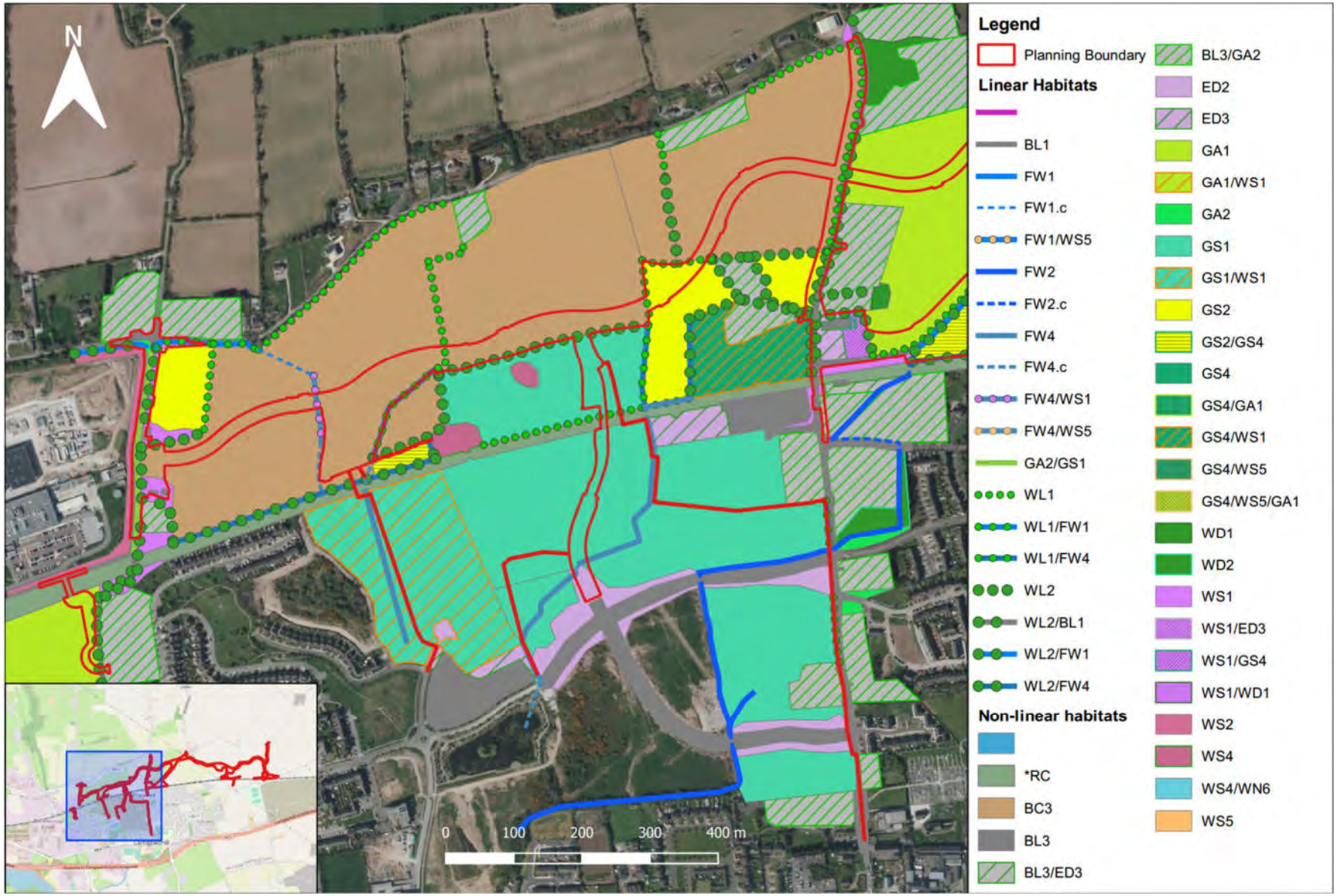

Figure 3-3a - Habitats recorded in the study area (western third).

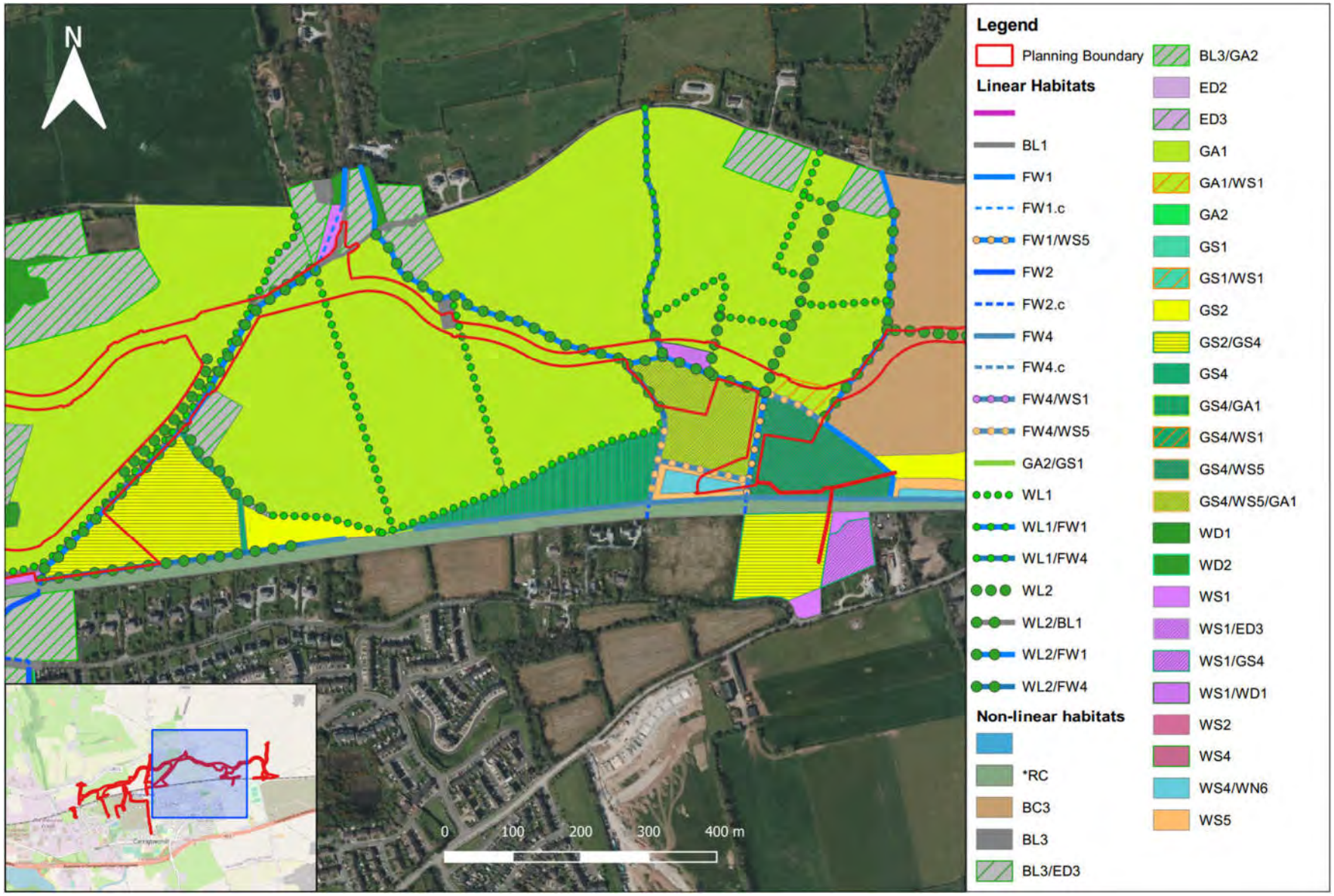

Figure 3-3b - Habitats recorded in the study area (middle third).

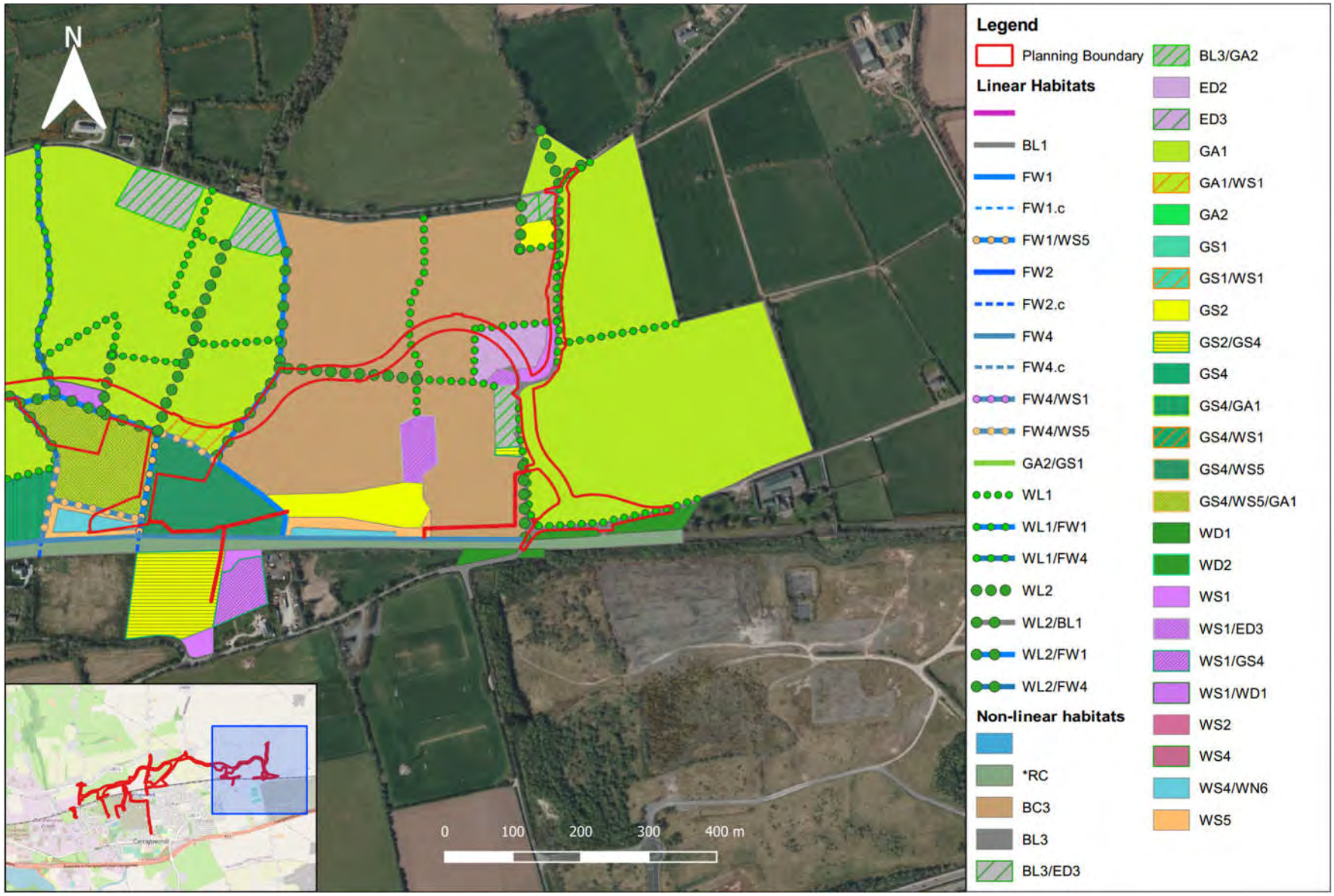

Figure 3-3c - Habitats recorded in the study area (eastern third).

Surface Water

The proposed development lies in the Tibbotstown Water Framework Directive (WFD) sub catchment (SC_010). Watercourses shown on *EPA Maps* within the study area are the Tibbotstown stream and the Anngrove stream. However, neither is shown within or adjacent to the proposed development. The Tibbotstown stream flows in a southerly direction along the eastern side of the IDA Industrial Estate, under the L3680 and the N25 roads, and into Slatty Water. The Anngrove stream flows in a southerly direction through Terry's-Land, and under the L3680 and N25, to Slatty Water. These are described in more detail below and illustrated in Figure 3-4.

Western section

In the west of the study area, water rises in an arable field and flows into a drainage pipe that discharges into a small stream/drainage ditch running parallel to the railway line. This then passes under the railway line via a culvert. It is assumed that this drainage network eventually discharges to the Anngrove stream south of the railway line. These watercourses are not depicted on EPA, Geological Survey Ireland (GSI) or Ordnance Survey Ireland (OSi) map viewers.

Central section

The Woodstock stream flows in a south-westerly direction from the general direction of the Woodstock townland, north of Carrigtwohill. The stream flows along the southern side of the Leamlara Road, is culverted under the railway line and Station Road and joins the Anngrove stream in Terry's-Land, south of the proposed development. The flow type in the stream ranges from riffle and fast glide sections to slow glide and more impounded sections. During the February 2023 ecological walkover, fish, likely Brown Trout (*Salmo trutta*) in the 2+ age-class, were observed in this stream. This is considered to be the only fish-bearing watercourse in the footprint of the proposed development.

Eastern section

The Poulaniska stream is situated in the eastern part of the study area and flows in a southerly and south-westerly direction in the vicinity of Poulaniska townland. It is associated with a network of drainage ditches. It flows south until it is culverted under the railway. It then flows in a south-westly direction for c. 650m. 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 discharges to this karst system. During the February 2023 ecological walkover, this stream and its associated ditches were noted to have been subject to recent re-grading and re-profiling.

Groundwater

The proposed development is situated within 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 Middleton groundwater body and diffuse recharge occurs via rainfall. Shallow groundwater is expected within <10m below the surface, according to the GSI map viewer.

Figure 3-4 - Watercourses recorded in the study area (arrows indicating direction of flow).

3.3.2. Habitats Directive - Annex I

None of the habitats found within the planning boundary of the proposed URDF Infrastructure Project or within the Carrigtwohill UEA were deemed to represent examples of Annex I habitats. Strictly, some of the watercourses in the study area, particularly the Woodstock 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 the 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 & Threatened Species

3.4.1. Flora

Vascular plant taxa identified during the June/July 2020 surveys (Greenleaf Ecology, 2020a) are listed below along with the habitat in which they were recorded (see Table 3-4). None of the species recorded are protected under the Flora (Protection) Order, 2022 or listed on Annex II, IV or V to the Habitats Directive. All of the species recorded are classified as LC (Least Concern) on *Ireland Red List No. 10: Vascular Plants* (Wyse Jackson *et al*., 2016).

Table 3-4 - Vascular plants identified within the study area. Source: Greenleaf Ecology (2020a).

Habitat code	Species present (flora)
GA1	Perennial Ryegrass (*Lolium perenne*), Timothy (*Phleum pratense*), Yorkshire-fog (*Holcus lanatus*), Dandelion (*Taraxacum* agg.), White Clover (*Trifolium repens*), Red Clover (*Trifolium pratense*), Creeping Buttercup (*Ranunculus repens*) and Ribwort Plantain (*Plantago lanceolata*).
GS1	Yorkshire-fog, Sweet Vernal-grass (*Anthoxanthum odoratum*), Timothy, Creeping Bent (*Agrostis stolonifera*), Rough Meadow-grass (*Poa trivialis*), Glaucus Sedge (*Carex flacca*), Sharp-flowered Rush (*Juncus acutiflorus*), Soft Rush (*Juncus effusus*), Creeping Buttercup, Greater Bird's-foot-trefoil (*Lotus pedunculatus*), Curled Dock (*Rumex crispus*), Ragwort (*Senecio jacobea*), Common Mouse-ear (*Cerastium fontanum*), White Clover, Common Knapweed (*Centaurea nigra*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Ox-eye Daisy (*Leucanthemum vulgare*).
GS2	False Oat-grass (*Arrhenatherum elatius*), Cock's-foot (*Dactylis glomerata*), Sweet Vernal-grass, Creeping Bent, Common Bent (*Agrostis capilaris*), Rough Meadow-grass, Yorkshire-fog, Daisy (*Bellis perennis*), Yarrow (*Achillea millefolium*), Common Vetch (*Vicia sativa*), Meadow Vetchling (*Lathyrus pratensis*), Greater Bird's-foot-trefoil, Common Knapweed, Self-heal (*Prunella vulgaris*), Ribwort Plantain, Curled Dock, Greater Plantain (*Plantago major*), Wild Carrot (*Daucus carota*), Common Centaury (*Centaurium erythraea*), Ox-eye Daisy, White Campion (*Silene latifolia*), Field Forget-me-not (*Myosotis arvensis*).
GS4	Hard Rush (*Juncus inflexus*), Common Fleabane (*Pulicaria dysenterica*), Field Horsetail (*Equisetum arvense*), Water Mint (*Mentha aquatica*), Meadowsweet (*Filipendula ulmaria*), Compact Rush (*Juncus conglomeratus*), Hard Rush, Grey Sedge (*Carex divisa*), Rough Meadow-grass, Creeping Bent, Yorkshire-fog, Nettle (*Urtica dioica*), Common Vetch, Meadow Vetchling, Greater Bird's-foot-trefoil, Creeping Cinquefoil (*Potentilla reptans*), Grey Willow (*Salix cinerea*), Alder (*Alnus glutinosa*), Gorse (*Ulex europaeus*) and Bramble (*Rubus fruticosus* agg.).
WS1	Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Elder (*Sambucus nigra*), Grey Willow, Bramble.
WD1	Sycamore (*Acer pseudoplatanus*), Oak (*Quercus* spp.), Ash, Elm (*Ulmus glabra*), Cherry (*Prunus* spp.), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), Bramble.

Habitat code	Species present (flora)
ED3	Purple Ramping-fumitory (*Fumaria purpurea*), White Clover, Prickly Sow-thistle (*Sonchus asper*), Sun Spurge (*Euphorbia helioscopia*), Curled Dock, Common Poppy (*Papaver rhoeas*), Scentless Mayweed (*Tripleurospermum inodorum*), Scarlet Pimpernel (*Anagallis arvensis*), Fat-hen (*Chenopodium album*), Common Hogweed (*Heracleum sphondylium*), Rosebay Willowherb (*Chamerion angustifolium*).
BC3	Scentless Mayweed, Scarlet Pimpernel, Prickly Sow-thistle, Common Hogweed, Field Pansy (*Viola arvensis*), Ragwort, Rosebay Willowherb, Sun Spurge.
WL1/WL2	Ash, Oak, Elm, Hawthorn, Elder, Willow.
BL1	Beech (*Fagus sylvatica*), Oak.
BL2	Grasses (multiple species), Nettle, Bramble.

Round-leaved Crane's-bill (*Geranium rotundifolium*) has been recorded as recently as 2020 within a grassy verge in the IDA Business Park, south of the roundabout (outside of the proposed development planning boundary and the Carrigtwohill UEA). This species is listed as Least Concern in Wyse Jackson *et al*. (2016). In addition, Bee orchid (*Ophrys apifera*), also of Least Concern, has been recorded remote from the proposed development, south of Carrigtwohill's main street in the vicinity of the GAA pitches.

There are records of 4 No. species, namely Chives (*Allium schoenoprasum*), Wormwood (*Artemisia absinthium*), Meadow Barley (*Hordeum secalinum*) and Dittander (*Lepidium latifolium*), all of which are classed as Vulnerable, from within c. 10km of the study area. However, there is no connectivity between the proposed development and these locations. Furthermore, the study area does not support suitable habitat for Meadow Barley. One species listed as Endangered in Wyse Jackson *et al*. (2016) and numbering <250 individuals nationally, namely Weasel's-snout or Lesser Snapdragon (*Misopates orontium*), was recorded in the vicinity of Carrigtwohill in 1892. No other or more recent records exist for this species in the study area and it was not observed during any of the field surveys which informed this EcIA. Thus, it is considered unlikely to be present.

3.4.2. Birds

All birds are afforded protection under the Wildlife Act, 1976 (as amended). A sub-set of these are also afforded varying levels of protection under the Birds Directive.

A large number of birds on the *Birds of Conservation Concern in Ireland 4: 2020-2026* (BoCCI4) Amber and Red Lists (Gilbert *et al*., 2021) have been recorded within 10km × 10km grid square (hectad) W87. A large number of waders and other waterbirds have also been recorded within the same hectad, as it includes the mudflats and saltmarshes of the Slatty Water and the Great Island Channel. The Conservation Objectives Supporting Document for the Cork Harbour SPA (NPWS, 2014c) and the Irish Wetland Bird Survey (I-WeBS) counts for the site Cork Harbour (0L403) and the sub-site Glounthane Estuary/Slatty Water (0L489) provide detailed accounts of the use of these estuarine habitats by waterbirds.

With regard to the use of the proposed development footprint and wider study area by field-feeding waterbirds, Limosa (2015) recorded 45 No. Curlew foraging in a field between the proposed Eastern Services Corridor Link Roads and the existing Station Road and Leamlara Road in December 2014 or January 2015, while Gittings (2023) recorded 16 No. Curlew in the same location in November 2022 and 86 No. in December 2022. Gittings (2023) also recorded 38 No. Black-tailed Godwit at this location in December 2022 (together with Curlew). The waterbird 2022/23 waterbird surveys are described in more detail in Section 3.4.3 below and in Gittings (2023), which is included in with the application.

Other species of concern in relation to road projects in rural areas include Barn Owl (*Tyto alba*). There is one record of a single roosting Barn Owl approximately 1km north of the proposed development from summer 2021 (Anon, *pers. comm*.). There is potential for Barn Owl to roost and forage within the proposed development boundary. After a period of decline Barn Owl numbers are showing sign of recovery, linked in part to the presence of the invasive small mammal, Greater white-toothed shrew (*Crocidura russula*).

A breeding bird survey of the study area was undertaken on 30th June 2020 (Greenleaf Ecology, 2020a). The survey targeted suitable habitat areas previously identified. During the survey, 22 No. bird species were recorded. No Annex I or BoCCI4 Red-listed birds were recorded within the study area during the

course of surveys undertaken in 2020. Two Amber-listed species, namely Robin and House Sparrow, were recorded as possibly breeding within the study area. Swallow was the only Amber-listed species confirmed breeding in the study area. Swallows were observed nesting within a disused house located adjacent to a local road at the west of the UEA area and it is likely that this species breeds in agricultural barns throughout the study area. The remaining 19 No. species recorded are all Green-listed and comprise a range of relatively common species typically associated with the hedgerow, garden and agricultural habitats present within the study area. The full results are shown in Table 3-5 below.

A detailed account of the wintering birds in the vicinity of the proposed development is provided in the AA Screening Report which accompanies the application.

Table 3-5 - Breeding birds recorded within the study area. Source: Greenleaf Ecology (2020a).

Species	Breeding evidence	BoCCI4 List	Birds Directive
Blackbird (*Turdus merula*)	Probable (P)	Green	Annex II
Blackcap (*Sylvia atricapilla*)	Possible (H)	Green	n/a
Blue Tit (*Parus caeruleus*)	Possible (H)	Green	n/a
Buzzard (*Buteo buteo*)	Non-breeding (F)	Green	n/a
Chaffinch (*Fringilla coelebs*)	Possible (H)	Green	n/a
Chiffchaff (*Phylloscopus collybita*)	Possible (S)	Green	n/a
Collared Dove (*Streptopelia decaocto*)	Possible (H)	Green	Annex II
Dunnock (*Prunella modularis*)	Possible (H)	Green	n/a
Garden Warbler (*Sylvia borin*)[1]	Possible (H)[1]	Green	n/a
Goldfinch (*Carduelis carduelis*)	Possible (H)	Green	n/a
Grey Heron (*Ardea cinerea*)	Non-breeding (F)	Green	n/a
Hooded Crow (*Corvus cornix*)	Possible (H)	Green	n/a
House Sparrow (*Passer domesticus*)	Possible (H)	Amber	n/a
Long-tailed Tit (*Aegithalos caudatus*)	Possible (H)	Green	n/a
Magpie (*Pica pica*)	Possible (H)	Green	Annex II
Pheasant (*Phasianus colchicus*)	Possible (H)	Green	Annex III
Robin (*Erithacus rubecula*)	Possible (H)	Amber	n/a
Rook (*Corvus frugilegus*)	Possible (H)	Green	Annex II
Song Thrush (*Turdus philomelos*)	Possible (S)	Green	Annex II
Swallow (*Hirundo rustica*)	Confirmed (ON)	Amber	n/a
Woodpigeon (*Columba palumbus*)	Possible (H)	Green	Annex II
Wren (*Troglodytes troglodytes*)	Probable (A)	Green	n/a

[1] Sighting of a single Garden Warbler that flew into a treeline along a local road c. 225m north of the proposed development. While it is possible that it was breeding, given the lack of optimal breeding habitat in the vicinity and that this species has never been recorded breeding in Co. Cork, this bird was more likely to be passing through than breeding.

3.4.3. Mammals

Bats

This section presents a summary of the results of the bat studies which informed this assessment. Full details are provided in Greenleaf Ecology (2020b), which is appended to this EcIA.

All bat species in Ireland, and their roosts, are protected under the Wildlife Act, 1976 (as amended) and are also afforded strict protection under Article 12 of the Habitats Directive (as they are listed on Annex IV). Several bat species have been recorded in the study area, including Leisler's Bat (*Nyctalus leisleri*), Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Brown Long-

eared Bat (*Plecotus auritus*) and Daubenton's Bat (*Myotis daubentonii*). Landscape association models have been constructed to provide a landscape conservation guide for Irish bats (Lundy *et al.*, 2011). The western half of the study area has a bat suitability score of 33%, while the eastern half has a suitability score of 26.89%. Across the study area, the highest suitability scores were for Leisler's Bat, Soprano Pipistrelle, Brown Long-eared Bat. Therefore, bats are likely to use the landscape within the study area for foraging and commuting purposes.

Potential Bat Roosts

Greenleaf Ecology (2020b) identified 5 No. structures as having potential roost features, but no evidence of bats was found during the daytime surveys (30th June to 3rd July 2020). Subsequent dusk emergence surveys recorded no bats emerging from any of the structures. The Parochial House was subjected to an emergence survey due to the presence of mature trees. No bats were recorded emerging from the trees, but soprano pipistrelles were noted emerging from roof of the Parochial House. This indicates a Soprano Pipistrelle roost, which was determined to be of low conservation significance. No bat roosts were recorded in any of the structures with potential features.

During the site visit by Atkins in February 2023, one additional structure with High potential to support a bat roost was identified in the study area. This was the disused gate lodge at the entrance to Ballyadam House. This building adjoins the planning boundary of the proposed development and will not be affected.

Greenleaf Ecology (2020b) identified a total of 9 No. trees within the study area as being of moderate suitability for roosting bats during walkover surveys (30th June 2020 and 3rd July 2020). However, none were suitable for use by larger numbers of bats on a regular basis and none were confirmed as active bat roosts at the time of survey.

Activity Survey

Bat activity transects undertaken on 21st July and 5th August 2020 (Greenleaf Ecology, 2020b) recorded three species of bat within the study area: Soprano Pipistrelle, Common Pipistrelle and Leisler's Bat. Soprano Pipistrelle was the most frequently recorded species, followed by Leisler's Bat. All three species were recorded foraging and commuting along hedgerows and treelines across the study area.

Passive monitors were located in the western half of the UEA. A notably high proportion (93%) of calls picked up by the westernmost monitor were of Common Pipistrelle, 13 minutes after sunset, which likely indicates a roost nearby. Monitor located near watercourses recorded a higher diversity of bat species, including Whiskered Bat, Daubenton's Bat and *Myotis* spp., as well as the aforementioned species. Brown Long-eared Bat was recorded on one occasion in the east of the study area.

Features in the study area of potential use by foraging and commuting bats include linear features such as scrub, hedgerows and treelines and associated watercourses/drainage ditches, which provide connectivity between the study area and other foraging areas in the wider landscape.

The study area and its environs are considered to be of moderate to high suitability for bats due to the presence of a confirmed bat roost (Parochial House), relatively good quality habitat for bats and moderate connectivity to other suitable habitats in the wider landscape. The survey results indicate that at least six species commute to or through the study area to forage. A higher diversity of bat species was recorded to the east of the study area, which supports semi-natural habitats including wet grassland, scrub and mature treelines.

Otter

Numerous records for Otter (*Lutra lutra*) exist within and in close proximity to the study area on the NBDC's *Biodiversity Maps*. These are mainly along the Slatty Water. Otters are listed on Annexes II and IV to the Habitats Directive. As such, they require the designated of SACs for the protection of their populations and are also strictly protected, wherever they occur, under Article 12 of the Directive. They are also protected under the Wildlife Act, 1976 (as amended).

Given the scale and condition of the streams and drainage ditches within the study area, with the exception of the Woodstock stream, they are not considered to provide suitable foraging habitat for otters. Furthermore, given the levels of modification and disturbance to their riparian zones, they do not provide

suitable habitat for otter holts or couches. In addition, connectivity along these watercourses is poor due to the presence of multiple low culverts under roads and the railway line, forming a barrier to the movement of otters. While the Woodstock, stream provides more suitable foraging habitat, these barriers to movement remain and it is considered that this watercourse is also unlikely to support.

In light of the poor habitat conditions and connectivity, and the fact that no evidence of otters was recorded within the study area during any of the field surveys which informed this report, Otter is not considered to be a key ecological receptor (KER) for the proposed development.

Badger

Badger (*Meles meles*) and their setts are protected under the Wildlife Act ,1976 (as amended). This species has been recorded at multiple locations along the N25 road, between Carrigtwohill and Midleton, and the study area provides suitable foraging and commuting habitat. Therefore, there is potential for badgers to occur within the study area.

During the surveys by Greenleaf Ecology (2020a), no badger setts or evidence of badger activity were recorded in the study area. During the walkover by Atkins ecologists in February 2023, while badger prints were observed in several locations, no confirmed or potential badger setts were identified. Given the low levels of badger activity apparent in the study area and lack of any confirmed or potential setts, Badger is not considered to be a KER for the proposed development.

Other Mammals

Other species of mammals for which records exist or which potentially occur in the vicinity of the study area include Red Fox (*Vulpes vulpes*), Pine Marten (*Martes martes*), Red squirrel (*Sciurus vulgaris*), Irish Hare (*Lepus timidus hibernicus*), Rabbit (*Oryctolagus cuniculus*), Hedgehog (*Erinaceus europaeus*), Pygmy Shrew (*Sorex minutus*), Irish Stoat (*Mustela erminea hibernica*), and a deer species.

During the field surveys which informed this report, evidence of foxes and rabbits (in the form of droppings and burrows) was observed frequently within the proposed development and the wider study area. Both species are common and widespread locally and nationally. While no evidence of hedgehogs or shrews was observed, these species are widespread so are considered likely to occur. Area of woodland in the study area are generally small and immature, and do not provide suitable habitat for pine martens or squirrels, nor do these woodlands/scrub or treelines/hedgerows in the study area provide links between woodlands of greater suitability for these species. No evidence of hares or stoats was observed, but some suitable habitat is present, so these species potentially occur. Limited evidence of deer (prints of deer of unknown species) was observed during the surveys.

Given the limited evidence of other mammal species found during the surveys, their conservation and protection status, their habitat requirements and high degree of mobility, they are not considered KERs for the proposed development.

3.4.4. Reptiles & Amphibians

There are numerous records for Common Frog (*Rana temporaria*) within the hectad W87 and surveys by Atkins ecologists in March 2020 and February 2023 recorded frog spawn within the study area. The Atkins surveys recorded frog spawn in a water-logged depression in wet grassland, just north of the railway line in the eastern part of the study area. Other parts of the study area are unlikely to support frogs.

There are no records for Smooth Newt (*Lissotriton vulgaris*) or Viviparous Lizard (*Zootoca vivipara*) in the study area and neither of these species was observed during any of the field surveys. However, their presence cannot be entirely ruled out, and the area most likely to support them is in the complex of wet grassland and scrub in the eastern part of the study area/Poulaniska.

The proposed development is not within or connected to the range of Natterjack Toad (*Bufo calamita*), which in Ireland is restricted to a small number of sites in Co. Kerry and The Raven in Co. Wexford.

3.4.5. Fisheries & Aquatic Invertebrates

As the watercourses in the study area are not monitored, there is no baseline data available regarding the fish species present therein or the potential fisheries value of these watercourses. During the February 2023 survey, fish, likely Brown Trout (*Salmo trutta*) in the 2+ age-class, were observed in the Woodstock stream. Following an examination of this and the other streams and ditches, the Woodstock stream was considered to be the only fish-bearing watercourse in the footprint of the proposed development.

The proposed development is not within or connected to the range of White-clawed Crayfish (*Austropotamobius pallipes*) or Freshwater Pearl Mussel (*Margaritifera margaritifera*). As the EPA does not monitor any of the water courses in the study area, there is no baseline data available on the aquatic invertebrate communities therein. Given the size of these watercourses (and the areas of standing water) and the high levels of modification and disturbance, it is considered that the aquatic invertebrate communities therein are likely to be impoverished and not contain any species or species assemblages of conservation interest.

3.4.6. Terrestrial Invertebrates

Greenleaf Ecology (2020a) recorded the following invertebrate species (all of which are butterflies) during the field surveys conducted from 30th June to 3rd July: Meadow Brown (*Maniola jurtina*), Peacock (*Aglais io*), Red Admiral (*Vanessa atalanta*) and Ringlet (*Aphantopus hyperantus*). These species are all common and widespread in Ireland.

Given the intensity of land use throughout the study area, the only part of the study area considered to have any potential to support more diverse invertebrate communities is the mosaic of wet grassland, scrub, hedgerows, treelines, drainage ditches and standing water north of the railway line in the eastern half of the study area.

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.

Part 1 of the Third Schedule to the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended) ("the Habitats Regulations") lists IAPS requiring legal restrictions to prevent their spread. Section 49(2) and (3) of the Habitats Regulations make it an offence to cause or allow the spread the of any of the species (or their hybrids, cultivars etc.) listed in Part 1 of the Third Schedule, except where all reasonable steps have been taken and due diligence exercised to avoid committing the offence. As such, these species are of particular concern with regard to site development and construction works.

In addition, the EU Invasive Alien Species (IAS) Regulation (No. 1143/2014) (as amended) 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, 2022). 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.

During the 2014/15 surveys, Limosa (2015) recorded Traveller's Joy growing in some areas over treeline/ hedgerow vegetation. During the surveys in July 2020, Greenleaf Ecology (2020a) recorded Himalayan Balsam to the north of an arable field and in the vicinity of a railway underpass, both of which are located in the townland of Terry's-Land. Japanese Knotweed was recorded 3rd July 2020 (Greenleaf Ecology, 2020a) at the southeast of the UEA area, to the south of the railway line. Four Butterfly Bush shrubs were recorded in the study area in the boundaries of domestic gardens. Cherry Laurel was present within the tree lines in several locations within the study area. Himalayan Honeysuckle was recorded in one location

to the south of the UEA in the townland of Carrigtwohill. Additional species observed during the February 2023 walkover included Three-cornered Leek, Winter Heliotrope and Montbretia. The IAPS identified in the study area are listed and their status given in Table 3-6 below.

Table 3-6 - IAPS identified on site, their impact ratings and status.

Species	O'Flynn *et al.* (2014)	Third Schedule	Union concern
Himalayan Balsam (*Impatiens glandulifera*)	**High-impact**	**Yes**	**Yes**
Japanese Knotweed (*Fallopia japonica*)	**High-impact**	**Yes**	No
Cherry Laurel (*Prunus laurocerasus*)	**High-impact**	No	No
Three-cornered Leek (*Allium triquetrum*)	Medium-impact	**Yes**	No
Butterfly Bush (*Buddleja davidii*)	Medium-impact	No	No
Himalayan Honeysuckle (*Leycesteria formosa*)	Medium-impact	No	No
Sycamore (*Acer pseudoplatanus*)	Medium-impact	No	No
Traveller's-joy (*Clematis vitalba*)	Medium-impact	No	No
Winter Heliotrope (*Petasites fragrans*)	n/a	No	No
Montbretia (*Crocosmia* × *crocosmiiflora*)	n/a	No	No

The locations of Himalayan Balsam, Japanese Knotweed, Cherry Laurel, Three-cornered Leek, Butterfly Bush and Himalayan Honeysuckle recorded during the surveys are illustrated in Figure 3-5 below. Sycamore and Traveller's-joy occur frequently in treelines, hedgerows and scrub throughout the study area, while Winter Heliotrope occur frequently along the roads and the railway line.

During the field surveys, a large number of non-native species and cultivars were observed in domestic gardens in the study area. Although not native, many of these species provide some benefit to biodiversity, e.g., as an additional food source for pollinators, and the vast majority are unlikely to become invasive.

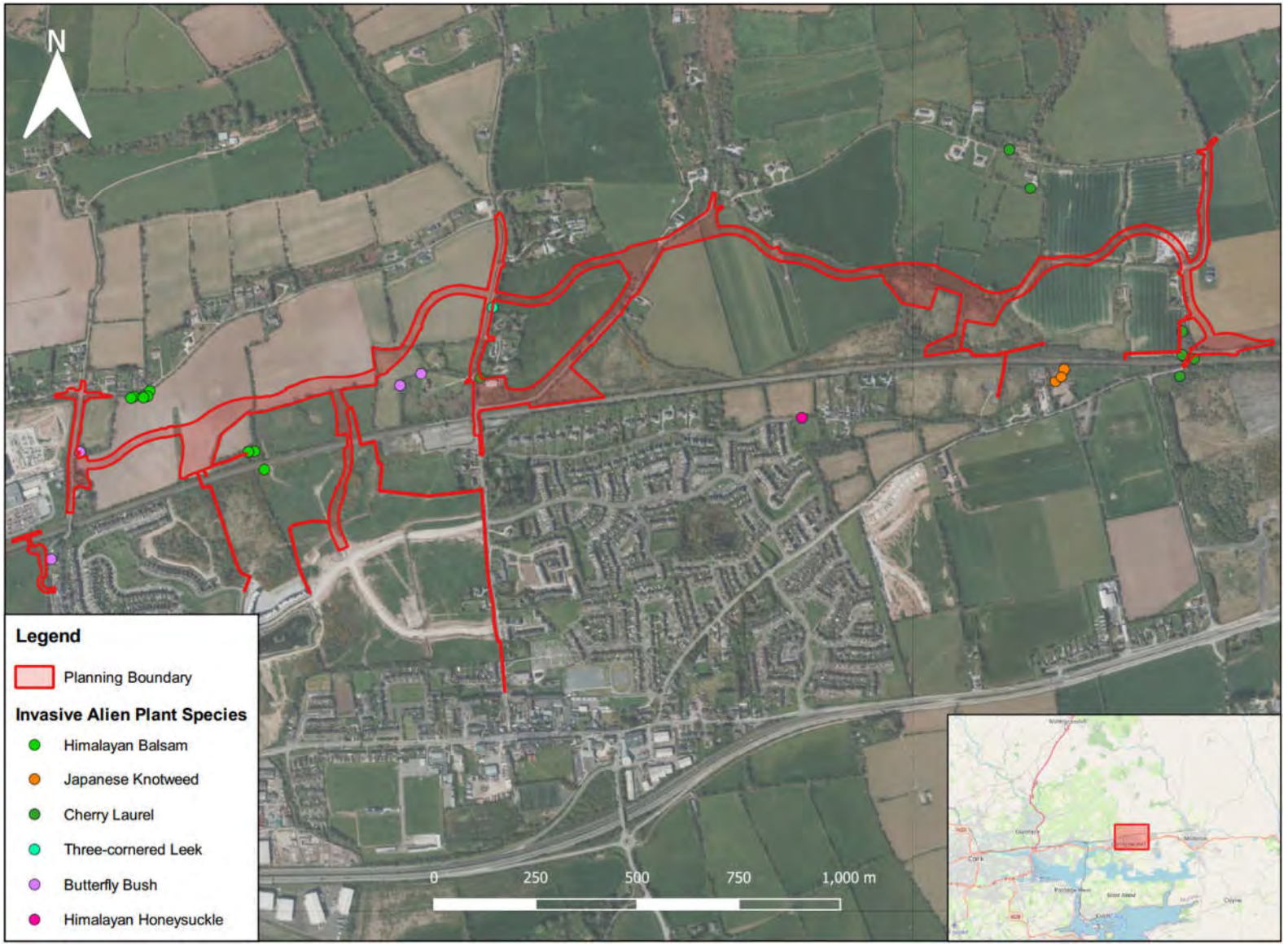

Figure 3-5 - Locations of invasive alien plant species of most concern identified during the surveys.

4. Evaluation of Ecological Features

Based on the description given in the preceding section of the biodiversity and baseline ecological conditions in the receiving environment of the proposed development, the following KERs have been defined as set out below. All of the other receptors were of Local Importance (Lower Value) or below.

4.1. Cork Harbour

Areas of Cork Harbour within the Zone of Influence of the proposed development are covered by the following international, European, and national designations: -

- Cork Harbour Wetland of International Importance (site no. 837)
- Cork Harbour Important Bird Area (site code: IE088)
- Great Island Channel SAC (site code: 001058)
- Cork Harbour SPA (site code: 004030)
- Great Island Channel pNHA (site code: 001058) and 10 No. other pNHAs
- Douglas Estuary Wildfowl Sanctuary (site code: WFS-67)

In addition, areas of Cork Harbour within the Zone of Influence support the following examples of natural habitat types and assemblages of species of international and national conservation importance:

- Estuarine habitat complex including the Annex I habitats 'Mudflats and sandflats not covered by seawater at low tide' (1140) and 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' (1330).
- Wintering birds in numbers >20,000 individuals; internationally important populations of 2 No. species, i.e., Black-tailed Godwit and Redshank; nationally important wintering populations of 22 No. species; and regularly occurring populations of species listed on Annex I to the Birds Directive, i.e., Whooper Swan, Little Egret, Golden Plover, Bar-tailed Godwit, Ruff, Mediterranean Gull, and Common Tern.

The KER 'Cork Harbour' encapsulate all of the above protected sites, habitats and species populations.

Evaluation: International Importance

4.2. Semi-natural Grasslands

Areas of less intensively managed grasslands, including mosaics of dry calcareous and neutral grassland (GS1), dry meadows and grassy verges (GS2) and wet grassland (GS4) occur along the northern boundary of the railway line, particularly in the eastern part of the study area, and they include areas of scrub and watercourses. These areas are of higher botanical diversity relative to other agricultural habitats in the locality and provide habitat for birds and other fauna, including invertebrates.

Evaluation: Local Importance (Higher Value)

4.3. Hedgerows, Treelines, Woodland and Scrub

The hedgerows, treelines, woodland and scrub within the study area, while being of relatively low quality, provide important cover and forage for breeding birds and other fauna, including badgers and other mammals. In addition, the network of hedgerows and treelines form links between woodlands and other higher-value habitats in the wider landscape.

Evaluation: Local Importance (Higher Value)

4.4. Watercourses and Wetlands

While small in scale and highly modified, the Anngrove stream, Woodstock stream and Poulaniska stream, and their associated drainage ditches provide important connectivity in the landscape, particularly where they occur in association with hedgerows and other linear habitats. The Woodstock stream also supports a relatively diverse aquatic fauna, including Brown Trout, compared to the other watercourses in the study area. As such, it is the only watercourse in the study area with potential to support Otter (although this is significantly compromised by poor connectivity to areas of greater suitability).

The network of drainage ditches provides some connectivity between other habitats, including streams, standing water and hedgerows/treelines/scrub, and foraging and commuting lines for bats and other fauna. Standing water in depressions within wet grassland north of the railway line in the eastern part of the study area support frogs and other fauna.

Evaluation: Local Importance (Higher Value)

4.5. Fauna

4.5.1. Birds

Wintering Birds

The wintering bird populations and assemblages in the Zone of Influence are of International Importance and included under the KER 'Cork Harbour' (Section 4.1 above) and impacts thereon are assessed in detail in the AA Screening Report which accompanies the application.

Breeding Birds

As shown in Table 3-5 above, the 22 No. species recorded during the summer bird survey did not include and Annex I or Red-listed species. Two Amber-listed species, namely Robin and House Sparrow, were recorded as possibly breeding. Swallow was the only Amber-listed species confirmed breeding. Swallows were observed nesting within a disused house and is likely to breed in other buildings in the study area. The remaining 19 No. species recorded are all Green-listed and are relatively common species typically associated with the habitats present within the study area.

The habitats for these species are included in the KERs 'Hedgerows, Treelines, Woodland and Scrub' in Section 4.3 and also 'Artificial Structures' in Section 4.6.

Evaluation: Local Importance (Higher Value)

4.5.2. Protected Mammals

Bats

The study area is of Moderate to High suitability for foraging and commuting by bats due to the networks of hedgerows, treelines and other vegetation providing commuting lines and prey. While no bat roosts were confirmed during the surveys, several trees and structures with features of Moderate or High suitability for roosting bats were identified.

The habitats of importance for bats are included in the KERs 'Hedgerows, Treelines, Woodland and Scrub' in Section 4.3 and 'Artificial Structures' in Section 4.6.

Evaluation: Local Importance (Higher Value)

Otter

As explained in Section 3.4.3, while the Woodstock stream and, to a lesser degree, other watercourses in the study area are suitable for commuting and foraging by Otter, these habitats are effectively isolated from more suitable areas by low bridges/culverts, and are not considered suitable for holting due to high levels of disturbance. Notwithstanding this poor habitat quality and connectivity, and the lack of any evidence of otters at the time of the field surveys, the possibility of otter presence at the time of construction cannot be entirely excluded.

Habitats with some potential to support otter are included in the KER 'Watercourses and Wetlands' in Section 4.4 above.

Evaluation: Local Importance (Lower Value)

Badger and Other Mammals

Badger N25 between Carrigtwohill and Midleton and the study area provides suitable habitat. Therefore, there is potential for badgers to occur within the study area. During the field surveys, the only evidence of badgers were prints found on one occasion (no confirmed or potential badger setts were identified). While there were no breeding or resting places of Badger at the time of the surveys, given the suitability of the habitat and mobility of this species, the possibility of a badger sett becoming established between the time of the surveys and commencement of construction must be acknowledged.

Other species of mammals for potentially present include Red Fox, Pine Marten, Red Squirrel, Irish Hare, Rabbit, Hedgehog, Pygmy Shrew, Irish Stoat and a deer species. The only species for which evidence was noted during the surveys were foxes, rabbits and deer. The habitats within the study area, while suitable for these species, are not considered to be of an extent or quality capable of supporting populations of conservation significance of any of these species.

The habitats of importance for badgers and other mammals are included in the KER 'Hedgerows, Treelines, Woodland and Scrub' in Section 4.3 above.

Evaluation: Local Importance (Lower Value)

4.5.3. Other Fauna

No threatened or protected invertebrates were noted during the surveys which informed this EcIA. Habitats with potential to support such species or communities are included in the KERs 'Semi-natural Grasslands', 'Hedgerows, Treelines, Woodland and Scrub' and 'Watercourses and Wetlands' in Sections 4.2, 4.3 and 4.4.

Aquatic fauna, including Common Frog, is included under the KER 'Watercourses and Wetlands' in Section 4.4 above.

4.6. Artificial Structures

Buildings and other artificial structures within the study area have potential to support roosting bats and nesting birds such as swallows and house martins. Given the conservation and protection status of such species, such structures are deemed to be important for these species locally.

Evaluation: Local Importance (Higher Value)

4.7. Invasive Alien Species

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. Given the risks associated with construction works near these species, they are considered to be a KER. However, as they represent a threat of an impact/effect, they are not assigned a level of importance.

Evaluation: n/a

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.

5.1. Cork Harbour

As Cork Harbour is within the Zone of Influence of the proposed development, but not within its planning boundary or the study area, i.e. the Carrigtwohill UEA, the only pathways for impacts on this KER are as follows:

- Indirect impacts on water quality in the Slatty Water/Glounthaune Estuary and the Great Island Channel via surface water pathways, most notably the Woodstock stream, and
- Ex-situ impacts on field feeding waterbirds, specifically Black-tailed Godwit and Curlew.

The potential for impacts on the receptors in Cork Harbour are assessed in detail in the AA Screening Report which accompanies the application.

5.2. Semi-natural Grasslands

The impacts of the proposed development on semi-natural grasslands of conservation interest or potential in the study area are assessed in Table 5-1 below. This focusses on discrete habitat areas which are within or intersect the planning boundary of the proposed development. Given the nature of the proposed development and the sensitivities of these habitat types, this assessment focussed on direct habitat loss and fragmentation.

Total area of the semi-natural grassland habitats considered was c. 320,590m^2 with a total of c. 37,751m^2 (c. 12%) of these occurring within the planning boundary of the proposed development. However, as shown in Table 5-1 below, much of this area is not within the permanent footprint of the proposed development and will either be reinstated or maintained as passive green space.

In addition, a length of c. 294m of amenity grassland (GA2) transitional to dry calcareous/neutral grassland (GS1) is present along Wyse's Road, c. 275m of which (c. 94% of the total length) is within the planning boundary of the proposed development. However, apart from a connection for a pedestrian/cyclist crossing of the road, this habitat will be preserved in situ during construction and thereafter.

Evaluation: Slight effects at the local level in the short term, reducing to imperceptible in the long term.

Table 5-1 - Areas of semi-natural grassland habitats impacted by the proposed development.

Habitat	Location	Existing area	Within planning boundary	Impact	Effect
Dry meadow (GS2)	Adjoining Wyse's Road, in the western part of the study area	9,724m^2	71m^2 (1%)	The western and northern boundaries and edges of this field will be cleared of scrub during construction, with almost no incursion into the existing grassland. Any GS2 cleared will be re-instated post-construction, with no permanent loss due to the widening of the road corridor. New boundaries will also be established.	Imperceptible effect locally in the short term, none in the long term
Dry calcareous/neutral grassland (GS1)	Between the proposed Western Services Corridor Link Road and the railway line	33,388m^2	3,438m^2 (10%)	This field will be crossed by the proposed Northern Services Corridor Link Road and surface water drainage pipeline. The only boundary which will be fragmentated will be where the new road enters from the field to the north. The remaining boundaries and 90% of the field will remain unaffected. The proposed pipeline is underground only and the habitat above it will be reinstated post-construction.	Permanent moderate effect at the local level
Dry calcareous/neutral grassland (GS1)	As above but to the south of the railway line	150,161m^2	5,886m^2 (4%)	As above, except that the road will cross the railway line from the north via a new bridge. The proposed surface water drainage pipeline will also run along fields of this habitat to the south along Station Road. These are currently subject to significant disturbance.	Permanent slight effect at the local level
Dry meadow (GS2)	c. 200m north of the railway line and west of the existing Station Road	17,551m^2	3,893m^2 (22%)	The north-west corner of this site will be cleared during construction. The proposed Western Services Corridor Link Road will run in a north-easterly direction through this corner. Other than as required for the road corridor, existing boundaries will be retained. The lands in the extreme north-west corner will become passive green space. The remaining 78% of the field will remain unaffected.	Permanent slight to moderate effect at the local level
Dry meadow (GS2)	Adjoining Station Road to the west, c. 200m north of the railway line	6,549m^2	1,148m^2 (18%)	The eastern boundary and edge of this field will be cleared during construction. The remaining 82% of the field will remain unaffected. The majority of the GS2 cleared will be re-instated post-construction, with only minor permanent loss	Slight effect locally in the short term, imperceptible in the long term

Habitat	Location	Existing area	Within planning boundary	Impact	Effect
				due to the widening of the road corridor. A new boundary will also be established.	
Dry meadow grading to wet grassland (GS2/GS4)	South of Leamlara Road, north of the railway line	31,621m^2	8,194m^2 (26%)	A small break in the north-western boundary of this field will be made to provide a tie-in to the approved Inter-urban Cycleway, all other boundaries and GS2/GS4 area will remain unaffected. A separately approved cycleway will travel through the area of this habitat within the planning boundary of the URDF Infrastructure, while the remainder will be passive green space as part of this present project.	Permanent slight effect at the local level
Wet grassland (GS4) with recently cleared scrub (WS5), transitioning to improved agricultural grassland (GA1)	Northern/central of wet fields in Poulaniska	22,156m^2	9,186m^2 (41%)	While 41% of this field is within the planning boundary, the road and other proposed infrastructure runs in the fields to the north. The only development proposed in this field are cycle paths and an attenuation pond. The remainder will be passive green space. All other GS4 and boundaries will be retained.	Significant effect locally in the short term, but partial (extent) recovery in the medium/long term and change of some areas to other habitats of biodiversity value
Wet grassland (GS4) with recently cleared scrub (WS5)	Eastern of larger wet fields in Poulaniska	21,472m^2	5,672m^2 (26%)	As above.	As above
Dry meadow (GS2)	Elongated field in east of Poulaniska	10,129m^2	17m^2 (<1%)	A slight incursion into the western end of this field is necessary to provide a foul sewer connection for potential future development.	Imperceptible
Dry meadow grading to wet grassland (GS2/GS4)	South of the railway line, where new wastewater pipeline to the existing pumping station is proposed	15,773m^2	153m^2 (1%)	A small strip of this field will be cleared for the construction of a new foul sewer to the existing pumping station on the site. However, there will be no new above-ground infrastructure here and the habitat will be reinstated post-construction.	Slight to imperceptible effect locally in the short term, no effect in the long term
Dry meadow (GS2)	Adjoining the Ballyadam Road to the west, in the eastern part of the study area	2,066m^2	93m^2 (5%)	The eastern boundary and edge of this field will be cleared during construction. The remaining 95% of the field will remain unaffected. The majority of the GS2 cleared will be re-instated post-construction, with only minor permanent loss due to the widening of the road corridor. A new boundary will also be established.	Slight effect locally in the short term, imperceptible in the long term

5.3. Hedgerows, Treelines, Woodland and Scrub

As per semi-natural grasslands in Section 5.2, given the nature of the proposed development and the sensitivities of these habitat types, the assessment of the impact of the proposed development on hedgerows, treelines, woodland and scrub focussed on direct habitat loss and fragmentation.

Total length of hedgerows and treelines in the study area is c. 10,110m, of which c. 5,143m (51%) is within the planning boundary of the proposed development. However, as shown in the design drawings submitted with the Part VIII application, the majority of these hedgerows and treelines are not within the permanent footprint of the proposed development or will be protected during construction and retained long-term. The most significant lengths of hedgerow/treeline loss are incurred along Wyse's Road, Station Road and Leamlara Road. The extent of loss has been minimised by widening each of these roads on side only, preserving the hedgerows/treelines on the other side of the road. In total, it will be necessary to remove c. 1,960m of hedgerows/treelines to construct the infrastructure. This will be mitigated by the replacement of this with a minimum of 1,960m of new hedgerows/ treelines aligned to the new infrastructure as well as new areas of planting at various locations of 'passive green space' throughout the UEA.

Areas of woodland/scrub loss are as follows: -

- Immature woodland along the western side of Wyse's Road will be preserved during construction and thereafter, with the exception of the loss of a small corner at the northern end which is required for junction improvements.

- Bramble-dominated scrub in field margins along the eastern side of Wyse's Road will be lost, approximately half of which will ultimately be replaced by passive green space.

- A very minor incursion will be made into the stand of willow north of the railway line in the western part of the study area to facilitate the provision of a foul sewer connection for potential future development in this area.

- South of the railway line and north of Castle Lake, a narrow strip of scrub present in a mosaic with dry calcareous/neutral grassland will be cleared to facilitate the laying of a new foul sewer. This area will be reinstated post-construction, with no above-ground infrastructure.

- Scrub in the vicinity of a disused building at the junction of Station Road and Leamlara Road will be cleared to facilitate the moving of this junction further north and provision of a new surface water detention pond on the side of the existing approach to Station Road from the Leamlara Road. Passive green space in this area will include tree and shrub planting connecting with the treeline along the southern side of Leamlara Road, existing scrub and the new pond.

- In Poulaniska, areas of scrub (some of which is maturing to woodland) and mature stands of willow are almost entirely within the planning boundary, but <50% is within the footprint of the proposed infrastructure. The construction footprint will be minimised to preserve as much of these as possible. The remaining area is proposed as passive green space, where planting can extend and enhance these habitats.

There is a total of approximately. 5.5ha of passive green space, located in different areas of the UEA, included in the proposals. This space has been designated as passive to enhance local biodiversity value as appropriate for each area. This will be done through the retention and integration of existing trees and hedgerows, landscaping through the planting of native trees and other suitable plant species and the planting of pollinator-friendly species. Planting in each area will be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist so that it is most appropriate for the characteristics of that area and to retain connectivity to the wider green infrastructure network.

Evaluation: Moderate to significant effects locally in the medium term, reducing to imperceptible in the long term through the implementation of a Landscape Plan.

5.4. Watercourses and Wetlands

5.4.1. 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 noted in Section 3.3, interceptor drains will be installed prior to the earthworks commencing in order to prevent overland flows interacting with earthworks. These will drain either directly to ground or to existing ditches/streams via the new detention ponds. A construction compound(s) will also be established within the red line boundary and will not be located in close proximity to any drains or surface water features through which sediment or pollutants such as hydrocarbons could be discharged. The development lands and construction activities will be managed following routine practices and procedures for the control of pollution from construction sites, including the relevant, well-established guidelines from CIRIA and TII, as listed in the outline Construction Environmental Management Plan (oCEMP) included with the application. These include controls on the phasing of works, waste management, location of site compounds, and surface water management.

The measures in the oCEMP are routine practices and procedures for the management of environmental impacts from construction and are based on the following guidance:

- 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.
- IFI (2016) *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters.* Inland Fisheries Ireland, Dublin.
- 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.

Given the overall works sequence and methodology, as well as the soil, surface water, groundwater and waste management procedures included through the oCEMP, the magnitude of any negative water quality impacts from the construction of the proposed development will be low and their duration brief or temporary. The probability of any significant pollution event occurring is very low. Therefore, no specific mitigation beyond what is included in the oCEMP is required.

Evaluation: Brief or temporary slight to imperceptible effects at the local level.

5.4.2. Water Quality - Operational Phase

Potential water quality impacts from the operation of the proposed development relate to run-off from the new and upgraded roads, footpaths and cycleways. The impermeability of these surfaces can result in increased run-off rates. Run-off from roads can be contaminated by hydrocarbons such as fuels, oils, greases, coolants and anti-freeze from vehicles and micro-plastics such as tyre dust, as well as general litter and fine sediments. Increased run-off rates and contaminants from roads (as well as footpaths and cycleways) can negatively impact on water quality and hydrological regime in receiving waterbodies.

As described in more detail in Section 3.3, the road drainage system for the proposed development comprises a six separate networks of gullies, pipes and manholes which will collect surface water run-off

from the roads and convey it to attenuation and treatment systems. For most networks, attenuation of flows is provided by detention ponds, which also provide settlement and treatment to remove contaminants prior to discharge to existing drainage ditches/streams or existing surface water sewers. These ponds have been designed following a Nature-based Solutions (NbS) approach, consistent with the Sustainable Drainage Systems (SuDS) principles which guided the overall design of the proposed development. Due to spatial and other constraints, two of the drainage networks have attenuation tanks with hydrocarbon interceptors in place of detention ponds. Attenuation and treatment of run-off from the footpaths and cycleways will be provided by SuDS/NbS features in the verges.

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 design of the proposed drainage systems, there will be no negative impact on surface waters due to the quantity or quality of run-off from the new roads, footpaths or cycleways. With regard to existing roads and other artificial surfaces to be upgraded as part of the proposed development, the design of the proposed drainage systems will result in an improvement in the quantity and quality of run-off from these areas, as there is currently no attenuation or treatment of same.

While a foul sewer network forms part of the design, no wastewater flows will be generated from the proposed development itself. Therefore, there will be no impact from wastewater. The potential for in-combination effects from wastewater is assessed in Section 7.

Evaluation: Slight to imperceptible permanent positive effects at the local level.

5.4.3. Streams and Drainage Ditches

In accordance with Cork County Development Plan 2022-2028 Objective WM 11-11: River Channel Protection, the alignment of the proposed roads and other infrastructure has minimised the number of watercourse crossings and permanent diversions required.

As described in Section 1.3, crossings of smaller drainage ditches will be pipe culverts up to a diameter of 900mm. Crossings of larger drainage ditches and small streams will be box culverts up to a maximum width of 1500mm. The positions and dimensions of all culverts will meet the requirements of *Guidelines for the Crossing of Watercourses during the construction of National Road Schemes* (NRA, 2008b) and *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016). The Woodstock Stream will be crossed by a small bridge with abutments set back from the stream banks.

All culverts, headwalls and bridge beams/decks will be brought to site as pre-cast concrete, avoiding the risks to water quality arising from the pouring of wet concrete on site.

Given the alignment of the proposed development and the design and works methods for watercourse crossings, there will be no significant reduction in the total length or the quality of linear freshwater habitats in the UEA or downstream. As such, no specific mitigation is required.

Evaluation: Slight effect at the local level in the short term, reducing to imperceptible in the long term.

5.4.4. Wetland Areas

Areas of standing water in depressions within grassland habitats along the railway line support freshwater flora and fauna, including Common Frog (*Rana temporaria*). Within the proposed development boundary, these areas are proposed as 'passive green space' and so form part of the green-blue infrastructure and can be retained during the construction and operation of the proposed development. However, the already approved Carrigtwohill to Midleton Inter-urban Cycle Route passes through the area and may result in a partial loss of these habitats prior to construction of the proposed development.

The detention ponds and other SuDS features which form part of the proposed development will represent a significant increase in the quantity and quality of standing water habitats within the UEA. Through the addition of ponds and diversification of smaller/more ephemeral areas standing waters, the quality of existing habitats will improve for those species already present and opportunities will exist for a greater number of species associated with such habitats to colonise these features.

The exact nature and magnitude of these positive impacts will depend on the final landscape specification to be developed during detailed design.

Evaluation: Short-term slight to moderate negative effect within the proposed development footprint during construction, moderate to significant positive effect locally in the medium to long term.

5.5. Fauna

5.5.1. Birds

Wintering Birds

Impacts on the wintering bird populations and assemblages in the Zone of Influence are assessed in detail in the AA Screening Report which accompanies the application.

Breeding Birds

Impacts on the habitats for these species are assessed under KERs 'Hedgerows, Treelines, Woodland and Scrub' in Section 5.3 and also 'Artificial Structures' in Section 5.6.

5.5.2. Protected Mammals

Bats

Impacts on habitats of importance for bats are assessed under KERs 'Hedgerows, Treelines, Woodland and Scrub' in Section 5.3 and 'Artificial Structures' in Section 5.6.

Otter

Impacts on the habitats with some potential to support otter are assessed under KER 'Watercourses and Wetlands' in Section 5.4 above.

Badger and Other Mammals

Impacts on the habitats of potential importance for badgers and other mammals are assessed under KER 'Hedgerows, Treelines, Woodland and Scrub' in Section 5.3 above.

5.5.3. Other Fauna

Impacts on habitats with potential to support threatened or protected invertebrates or communities are assessed under KERs 'Semi-natural Grasslands', 'Hedgerows, Treelines, Woodland and Scrub' and 'Watercourses and Wetlands' in Sections 5.2, 5.3 and 5.4.

Impacts on habitats for aquatic fauna, including Common Frog, are assessed under KER 'Watercourses and Wetlands' in Section 5.4 above.

5.6. Artificial Structures

Greenleaf Ecology (2020b) identified 9 No. structures to be assessed for their potential to support roosting bats, 6 No. of which were of Moderate or High suitability (Greenleaf Ecology, 2020b). In order to facilitate the construction of the proposed development, 3 No. buildings are required to be demolished. These include: -

- An abandoned house adjoining Wyse's Road, in the western part of the study area, identified as "Structure 1" and High suitability in Greenleaf Ecology (2020b);
- Disused commercial buildings at the junction of Station Road and Leamlara Road, in the central part of the study area, identified as "Structure 3" and Moderate suitability in Greenleaf Ecology (2020b); and,
- An agricultural shed/barn, on the proposed Eastern Services Corridor Link Road, not evaluated in Greenleaf Ecology (2020b) but assessed by Atkins ecologists as having Negligible suitability for roosting bats due to its metal construction.

No evidence of bats was found at any of these structures during daytime surveys and no bats were observed emerging from any of these structures during the dusk emergence surveys. Furthermore, bat activity was low along Wyse's Road during the activity survey (Greenleaf Ecology, 2020b). Bat activity was high near Structure 3 and a roost was confirmed at the nearby Parochial House during the emergence survey (Greenleaf Ecology, 2020b). The Parochial House will not be impacted by the proposed development.

While Structure 1 and Structure 3 did not support a bat roost during the surveys (Greenleaf Ecology, 2020b), their High and Moderate suitability, respectively, remains of note in terms of the loss of potential roosting habitat following their demolition. The other 4 No. structures with Moderate or High suitability will not be impacted.

Evaluation: Moderate long-term effect at the local level, imperceptible at higher geographical levels.

While birds such as Barn Swallow and House Martin are likely to nest in the 3 No. buildings to be demolished, the loss of these buildings does not represent the same impact for these species as it does for bats, due to the different requirements of nesting birds compared to roosting bats. There is an abundance of buildings and other structures in the local area which meet the requirements of these and other birds and, as such, the demolition of the 3 No. buildings in question is not a significant impact.

Evaluation: Slight to imperceptible effect at the local level.

5.7. Invasive Alien Species

Given the nature and extent of the proposed development, activities associated with its construction pose a risk of importing IAPS to the site, spreading IAPS already present locally, or exporting IAPS from the site. Species of particular concern include Himalayan Balsam, Japanese Knotweed, Cherry Laurel and Three-cornered Leek.

All of these species can have negative impacts on native habitats and species, most notably through competition and displacement, as well as by altering the physical and chemical properties of the soil. As such, these species can significantly alter the character of the habitats and ecosystems which they invade.

In addition, some of these species are subject to legal restrictions under Irish and European regulations, making it an offence to cause their spread. Therefore, the potential of construction works to cause or facilitate the spread these species represents a significant project risk.

Evaluation: Moderate to significant long-term effect at the local level.

6. Mitigation & Enhancement

6.1. Design Phase

As the design process so far has been informed by *C753 - The SuDS Manual* (CIRIA, 2015) and the relevant policies and objectives of the Cork County Development Plan 2022-2028, as detailed in Section 1.2.2, so the detailed design of the proposed development will also be guided by the principles and standards set out in these documents.

The development of the detailed landscape plan and specification by the Landscape Architect will maximise the biodiversity value of the final design. In particular, the landscape plan/specification will maximise the quantity, quality and connectivity of replacement hedgerow/treeline and scrub/woodland planting (to deliver a net gain on the lengths/areas of those habitats lost during construction) as well as all realigned watercourses and new ponds (including their banks and adjoining terrestrial habitats).

To that end, the development of the landscape plan/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.

The detailed design of watercourse crossings and other structures will have regard to the following: -

- 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.
- OPW (2021) *Design Guidance for Fish Passage on Small Barriers.* Office of Public Works with support from Inland Fisheries Ireland and the Department of Housing, Local Government and Heritage.

IFI will also be consulted with regard to the detailed design of watercourse crossings, especially proposed bridge crossing of the Woodstock stream.

To compensate for the loss of the 2 No. structures to be demolished to facilitate the proposed development, new pedestrian/cycling bridges and watercourse crossings, where appropriate, will incorporate artificial roost features for bats and nesting features for birds. Such features may also be incorporated into the existing underpass which the proposed Northern Services Link Corridor will utilise. The types, numbers and positions of roost/nest features will be determined during the detailed design process, on the advice of a suitably qualified ecologist.

In total, it will be necessary to remove c. 1,960m of hedgerows/ treelines to construct the infrastructure. This will be mitigated by the replacement of this with a minimum of 1,960m of new hedgerows/ treelines aligned to the new infrastructure as well as new areas of planting at various locations of ‘passive green space’ throughout the UEA.

There is a total of c. 5.5ha of passive green space, located in different areas of the UEA, included in the proposals. This space has been designated as passive to enhance local biodiversity value as appropriate for each area. This will be done through the retention and integration of existing trees and hedgerows, landscaping through the planting of native trees and other suitable plant species and the planting of pollinator-friendly species. Planting in each area will be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist so that it is most appropriate for the characteristics of that area and to retain connectivity to the wider green infrastructure network.

Surface water detention ponds, stream overflow channels and low-lying areas will encourage biodiversity through the creation of new aquatic and wetland habitats. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas. Planting in these areas will also be specified by a Landscape Architect under the advice of a suitably qualified and experienced ecologist. These areas will also have amenity value and provide surface water pollution prevention measures which will also be located in these areas.

No works are proposed to the south of the existing Leamlara Road boundary, i.e. the Woodstock Stream side of the road. No works on the south side of this road will extend into the roadside verge, treeline or hedgerow and the existing buffer between the road and the stream will be maintained. Natural buffer areas on existing watercourses outside of the infrastructure area will be maintained and protected during the construction of the proposed infrastructure. Where proposed drains cross below watercourses/ ditches the methods used to install them will allow for maintaining existing buffer areas where possible. An ecological buffer area between the Eastern Services Corridor Link Road and the Poulaniska Stream has been maintained in the design where the road runs parallel to the stream.

Any development on adjacent lands in the future will need to recognise the importance of green infrastructure and particularly the ecological corridor along the road and connectivity to the wider green infrastructure network. Through the planning process and development management adjacent developments will be required by the Local Authority to contribute to this on their lands to be permitted to develop and connect to the road.

6.2. Construction Phase

6.2.1. Water Quality

As noted in Section 5.4.1, the routine practices and procedures which have already been incorporated into the construction methodology for the proposed development through the oCEMP are sufficient to prevent significant water quality impacts from the works. As such, further measures are proposed here.

6.2.2. Terrestrial Habitats

The extent of vegetation clearance will be limited to the area required to facilitate the construction. All vegetation, including hedgerows, treelines, scrub, woodland and grasslands, not required to be cleared will be fenced off as part of site preparations and protected for the duration of the construction stage.

Where possible, topsoil from areas of grassland habitats required for construction shall be stockpiled and re-used on site as part of the landscaping. The locations, heights etc. of stockpiles for grassland 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.

6.2.3. Nesting Birds

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 1st day of March and ending on the 31st 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, the appointed Contractor will strive to avoid cutting/felling trees or clearing vegetation during this period.

Where tree felling or vegetation clearance is necessary between 1st March and 31st 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. Invasive Alien Plant Species

As detailed in Section 5.7 above, in the absence of appropriate controls, IAPS pose a risk of moderate to significant 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, particularly the Knockaunglass stream,
- 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.

6.2.5. Protected Mammals (including Bats)

Based on the baseline data currently available, there are no bat roosts or other breeding or resting places of protected mammals within or adjacent to the proposed development and, therefore, no requirement for any licences under Section 23 of the Wildlife Act, in the case of protected species such as Badger, or Regulation 54 of the Habitats Regulations, in the case of strictly protected species such as Otter and bats.

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

- Identification of any breeding or resting places of protected non-volant mammals, e.g., Otter and Badger; and,

- Inspections for roosting bats at structures to be demolished, as well as 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.

The results of the pre-construction survey for protected mammals 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 (2008a) *Guidelines for the Treatment of Otters 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.

6.3. Operational Phase

The implementation of the landscape plan and specification will continue into the operational phase. This will include the establishment and ongoing management of the new planting, which 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.

In addition, the proposed development and adjoining areas will be monitored for regrowth of IAPS over 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.

6.4. Residual Effects

Given the full and proper implementation of the mitigation and enhancement measures detailed in this section, the residual effects of the proposed development on the KERs are evaluated as follows:

- Cork Harbour:
    - Effects on habitats via water quality impacts: Short-term slight to imperceptible effects on the quality of mudflats and saltmarshes at the local level, not significant in the context of the Cork Harbour internationally designated sites.
    - Effects on bird populations via water quality impacts: Short-term imperceptible effect on the estuarine feeding resource for waterbirds at the local level, not significant in the context of the Cork Harbour internationally designated sites.
    - Effects on bird populations via ex-situ impacts: Permanent slight to moderate effect on the availability of field foraging habitat for waterbirds at the local level, not significant in the context of the Cork Harbour internationally designated sites.
- Semi-natural Grasslands: Slight to imperceptible effects at the local level in the short term, imperceptible in the long term.
- Hedgerows, Treelines, Woodland and Scrub: Moderate to significant effects locally in the medium term, reducing to imperceptible in the long term through the implementation of a Landscape Plan.

- Watercourses and Wetlands:
    - Water quality - construction phase: Slight to imperceptible brief or temporary effects at the local level.
    - Water quality - operational phase: Slight to imperceptible permanent positive effects at the local level.
    - Streams and drainage ditches: Slight effect at the local level in the short term, reducing to imperceptible in the long term.
    - Wetland areas: Short-term slight to moderate negative effect within the proposed development footprint during construction, moderate to significant positive effect locally in the medium to long term.
- Fauna: As per other KERs under which the relevant species groups are assessed.
- Artificial Structures:
    - Bats: Slight to moderate short-term effect at the local level, imperceptible at higher geographical levels.
    - Birds: Slight to imperceptible effect at the local level.
- Invasive Alien Species: Low risk of moderate to significant long-term effects at the local level.

7. Potential In-combination Effects

7.1. Scope of Assessment

The objective of this section is to capture significant ecological effects potentially arising from the cumulation or other interaction of effects from multiple plans and projects. Consequently, it is not a pair-wise assessment, rather, it considers the totality of the effects arising from all plans and projects affecting the KERs of the proposed development. In identifying the plans and projects to be included in this assessment, it is important to define an appropriate geographical scope and timescale over which potential in-combination effects are to be considered and the sources of information to be consulted, as described below. It is also important to consider the nature of the interactions between effects, which may be additive, antagonistic, synergistic or complex.

7.1.1. Geographical Scope

The geographical scope of the in-combination assessment covered all areas which influence biodiversity within the Carrigtwohill UEA and URDF Infrastructure Project boundary, which was taken to be the ZoI of the proposed development itself, plus transitional and coastal waterbodies of Cork Harbour and the adjoining lands (including lands adjoining the River Lee in Cork City and the River Owenacurra in Midleton.

7.1.2. Timescale

Given the nature and scale of the proposed development, as well as its integration with other future developments as part of the Carrigtwohill UEA and the development of the wider Carrigtwohill/South-East Cork area, the was considered appropriate to include all existing plans, projects and ongoing activities, projects under construction, approved or awaiting planning decisions, activities awaiting licensing, and any additional future plans or projects for which there is sufficient information available at this stage to allow for meaningful consideration of the potential in-combination effects. This includes particularly other projects relating to the Carrigtwohill UEA.

7.1.3. Sources of Information

The following sources of information were consulted to gather information on other plans and projects: -

- *Cork County Development Plan 2022-2028*.
- *Cork City Development Plan 2022-2028*.
- *Cork County Council Planning Viewer* <https://corkcoco.maps.arcgis.com/apps/webappviewer/index.html?id=03a3b83db76c46fd9b66178f8d407e0d> [accessed 09/03/2023];
- *Cork City Council Planning Viewer* <https://corkcity.maps.arcgis.com/apps/webappviewer/index.html?id=e4af482c8da547de9f1689eba346a1ed> [accessed 09/03/2023];
- *EIA Portal* <https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1> [accessed 09/03/2023];
- *EPA Maps* <https://gis.epa.ie/EPAMaps> [accessed 09/03/2023]; and,
- *Ireland's Marine Atlas* <https://atlas.marine.ie/> [accessed 09/03/2023].

Plans and projects in the following categories were considered to be particularly relevant to this assessment: -

- Plans and projects contributing to the known threats, pressures and activities with negative effects on the Great Island Channel SAC and Cork Harbour SPA, as described in the Site Synopses

(NPWS, 2013, 2015) and catalogued in the Natura 2000 Standard Data Forms (NPWS, 2019d, 2021),

- Other plans and projects whose construction or operation negatively affect water quality in Cork Harbour, particularly the Great Island Channel and the Slatty Water,

- Other plans and projects causing habitat loss/fragmentation (including outside the Cork Harbour SPA) for waterbirds, particularly in Carrigtwohill and the surrounding agricultural areas, and

- Carrigtwohill UEA projects and other projects connecting to the wastewater infrastructure which forms part of the proposed development.

7.2. Assessment

Plans

The current Cork City Development Plan and Cork County Development Plan set out the policies and objectives of Cork City Council and Cork County Council, respectively, with regard to the proper planning and sustainable development within their respective functional areas. Both plans cover the period from 2022 to 2028.

Both the Cork City Development Plan and the Cork County Development Plan were subject to SEA which assessed, at a strategic level, the implications of the plans for biodiversity. The adopted plans contain specific text in relation to the protection of biodiversity, including the use of SuDS, and commitments to develop blue-green infrastructure to support biodiversity, in line with Article 10 of the Habitats Directive and Article 3 of the Birds Directive.

The policies and objectives in these local authority development plans contribute to mitigating the negative effects of development on the KERs of the proposed development. Therefore, there will be no significant negative effects from the proposed works in combination with these development plans and these plans will also mitigate any in-combination effects arising from other projects.

Projects

A number of key infrastructure projects are currently being implemented in Carrigtwohill as follows:

Carrigtwohill URDF Initiative – Public Realm Infrastructure Bundle (Adjacent but separate project already approved under Part 8)

Cork County Council approved Part 8 planning for the Carrigtwohill URDF Initiative – Public Realm Infrastructure Bundle on 27th June 2022. That project included:

- Carrigtwohill Main Street and Station Road public realm works enhancement (Figure 7-1) including new link roads, road junction upgrades, footpath widening, provision of off-road cycling facilities, road re-alignment, resurfacing, signalisation, traffic calming measures, street lighting, demolition of buildings at the junction of Main Street and Station Road along with other small-scale demolition works and provision of new public spaces.

- Upgrade of junctions on Wises Road.

- Additional interim capacity upgrade measures at N25 Junction 3 (Cobh Cross) including widening and realignment of approach roads to the roundabout.

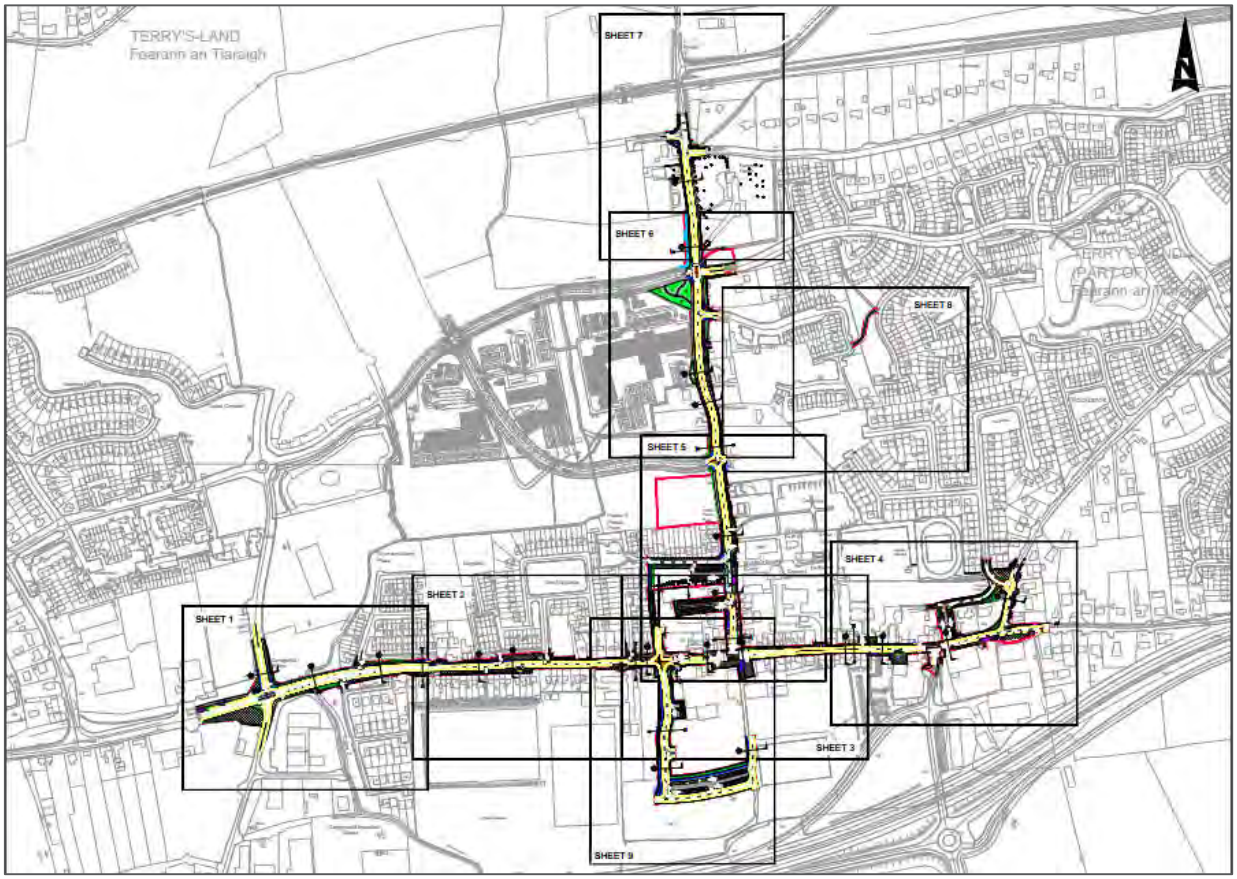

Figure 7-1 - Main Street and Station Road Public Realm Works.

The proposed Carrigtwohill UEA Infrastructure is compatible with that of the public realm infrastructure bundle. Together both projects will:

- Support regeneration, compact growth, and sustainable development in Carrigtwohill and its urban expansion area.
- Provide better quality streetscapes and public spaces to unlock the potential of Carrigtwohill.
- Improve connectivity between Carrigtwohill Town Centre and residential developments (existing and future), employment centres, Carrigtwohill train station, schools, business parks, commercial premises etc.
- Encourage sustainable modes of transport by reducing car dominance and providing safe pedestrian and cyclist facilities.

Station Road Schools Campus (Adjacent but separate project)

Cork County Council granted planning permission to the Department of Education (Planning reference: 19/5707) for a new school's campus on Station Road. This campus includes two new link roads connecting Station Road and Castlelake which have been completed, and comprises two primary schools and one post-primary school which are currently under construction. An extract of the site layout plan from the planning application is shown in Figure 7-2 below.

Figure 7-2 - Proposed Schools Campus Layout Plan (Planning Reference: 19/5707).

Midleton to Dunkettle Inter-urban Cycle Route (Adjacent but separate project)

The Midleton to Dunkettle Inter-urban Cycle Route (IU-1) is proposed in the Cork Metropolitan Area Transport Strategy 2040. This cycle route 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 Midleton to Dunkettle route will form part of the Cork to Waterford Inter-urban Demonstrator which is included in the Department of Transport Pathfinder Programme.

Sections of this route which are adjacent to the Carrigtwohill UEA Infrastructure project are described below.

Bury's Bridge Cycleway

Cork County Council granted Part 8 planning permission for a strategic cycleway scheme connecting Bury's Bridge at Dunkettle outside Cork City with Carrigtwohill. This scheme, part of which has now been constructed, provides approximately 7.7 kilometres of pedestrian and cycle path segregated from vehicular traffic. The indicative route of the cycleway, as extracted from the Preliminary Design Report included with the planning submission, is shown in Figure 7-3 below. The cycleway enters the east side of Carrigtwohill to the north of Cobh Cross (N25 Junction 3). It runs parallel to Carrigtwohill Main Street before turning north and running along the Castlelake Access Road. It then joins the link roads associated with the new schools' campus as described above.

Figure 7-3 - Bury's Bridge Cycleway (extract from Preliminary Design Report by Aecom, 2020).

Carrigtwohill to Midleton Inter-urban Cycle Route Phase 1

Phase 1 of the Carrigtwohill to Midleton Inter-urban Cycle Route received Part 8 Planning Approval from Cork County Council in 2022. This section of the route (Figure 7-4) runs west to east to the north of Carrigtwohill, primarily through the Carrigtwohill UEA, connecting the IDA Business Park in the west with lands zoned for Industry to the south of Carrigane Road in the east. It will provide a sustainable transport link between Carrigtwohill UEA lands and existing and future employment centres, Carrigtwohill Train Station, the new school's campus on Station Road and all existing and planned residential developments south of the railway line.

Note that whilst this section of this route has been shown on the Part 8 layout plans for the Carrigtwohill UEA Infrastructure to assist with the overall understanding, it already has Part 8 planning approval.

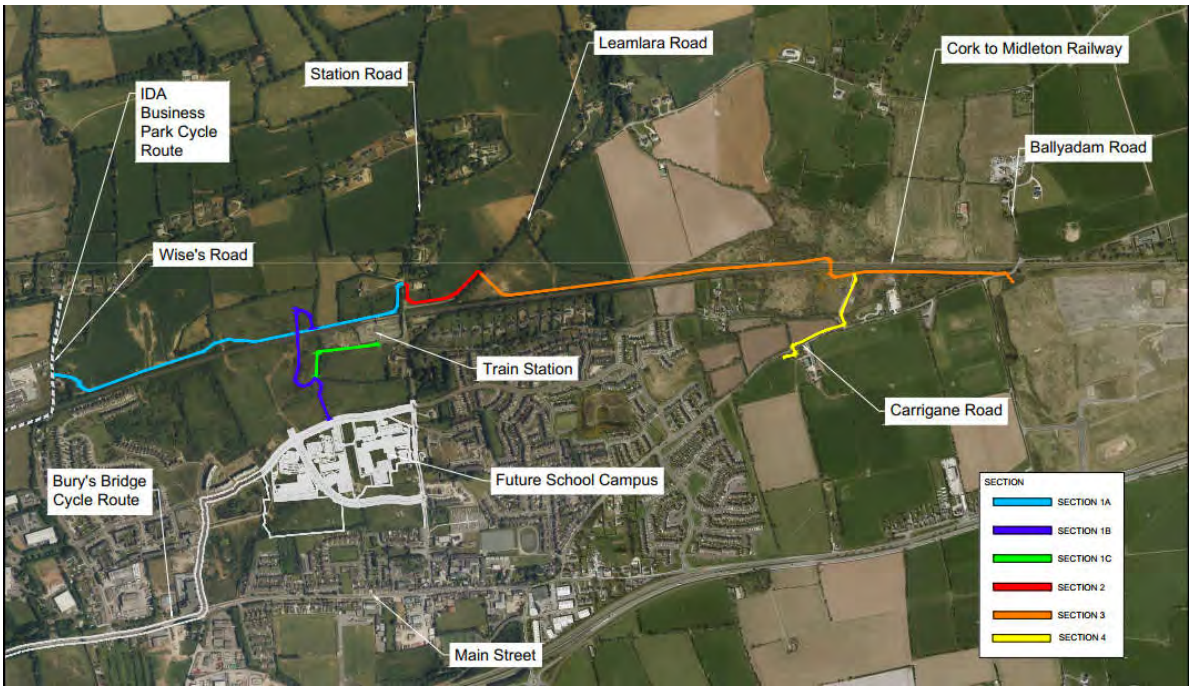

Figure 7-4 - Carrigtwohill to Midleton Inter-urban Cycle Route Phase 1.

Other Large-scale Projects

A search of the *EIA Portal*, focussing on areas in the Carrigtwohill UEA, Cork Harbour, and c. 1km buffer of these, identified 33 No. projects which required Environmental Impact Assessment (EIA). These included applications relating to quarries, new large-scale residential and mixed-use developments, railway improvement, electricity transmission, chemical and pharmaceutical industry, wastewater infrastructure, bridges and educational facilities. These projects are summarised in Table 7-1 below.

Table 7-1 - Projects identified through the *EIA Portal*.

Competent Authority	Application No.	Applicant Name	Location	Description
Cork County Council	17/5659	Janssen Sciences Ireland UC	Barnahely, Ringaskiddy, Co. Cork	An extension to the existing biomedicines manufacturing facility (proposed gross floor area c. 19,116m^2).
An Bord Pleanála	PL04.248154	GE Healthcare Life Sciences BioPark	Barnahely, Raheens East, Ringaskiddy, Co. Cork	BioPark and all ancillary site development works including landscaping.
Cork County Council	17/7428	John Garde	Courtstown Industrial Estate, Courtstown, Little Island, Co. Cork	Construct a building (6625m^2) containing a waste transfer and recycling facility. The proposed development also includes the construction of a separate two storey administration block (178m^2).
EPA	P0778-02	Janssen Sciences Ireland UC	Barnahely, Ringaskiddy, County Cork	5.16 The production of pharmaceutical products including intermediates.
Cork County Council	18/7200	Country Clean Recycling Unlimited Company	Courtstown Industrial Estate, Courtstown, Little Island, Co. Cork	Construct a building containing a waste transfer and recycling facility along with a separate Administration Block, ESB Sub-Station, weighbridges, underground tanks, service yard, new boundary treatments and all associated drainage and site works.
EPA	n/a	Indaver Ireland Limited	Ringaskiddy, County Cork (National Grid Ref. E179055, N064279)	Waste to Energy Facility (waste incinerator with energy recovery) for the treatment of residual household, commercial and industrial waste which includes up to 24,000 tonnes of suitable hazardous waste with an annual capacity of 240,000 tonnes per annum.
Cork City Council	n/a	Tower Development Properties Ltd	The Custom House site at North Custom House Quay and South Custom House Quay, Custom House Street, Cork City	Refurbishment of the existing buildings on site including the Custom House and Bonded Warehouses, construction of a 34-storey tower c. 140m over the Revenue Building, a distillery, remedial works to quay walls, and the provision of a new public realm.
An Bord Pleanála	n/a	Progressive Commercial Construction Ltd	Site of Carey Tool Hire and the former Sextant bar, Albert Quay, Cork City	A Strategic Housing Development of 201no. Build To Rent apartments in a building that ranges in height from 8 to 11 to 24 storeys over ground floor, ancillary resident & communal facilities; cafe; private rented office; public bar/restaurant; basement.
Cork County Council	19/6783	Belvelly Marino Development Company DAC	Belvelly Port Facility, Marino Point, townlands of Marino, Belvelly and Oldcourt, Cobh, Co. Cork	Demolition, site infrastructure improvements, and utility upgrade works to stabilise the existing site and to provide capacity for future industrial development proposals.
Cork County Council	19/6964	Architectural and Metal	Wallingstown, Little Island, Co. Cork, T45 VP40	Construction of a new single-storey extension for the surface treatment (anodising) of aluminium sections,

Competent Authority	Application No.	Applicant Name	Location	Description
		Systems Limited		underground services and associated site works.
Minister for Public Expenditure and Reform	DPE63-18-2018	Commissioners for Public Works	Blackpool, Cork	Flood Relief Scheme for Blackpool, Cork involving the construction of direct flood defences and conveyance improvement measures along a stretch of the River Bride and its tributaries in Blackpool, Cork.
Minister for Public Expenditure and Reform	DPE63-9-2018	Commissioners for Public Works	Glanmire/Sallybrook, Cork	Flood Relief Scheme for Glanmire/Sallybrook, Cork involving the construction of direct flood defences and conveyance improvement measures along the Glashaboy River and its tributaries.
Cork County Council	20/5627	Portfolio Concentrate Solutions UC ("PepsiCo Ireland")	Ballytrasna, Little Island, Co. Cork	Extension to the existing Production Building, expansion of the Site Utility Services and provision of a new Waste Water Treatment Plant.
An Bord Pleanála	n/a	Marina Quarter Limited	Former Ford Distribution Site, Centre Park Road, Cork	Permission for a Strategic Housing Development at the Former Ford Distribution Site, Centre Park Road, Cork, comprising demolition of existing structures and construction of a mixed-use development including apartments, commercial and community facilities.
Cork County Council	20/6955	Goulding Chemicals Limited and Belvelly Marino Development Company DAC	Belvelly Port Facility, in the townland of Marino, Marino Point, Cobh, Co. Cork	The construction of a new agricultural fertiliser facility for use by Goulding Chemicals Limited; and additional port operational use of the jetty to facilitate cargo vessels. An EIAR, and NIS will be submitted with the application.
Cork City Council	n/a	University College Cork & Tyndall National Institute	University College Cork, Distillery Fields, North Mall, Cork, T23 XA50	Construction of a new purpose-built research facility comprising of approximately 16,325m^2 (GIA) rising from 4 storeys at the east to 7 storeys at the west accommodating mix of research laboratories, seminar rooms, offices, exhibition space and café.
Cork County Council	21/5132	Pfizer Ireland Pharmaceuticals	Townlands of Ballintaggart and Ballybricken, Ringaskiddy, County Cork, P43 X336	The construction of a new five-storey clinical manufacturing building, associated buildings, utilities, piperack, and associated site development works.
Cork City Council	n/a	Progressive Commercial Construction Ltd	Carey Tool Hire site, Albert Quay, Cork City, bounded by Albert Quay East to the north, Albert Street to the west, Albert Road to the south, and Navigation Square to the east	Office building 5-12-14-16 storeys over ground floor, external terraces at Levels 2, 6, 13, & 15; two levels of basement for parking; café/deli & restaurant with outdoor seating; refurbishment 2no. Protected Structures; Demolition of Carey Tool Hire.
An Bord Pleanála	ABP-310798-21	EirGrid plc	County Cork, between the existing Knockraha substation in the townland of Ballynanelagh in County Cork and Claycastle Beach in Youghal in the	That portion of the Celtic Interconnector project to be constructed onshore in Ireland, to the Mean High Water Mark (HWM), including an electricity converter station in the townland of Ballyadam east of Carrigtwohill in County Cork.

Competent Authority	Application No.	Applicant Name	Location	Description
			townland of Summerfield in Co. Cork	
Cork County Council	21/5965	Kilsaran Concrete Unlimited Company	Barryscourt and Rossmore townlands, Carrigtwohill, Co. Cork	The development will comprise continuance of use of the existing quarry development within an overall application area of c. 24.ha; extraction to the permitted level of 40m below Ordnance Datum, within the area permitted under P. Ref. 03/4570.
Cork County Council	21/6983	Lagan Materials Ltd	Rossmore Townland, Carrigtwohill, Co. Cork	Permission sought for deepening the existing quarry from -20mOD to -50mOD within the existing permitted quarry footprint (P. Ref. S/02/5476; ABP Ref. PL04.203762; & ABP Ref. PL04.QD.0010) within an application area of 12ha.
Cork County Council	21/7265	Dawn Meats Ireland and EMR Projects Ltd	Lands at Water Rock, Midleton, Co. Cork	Two separate residential developments on adjoining sites at Water Rock, Midleton. EMR development will consist of 284no. residential units and associated buildings. Dawn Meats development will consist of 434no. residential units and associated buildings.
Cork City Council	n/a	Leeside Quays Limited	Kennedy Quay, Marina Walk, Victoria Road and Mill Road, South Docklands, Cork City	3.1426ha at Kennedy Quay & Marina Walk, South Docks, Cork City. Mixed Use: residential, office, entertainment, food & beverage, cinema, retail and public open space including Odlums Building (RPS ref. PS856) and rehabilitation hospital, all over double basement.
EPA	n/a	Irish Water	Cork Lower Harbour Ringaskiddy, Shanbally, Co. Cork	The provision of wastewater collection systems and treatment facilities in the Cork Lower Harbour area, with the wastewater treatment plant treating waste from Carrigaline, Crosshaven, Shanbally, Coolmore, Ringaskiddy, Passage West, Glenbrook, Monkstown & Cobh.
An Bord Pleanála	ABP-313216-22	Estuary View Enterprises 2020 Limited	Bessborough, Ballinure, Blackrock, Cork	Facilities, café, crèche, and all ancillary site development works.
An Bord Pleanála	ABP-313206-22	Estuary View Enterprises 2020 Limited	Bessborough, Ballinure, Blackrock, Cork	Demolition of 10no. existing agricultural buildings/sheds and log cabin residential structure and the construction of a residential development of 140no. apartment units, resident amenity facilities, crèche, and all ancillary site development works.
An Bord Pleanála	ABP-313277-22	Tiznow Property Company Limited (Comer Group Ireland)	Former Tedcastles Yard, Centre Park Road and the Marina, Cork	The demolition of existing structures and the construction of a strategic housing development of 823no. apartments in 6no. buildings ranging in height from part-1 to part-35no. storeys over lower ground floor level.
Cork County Council	n/a	Merck Millipore Ltd	Tullagreen, Carrigtwohill, Co. Cork, T45KD29	The demolition of an existing switch room and an existing drum store and the construction of a new 3-storey manufacturing building, a two storey Utilities Building, a single drum store, expansion to WWTP and Tank Farm with all associated site works.

Competent Authority	Application No.	Applicant Name	Location	Description
An Bord Pleanála	ABP-313720-22	Reside Investments Limited	Kilmoney Road, Carrigaline, Co. Cork	Consists of Strategic Housing Development providing 224no. residential units, a creche/childcare facility and 3no. retail units and all associated works.
An Bord Pleanála	ABP-313919-22	Hibernia Star Limited	Jacobs Island, Ballinure, Mahon, Cork	The development will consist of the construction of 489no. apartments, creche and offices in 5 no. buildings ranging in height from part-1 to part-8 no. storeys over lower ground and semi-basement podium levels.
An Bord Pleanála	BP-315087-22	Córas Iompair Éireann (CIÉ)	Traverses through the townlands of Anngrove; Ballyadam, Ballyrichard More; Broomfield East; Broomfield West; Carrigane; Carrigtwohill; Harpers Island; Johnstown; Killacloyne; Killahora, Co. Cork	Twin tracking of the existing single-track sections of railway between Glounthaune and Midleton, Co. Cork.
Cork City Council	22/41675	University College Cork & Tyndall National Institute	Lee Maltings, Dyke Parade, Cork, T12 PX46 to North Mall, Cork, T23 XA50	Construction of a circa 65m long × 3.5-4.5m wide tri-span bridge on two structural piers connecting the existing Tyndall National Institute campus on the south to Tyndall National Institute's New Facility on the North (subject to OPW Section 50 approval).

Owing to their proximity to the proposed Carrigtwohill URDF Infrastructure Project and its ZoI, as well as their nature and scale, the following projects were deemed to be the most relevant in terms of the potential for negative effects in combination with the proposed development:

- EirGrid Celtic Interconnector, including electricity converter station in Ballyadam, east of Carrigtwohill,
- Dawn Meats and EMR Projects residential developments at Water Rock, Midleton,
- Merck Millipore new buildings and expansion to WwTP in Tullagreen, Carrigtwohill, and
- CIÉ twin tracking of the existing single-track sections of railway between Glounthaune and Midleton.

In the context of the existing land use and habitats within the footprint of and adjoining these projects and the sensitivities of the receiving natural environment, and given the nature and scale of these projects, it is considered that they do not have any potential to give rise to adverse effects on any of the KERs in combination with the proposed development.

Furthermore, Uisce Éireann's planned upgrades to the wastewater networks and treatment plants discharging to Cork Harbour and connected waterbodies (as discussed in more detail below), ensure that adequate treatment is provided for wastewater from these and other projects before discharge to receiving waterbodies, thereby preventing negative effects on water quality in Cork Harbour.

Small-scale Projects

Searches of the *Cork County Council Planning Viewer* and *Cork City Council Planning Viewer* found that, since 1st January 2017, there have been c. 10,000 No. planning applications to these two local authorities for projects within the geographical scope of this in-combination assessment and connected waterbodies.

The nature and scale of these projects vary considerably, but they are generally of less concern in terms of their potential environmental effects than those identified through the *EIA Portal* (though there is some overlap). They include a large number of domestic projects such as retention of existing dwelling houses and associated structures, or modifications to same, or the construction of new domestic dwellings or extensions to dwellings, including new connections to the public wastewater network, or associated septic tanks or other on-site treatment.

Regarding potential impacts to water quality, such projects must comply with the EPA's *Code of Practice for Wastewater Treatment Systems for Single Houses* (EPA, 2009, 2018). Furthermore, Uisce Éireann's planned upgrades to the wastewater networks and treatment plants discharging to Cork Harbour and connected waterbodies (as discussed in more detail below), ensure that adequate treatment is provided for wastewater from such projects (where they are within urban wastewater agglomerations) prior to discharge to the receiving waterbodies, thereby preventing negative effects on water quality in Cork Harbour. Therefore, such projects are not likely to have any significant effects on the KERs in combination with the proposed Carrigtwohill URDF Infrastructure Project.

Licensed Activities

A review of licensed activities through *EPA Maps* found that there are 46 No. activities licences by the EPA in the vicinity of the Great Island Channel SAC and Cork Harbour SPA and connected waterbodies. These included the following: -

- 8 No. Integrated Pollution Control (IPC) licences for: -

Licence No.	Licensee	Location
P0028-01	Mr Brian Moran, Mr Tom Coughlan and Mr Hugh O'Regan	Marino Point, Cobh, Cork
P0218-01	Dulux Paints Ireland Ltd	Shandon Works, Commons Road, Cork
P0246-01	Georgia Holdings Ltd trading as Youghal Carpet Yarns	Killacloyne, Carrigtwohill, Cork
P0251-01	Rothbury Manufacturing Ltd	Sunbeam Industrial Park, Millfield, Blackpool, Cork
P0273-01	Cork Fabrication Services Ltd	Rushbrooke Commercial Park, Rushbrooke, Cork
P0343-01	Brooks Haughton Ltd	Pouladuff Industrial Estate, Togher, Cork
P0389-01	Goldenville Ltd	Wallingstown, Little Island, Cork
P0445-01	Heineken Ireland Ltd	Lady's Well Brewery, Cork

- 33 No. Industrial Emissions (IE) licences for: -

Licence No.	Licensee	Location
P0004-06	Thermo Fisher Scientific Cork Ltd	Currabinny, Carrigaline, Cork
P0006-04	Novartis Ringaskiddy Ltd	Ringaskiddy, Cork
P0010-05	Hovione Ltd	Loughbeg, Ringaskiddy, Cork
P0013-05	Pfizer Ireland Pharmaceuticals (Ringaskiddy)	PO Box 140, Ballintaggart, Ringaskiddy, Cork, P43 X336
P0016-02	Janssen Pharmaceutical Sciences UC	Wallingstown, Little Island, Cork
P0017-02	Cara Partners	Little Island Industrial Estate, Cork

P0034-03	Marinochem Ltd	Marino Point, Cobh, Cork
P0052-02	BASF Ireland Ltd	Inchera and Wallingstown, Little Island, Cork
P0091-03	Wexport Ltd	Wallingstown, Little Island, Cork, T45 RP82
P0136-04	Upjohn Manufacturing Ireland Unlimited Company	Wallingstown, Little Island, Cork, Cork
P0196-01	FLEXcon Company Incorporated	Carrigtwohill Industrial Estate, Tullagreen, Carrigtwohill, Cork
P0266-03	Irving Oil Whitegate Refinery Ltd	Whitegate, Midleton, Cork
P0316-01	Mr James O'Brien	Ballintubbrid East, Carrigtwohill, Cork
P0391-01	Galco (Cork) Ltd	Tramore Road, Cork
P0399-01	John A. Wood (Burnt Lime) Ltd	Carrigtwohill Quarry, Ballyvodock, Carrigtwohill, Cork
P0407-01	Irish Pioneer Works (Fabricators) Ltd	Kinsale Road, Cork, T12 K7XR
P0442-02	Irish Distillers Ltd	Midleton Distilleries, Midleton, Cork
P0476-02	Recordati Ireland Ltd	Raheens East, Ringaskiddy, Cork
P0561-05	Electricity Supply Board (Aghada)	Aghada Generating Station, Whitegate, Midleton, Cork
P0571-04	Merck Millipore Ltd	Tullagreen, Carrigtwohill, Cork, T45 KD29
P0578-03	Electricity Supply Board (Marina)	Marina Generating Station, Centre Park Road, Cork
P0778-02	Janssen Sciences Ireland UC	Barnahely, Ringaskiddy, Cork, P43 FA46
P0830-02	Bord Gais Energy Ltd	Whitegate Power Station, Whitegate (Corkbeg and Glanagow townlands), Cork
P0864-01	BioMarin International Ltd	Ballintaggart, Shanbally, Ringaskidddy, Cork
P0997-01	The Hammond Lane Metal Company Ltd	Ringaskiddy, Cork
P1018-01	Little Island BioEnergy Ltd	Inchera, Little Island, Cork
P1046-01	Fournier Laboratories Ireland Ltd trading as AbbVie	IDA Industrial Estate, Anngrove, Carrigtwohill, Cork
P1114-01	Indaver Ireland Ltd	Ringaskiddy Resource Recovery Centre, Ringaskiddy, Co. Cork
P1117-01	Architectural & Metal Systems Ltd	Wallingstown, Little Island, Cork, T45VP40
W0012-03	Kinsale Road Landfill	Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork
W0145-02	Enva Ireland Ltd (Cork)	Unit 9, Raffeen Industrial Estate, Raffeen, Monkstown, Cork
W0186-01	Indaver Ireland	Ringaskiddy, Cork
W0291-02	Forge Hill Recycling Unlimited Company	Forge Hill Waste Transfer Station, Forge Hill, Cork, T12 AK44

- 5 No. Waste licences for: -

Licence No.	Licensee	Location
W0022-01	East Cork Landfill Site	Rossmore, Carrigtwohill, Cork
W0023-01	Raffeen Landfill Site	Raffeen, Kerrycurrihy, Cork
W0132-01	Lotamore	Glanmire, Cork
W0171-01	Materials Recovery & Transfer Facility	Forge Hill, Kinsale Road, Ballycurreen, Cork

W0289-01	The East Tip	Haulbowline Island, Cork

Some of the above licences are currently pending approval, while others may no longer be in use. Based on the nature and scale of these activities, a risk of significant in-combination effects biodiversity in the ZoI via water quality impacts must be considered. However, given the conditions attached to the IPC and IE licences and enforcement of the same by the EPA, and the very low risk of any significant water quality impacts in Cork Harbour from the proposed Carrigtwohill IRDF Infrastructure Project, there is not likely to be any significant effects in combination with from these activities the proposed development.

Wastewater Treatment Plants and Networks

Upper Cork Harbour

The proposed Carrigtwohill URDF Infrastructure Project includes new wastewater infrastructure to accommodate future development within the Carrigtwohill UEA. This new infrastructure will feed into the existing Carrigtwohill Wastewater Treatment Plant (WwTP), which discharges treated effluent to the Lough Mahon (Harper's Island) transitional waterbody, within the Great Island Channel SAC and a short distance upstream of the Cork Harbour SPA. The Carrigtwohill WwTP can provide tertiary treatment (including nitrogen and phosphorus removal) for a population equivalent (p.e.) of up to 30,000. The current load is 10,010 p.e. (as of 2021) and the WwTP passed its Water Framework Directive (WFD) compliance test in 2021. This leaves adequate capacity for future from the developments envisaged as part of the UEA. Furthermore, Uisce Éireann will progress any WwTP and network upgrades as required and in advance of treatment headroom being exhausted.

The Midleton WwTP can provide tertiary treatment (including nitrogen removal) for 15,000 p.e. but is currently overloaded, with an agglomeration p.e. of 16,376 (as of 2021). Nevertheless, it passed its WFD compliance test in 2021. This plant discharges to the Owenacurra Estuary transitional waterbody, which is connected to the North Channel Great Island transitional waterbody. In addition, on 13th February 2023, Cork County Council granted planning permission for the Midleton North Wastewater Pumping Station and Network (Planning Ref. 22/05032), which will provide for the diversion of loads of c. 4,100 p.e. from the Midleton wastewater network to Carrigtwohill, which, as demonstrated above, currently has treatment headroom of almost 20,000 p.e. This will bring the effective loading to the Midleton WwTP within its design capacity without significantly reducing the capacity of the Carrigtwohill WwTP to accommodate expected loading from future UEA development.

The Cork City WwTP provides tertiary phosphorus removal for 231,000 p.e., the plant capacity is 413,200 p.e. and it passed its WFD compliance test in 2021. This WwTP is located at Carrigrenan, Little Island and discharges to the Lough Mahon transitional waterbody, which overlaps with the Great Island Channel SAC and Cork Harbour SPA, and is connected to the Glashaboy Estuary and Lee (Cork) Estuary Lower. There is no existing or proposed connection between the Carrigtwohill and Cork City wastewater networks.

The current WFD ecological status or potential and risk of not achieving WFD objectives by 2027 for each of the transitional waterbodies to which the three WwTPs concerned discharge are provided in Table 7-2 below.

Table 7-2 - WFD Status and Risk for transitional waterbodies covering the Great Island Channel SAC and inner sectors of the Cork Harbour SPA and to which the Carrigtwohill, Midleton and Cork City WwTPs are connected.

Transitional Waterbody	WFD Status 2016-2021	Risk (re 2027)
Slatty Bridge, Fota Island	Unassigned	Review
Lough Mahon (Harper's Island)	Good	At risk
Lough Mahon	Moderate	At risk
Glashaboy Estuary	Bad	At risk
Lee (Cork) Estuary Lower	Moderate	At risk
Owenacurra Estuary	Moderate	At risk
North Channel Great Island	Moderate	At risk

Given the existing capacity at the Carrigtwohill WwTP and Uisce Éireann's planned WwTP and network upgrades, the proposed new wastewater infrastructure will not facilitate future loading to the Carrigtwohill WwTP, i.e. from envisaged UEA developments, including in combination with future loads diverted from the Midleton network, which could lead to overloading of the WwTP and consequent negative impacts on water quality in Cork Harbour. As such, significant effects on the KERs in combination with future UEA development can be ruled out.

Lower Cork Harbour

Large WwTPs in discharging to the Lower Harbour and connected waterbodies include Ringaskiddy, Cobh North and Cloyne. The Ringaskiddy WwTP at Shanbally provides secondary treatment for 45,602 p.e. from Ringaskiddy Village, Ringaskiddy-Crosshaven-Carrigaline, Passage-Monkstown and Cobh Town, the plant capacity is 65,000 p.e. but it failed its WFD compliance test in 2021 due to discharges of industrial effluent downstream of the WwTP. The Cobh North provides secondary treatment for 1,135 p.e. and the plant capacity is 2,000 p.e. The Cloyne WwTP provides secondary treatment for 1,400 p.e., the plant capacity is 2,040 p.e. but it passed its WFD compliance test in 2021.There is no treatment provided for wastewater from Whitegate-Aghada (2,328 p.e.). The WFD status of transitional and coastal waterbodies to which these networks discharge and are connected are all 'Moderate' and 'At risk'.

Overall, the discharge from these wastewater networks is not considered to be significantly affecting the KERs of the proposed development and, given the absence of effects from the proposed development individually or in combination with the Carrigtwohill, Midleton and Cork City WwTPs (and future UEA development), it can be concluded that there will be no such effects in combination with these other wastewater networks.

Aquaculture

EPA Maps shows 4 No. areas designated under the Shellfish Waters Directive (2006/113/EC), as transposed into Irish law by European Communities (Quality of Shellfish Waters) Regulations, 2006 (as amended), in Cork Harbour. The largest of these is "Cork Great Island North Channel", which occupies approximately the middle third of the Great Island Channel. In addition, the "Rostellan North", "Rostellan South" and "Rostellan West" shellfish areas are located in the Lower Harbour. Under the Shellfish Waters Directive, the quality of these waters must be protected from pollution and meet specific targets for physical, chemical and microbiological parameters in order to support bivalve and gastropod molluscs.

A review of *Ireland's Marine Atlas* found 3 No. licensed aquaculture sites in Cork Harbour. These include a small area to the west of Brick Island, where Fota Oyster Farm Ltd is licensed to produce Pacific Oyster and Brown Seaweeds, a larger area to the east of Brick Island, where Atlantic Shellfish Ltd is licensed to produce Pacific Oyster, and a large area covering the north-eastern part of the Lower Harbour, where Atlantic Shellfish Ltd is licensed to produce Blue Mussel.

In its AA of aquaculture activities in Cork Harbour (October 2022), the Department of Agriculture, Food and the Marine found that, given the types of aquaculture practised, as well as the scale and location of activities, such activities do not pose a threat to the Great Island Channel SAC or Cork Harbour SPA. On the basis of that assessment and given the nature, scale and location of the proposed Carrigtwohill URDF Infrastructure Project, no significant effects will arise from the proposed development in combination with aquaculture.

Other Activities

Farmers and landowners may also undertake general agricultural operations in areas adjacent to the proposed works and along watercourses, which could potentially give rise to impacts of a similar nature to those arising from the proposed development. This could potentially result in additional an increased risk to water quality. Many agricultural operations are periodic, not continuous in nature, and qualify as Activities Requiring Consent (ARCs) that require consultation with the NPWS in advance of the works, e.g. reclamation, infilling or land drainage within 30m of a river, removal of trees or any aquatic vegetation within 30m of a river, and harvesting or burning of reed or willow (NPWS, 2022a). Agricultural operations must comply with the European Communities (Environmental Impact Assessment) (Agriculture) Regulations, 2011 (as amended) in relation to: -

- Restructuring of rural land holdings,
- Commencing use of uncultivated land or semi-natural areas for intensive, and
- Land drainage works on lands used for agriculture.

The drainage or reclamation of wetlands is controlled under the Planning and Development (Amendment) (No. 2) Regulations, 2011 and the European Communities (Amendment to Planning and Development) Regulations, 2011. In light of the application of these regulations to agricultural operations in the vicinity of the proposed development, any in-combination effects from such operations and the proposed development are not likely to be significant.

7.3. Conclusion

As detailed in the preceding sections, it can be concluded that, based on the nature of the proposed development and its integration with other projects under the Carrigtwohill URDF Initiative, UEA Masterplan and Cork County Development Plan, it will not give rise to significant effects on biodiversity in the Zone of Influence, in combination with other plans or projects.

8. 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 8-1 - 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 URDF Infrastructure, 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 EcIA, 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 opportunities created during the planning phases will be capitalised upon 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 EcIA 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.

9. Conclusion

This EcIA has examined the biodiversity and baseline ecological conditions of the receiving environment within the site of the proposed Carrigtwohill URDF Infrastructure Project 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 URDF Infrastructure Project, provided that it is implemented in accordance with the measures proposed in this EcIA, 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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