



Castletreasure

CARR'S HILL, CO. CORK

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

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Environmental Impact Statement Report (EIAR) and Appendices

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Chapter 1

Introduction

1

Environmental Impact Assessment Report (EIAR)

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CHAPTER 1 - INTRODUCTION

1.1 Context

Cairn Homes, is applying for planning permission for residential development at Castletreasure, Carr's Hill, Co. Cork, on lands outlined in red in Figure 1.1.

The proposed site (circa. 22 ha) is located within the South Environs of Cork City, approximately 1.2km south of Douglas Village, off the R609/Carr's Hill Road, which connects the village to the N28 Carrigaline Road. It lies 3.5 km south east of Cork City. Douglas Golf Club and the Maryborough Woods housing development sit on the opposing hill to the north east. Ballybrack Woods extend along the western boundary between the site and the developed lands at Donnybrook Hill. Moneygurney Stream and Douglas Stream are on the eastern and western boundaries respectively.

The site is greenfield in character, partially overgrown to the north, particularly along the river corridors, while there are some open pastoral fields located in the southern portion of the site. The site bounds the Vicarage and Temple Grove Estates, with access currently provided to the lands through these existing residential areas but also proposed from the R609.

The proposed development will consist of the construction of 472 dwelling units (referred to as circa 475 units within the specialist discipline chapters), a crèche and all associated ancillary site development works. A detailed description of the development and construction processes, and copy of the site layout is provided in chapter 2 of the EIAR. The accompanying planning application drawings provide further details of the proposed development.

The EIAR study boundary areas incorporate the red-line development boundary of the site and immediate surrounding areas, as defined within each specialist discipline chapter.

The EIAR provides information on the significant effects of the proposed development on the environment, based on current knowledge and methods of assessment. The structure of the EIAR is detailed in section 1.6.



Figure 1.1: Aerial View of site of Proposed Residential Development, Castletreasure, Carr's Hill Co. Cork.

1.2 The Applicant

Cairn is an Irish homebuilder founded in 2014 with a clear strategy to deliver high quality new homes with an emphasis on design, innovation and customer service. Following a successful initial public offering (IPO) in June 2015 to raise funds to finance the development of new homes in Ireland, Cairn is actively engaged in the delivery of some 15,000 homes over the coming years. These homes are being delivered on a land bank across the country which is predominantly within the Greater Dublin Area, but also in Cork, Galway and Kilkenny. There is an adopted focus on design driven by creating sustainable communities and, with the average site delivering more than 400 new homes, Cairn has the capacity to deliver these new homes in the short-medium term.

An example of Cairn's ability to deliver new homes quickly, can be seen in Adamstown, west Dublin (Cairn's Shackleton & Gandon Park developments). Planning permission was granted in January 2017 for a first phase of 267 new homes. This phase will be complete in March 2019. Two further phases for approx. 500 new homes were granted permission in 2018 and will be complete by June 2020.

Cairn is led by a highly experienced management team with a proven track record in delivering high quality residential properties at scale in Ireland and the UK, supported by a high calibre and experienced wider team. Cairn is committed to working with national and local government, and other state bodies, to meet the changing housing needs of Ireland, and ensure the timely delivery of functioning, sustainable residential communities.

1.3 Need for the Scheme

Given the growth in demand for quality residential housing in recent years, as well as the population / household targets outlined in both the Cork County Development Plan 2014 (CDP) and Ballincollig Carrigaline Municipal District Local Area Plan (Ballincollig Carrigaline MD LAP) 2017, it is evident that there is a demand for additional residential accommodation throughout County Cork, and within Metropolitan Cork. Under the provisions of the Ballincollig Carrigaline MD LAP, the subject site is zoned for residential development under the SE-R-06 zoning objective. This objective seeks the provision of:

“Medium A density residential development to cater for a variety of house types and sizes.

3 ha of additional open space over and above what is normally required in housing areas. This open space should include a fully landscaped and useable public park.

Retain the existing trees and hedgerows within the overall development of the site.

A site for a primary school that could be accessed from the R609 and developed by the Department of Education in the short term.

The timing and provision of appropriate drinking water disposal services for the development including where necessary the upgrading of off-site infrastructure.

Provision of a cycleway.

Consideration will need to be given to the provision of a primary school within this site at the detailed planning application stage.”

The proposed development is in accordance with this zoning objective and national density guidelines, as detailed in the Statement of Consistency, which accompanies the planning application. The proposed development will provide 473 no. dwelling units to serve the planned growth of Cork City South Environs to 31,308 people by 2022. The Ballincollig

Carrigaline MD LAP has estimated a need for an additional 1,285 dwelling units to be provided up to 2023. The proposed development represents approximately 37% of the units identified by Cork County Council as needed in Cork City South Environs up to 2023.

The proposed development will make a significant contribution to addressing the current shortage of housing supply in Cork, including shortage of social housing. In line with the requirements of the Planning and Development Act 2000 (as amended), ten percent of the housing units will be transferred for social housing. This will provide for the transfer of 47 no. social housing units.

1.4 Purpose of the EIAR

Environmental Impact Assessment (EIA) is a procedure under the terms of European Directives for the assessment of the effects of development projects on the environment. An Environmental Impact Assessment Report (EIAR) is a statement prepared by the developer, providing information on the significant effects on the environment based on current knowledge and methods of assessment. It is carried out by competent experts, with appropriate expertise to provide informed assessment on their discipline.

The primary objective of the EIAR is to identify the baseline environmental context of the proposed development, predict potential beneficial and/or adverse effects of the development and propose appropriate mitigation measures where necessary.

In preparing the EIAR the following regulations and guidelines were considered:

- The requirements of EC Directives and Irish Regulations regarding Environmental Impact Assessment;
- Guidelines on the Information to be Contained in Environmental Impact Statements (Environmental Protection Agency 2002)
- Draft Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, August 2017).
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003);
- Draft Advice Notes for Preparing Environmental Impact Statements, (EPA September 2015)

In addition, specialist disciplines have had regard to other relevant guidelines, as noted in the specific chapters of the EIAR.

1.5 Requirement for an EIA

Schedule 5 of the Planning and Development Regulations 2001 (as amended) sets out a comprehensive list of project types and development thresholds that require a mandatory Environmental Impact Assessment. The proposed development falls within Part 2, Article 10 of the Regulations: Infrastructure Projects. Sub-sections (b)i and (b)iv apply in this instance and provide that a mandatory EIA is required for developments which provide for:

- (b) i Construction of more than 500 dwelling units;
- (b) iv Urban development which would involve an area greater than 2 hectares in the case of a business district, 10 hectares in the case of other parts of a built-up area, and 20 hectares elsewhere.

The proposed development is for 472 dwelling units, on a site area of c. 22 hectares. A mandatory EIA is therefore required under the provisions of Part 2, Article 10 (b) iv.

This EIAR has been prepared in compliance with the requirements of Directive EIA 2014/52/EU, which is transposed into the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001 (as amended).

1.6 Structure of the EIAR

This EIAR is prepared according to the 'Grouped Format Structure'. This means that each topic is considered as a separate section and is drafted by relevant specialists.

The project managers for the proposed development are Cairn Homes; project architects are Meitheal Design Partners; consultant engineers and traffic engineers are J B Barry and Partners Ltd. The planning consultants and project co-ordinators of the EIAR are McCutcheon Halley Chartered Planning Consultant.

The EIAR structure and consultant company responsible for each of the chapters is as follows:

Chapter	Prepared By
1. Introduction	McCutcheon Halley
2. Project Description	McCutcheon Halley / Meitheal Design Partners (MDP) and J B Barry and Partners Ltd
3. Alternatives Considered	Meitheal Design Partners and J B Barry and Partners Ltd
4. Landscape	Aecom
5. Material Assets	
5.1. Roads & Traffic	J B Barry and Partners Ltd
5.2. Services Infrastructure	J B Barry and Partners Ltd
6. Land & Soils	J B Barry and Partners Ltd
7. Water	J B Barry and Partners Ltd
8. Biodiversity	Kelleher Ecology Services
9. Noise & Vibration	AWN
10. Air Quality & Climate	AWN
11. Cultural Heritage	John Cronin & Associates
12. Population & Human Health	McCutcheon Halley
13. Significant, Interaction of & Cumulative Impacts	McCutcheon Halley
14. Summary of Mitigation Measures	McCutcheon Halley

Each chapter has been prepared by a consultant with competency for the relevant discipline. The qualifications of consultants responsible for each discipline is provided in the introduction to the relevant chapter. Production of the EIAR has been co-ordinated by Màiri Henderson BA (Hons) Housing; RTPI, MCIH, Associate Director with McCutcheon Halley.

1.7 Scoping of the EIAR

The EIAR was scoped following an appraisal of the EPA guidelines of information to be contained within the EIAR; through design team meetings with the specialist consultants; and through a pre-planning meeting with Cork County Council.

Projects considered for their potential cumulative impacts with the proposed development are identified in Chapter 2 (Project Description).

1.8 Consultation

The following relevant statutory agencies and stakeholder groups were formally consulted during the preparation of the EIAR:

1.8.1 Prescribed Bodies

Statutory consultees, as prescribed by the Planning and Development Act 2000 (as amended) and Planning and Development Regulations 2001 (as amended). Specifically, this includes the following:

- a. Department of Culture, Heritage & the Gaeltacht (Development Applications Unit)
 - i. National Monuments Services,
 - ii. National Parks & Wildlife Service;
- b. Department of Education;
- c. Transport Infrastructure Ireland;
- d. Inland Fisheries Ireland;
- e. The Health Service Executive;
- f. The Health Service Authority;
- g. Irish Water;
- h. Geological Survey Ireland;
- i. Bird Watch Ireland;
- j. Bat Conservation Ireland.

Responses were received from Transport Infrastructure Ireland (TII); Health Services Executive (HSE) and Inland Fisheries Ireland (IFI). The following is a summary of the comments received:

TII

TII's Response noted that:

- Consultation should be had with the relevant Local Authority / National Roads Design Office with regard to locations of existing and future national road schemes.
- The site was contiguous with lands the subject of the M28 scheme and should be design so as not to prejudice this scheme.
- The EIAR should demonstrate that development can proceed complementary to safeguarding the capacity, safety and operational efficiency of the N28, and the proposed M28, including at the R609 interchange junction. Analysis should include capacity analysis of the cumulative impact of the roads scheme during both construction and operational phases on the N28 mainline and its interchange.
- EIAR should include provision for travel planning / mobility management planning in the interest of protecting national roads capacity and in the interests of sustainable travel policy.

- Developer should assess visual impacts from existing national roads and future roads schemes.

TII also noted that the EIAR should have regard to TII guidance on assessments, design and construction and maintenance standards, and to guidelines for Treatment of Air Quality and Noise & Vibration.

HSE

- The HSE has no comments regarding the scoping stage of the report, but noted their intention to comment during the application stage on the following areas: Public Consultation; Human Beings; Traffic, Noise & Vibration; Water Quality; Dust; Waste Management and Pest Control.

IFI

- IFI responded that the proposed development should be designed and constructed in a manner that ensures there be no interference with, draining, or culverting of the onsite stream or watercourse, its banks or bankside vegetation to facilitate this development without the prior approval of IFI. The proposed bridge crossing should be of span design with no instream works. All site runoff must be controlled, so as solids or other contaminated materials do not discharge to the adjacent stream during construction phase. Prior to any site works, a fenced (with silt fencing) off buffer zone of 10m minimum from all watercourses should be established, inside of which no construction activity or storage of any soils or other construction materials can occur.

A copy of comments received from prescribed bodies is provided in Appendix A.1. Comments from each of the prescribed bodies were circulated to the EIAR design and have been taken into consideration in the drafting of relevant discipline chapters.

1.8.2 Public

The applicant has engaged with local stakeholders, including residents of adjacent properties (namely the detached dwellings along the laneway north of the Vicarage and the dwellings east of the proposed access onto the R609), representatives from the Vicarage, Temple Grove and Berkeley estates, and the owner of the Darraglynn Nursing Home to the north of the site. Among the issues discussed were

- Potential impact of traffic (including construction traffic);
- Loss of informal walking routes through site;
- Boundary treatments and security of existing properties;
- Visual impact;
- Construction related concerns, including noise and dust.

The applicant has also been in contact with representatives of the Douglas GAA Club, Douglas Rugby Club, the Educate Together Primary School and local Councillors to identify local needs including playing pitches and training facilities. In acknowledgement of feedback from this consultation, land has been identified for a grassed kick about area close to the greenway, that could cater for the local need and be used by the local school and/or sporting organisations. It has been suggested that the school could partner with a local sporting organization to support and manage these grounds for the greater good of all the local community and adjoining area. Cairn support this arrangement in principle.

The Landscape Design Statement and associated drawings, which accompany the planning application, provide details of the recreational and active play areas within the proposed layout.



Chapter 2

Project Description

2

Environmental Impact Assessment Report (EIAR)

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CHAPTER 02 PROJECT DESCRIPTION

2.1 Introduction

Cairn Homes intend to develop a scheme of 472 residential units and a creche at Castletreasure / Maryborough (townlands), Carr's Hill, Douglas, Co. Cork, as indicated in Figure 2.1 (site layout) and drawings which accompany the planning application.

This chapter provides a description of the proposed development and construction activities and details of the Outline Construction Management Plan (CMP); Waste Management Strategy and the Outline Construction Traffic Management Plan (CTMP), proposed to mitigate impacts of the construction process.

This chapter has been prepared by the project architects, Meitheal (Gerry O'Sullivan, RIAI Arch. Tech, Dip. Arch. Tech); project engineers, J B Barry (John Fallon, BSc(Hons) Geology, MSc Civil / Environmental Engineering) and planning consultants, McCutcheon Halley (Orla O'Sullivan, BSc Hons. Architectural Technology; MPlan Planning & Sustainable Development)

2.2 Proposed Development

2.2.1 Existing Site

The proposed development site is located within the South Environs of Cork City, approximately 1.2km south of Douglas Village, off the Carr's Hill Road, which connects the village to the N28 Carrigaline road. It lies 3.5km southeast of Cork City. Douglas Golf Club and the Maryborough Woods housing development site are located on the opposing hill to the north east.

Ballybrack Woods extend along the western boundary between the site and the developed lands at Donnybrook Hill.

The site is partially in agricultural use, to the south & west, the lands to the north & north east of the site are overgrown along the stream and along the boundary to the R609 Carrigaline Road / Carr's Hill. Lands to the south of the subject site are also in agricultural use.

Access to the site is primarily from the R609 Carrigaline Road / Carr's Hill and the proposed junction and access road will be consistent with that proposed as part of the proposed primary school (Cork County Council plan file 18/5369, currently under appeal).

The site is particularly challenging in terms of topography, and is quite elevated, particularly to the south. The gradient of the land falls steadily from the southern boundary (+82.5m) to the edge of the watercourses located along the western boundary or the Douglas Stream (+43.0m to +35.0m) and through the east of the site where the Moneygurney Stream runs through the site (+48.0m north-east corner to +28.0m at the north-west corner).

The parcel of the site from the Moneygurney Stream to the R609 Carrigaline Road / Carr's Hill forms a steady gradient from +48.0m (stream) to +68.0m (road) at the north-east corner and from +28.0m (stream) to +51.0m (road) at the north-west corner. This parcel of land, including the school site, forms a valley into the site and has a dense cover of trees and shrubs lining the site from the edge of the stream right up to the road boundary.

The site is zoned primarily for residential development, under the Zoning Objective SE-R-06, in the Ballincollig Carrigaline Municipal District Local Area Plan, with part of the site also located within the Existing Built-Up Area which falls into the Zoning Objective ZU 3-1. The SE-R-06 objective requires:

"A Medium A density residential development, 3 Ha of additional open space over & above what is normally required in housing developments, the inclusion of a fully landscaped & useable public park, along with the retention of the existing trees and hedgerows within the overall site".

A primary school site is also required, this is being delivered by the Department of Education & Skills under a separate permitted planning application 18/5369, currently under appeal to An Bord Pleanála.

2.2.2 Development Description

The proposed development includes the construction of a strategic housing development comprising 472 residential units, a creche and all associated ancillary development works at Castletreasure / Maryborough (townlands), Carr's Hill, Douglas, Co. Cork.

The proposed 472 no. residential units are broken down as follows:

- 234 no. semi-detached and terraced houses consisting 67 no. 4 bed units and 167 no. 3 bed units,

- 93 no. duplexes / apartments and 145 no. apartments (in Blocks A, B, C & D) comprising 76 no. 1 bed units, 123 no. 2 bed units and 39 no. 3 bed units.

The breakdown of the schedule of units is provided in Appendix 2.1.

The development also includes several play areas, amenity spaces and circa. 4.4 ha (c. 20% of the site area) of landscaped parkland which runs northwest to southeast through the site. A section of the Ballybrack Greenway is also provided within the parkland which will connect to the existing Cork County Council cycle network at the site's western boundary via the existing Irish Water Pumping Station compound, and to the future expansion of the Greenway towards Maryborough at the site's eastern boundary.

Primary access to the proposed development will be from a new signalised junction on to the R609/Carr's Hill Road, which will also serve a 24 classroom Primary School (permitted under Cork County Council planning application ref. 18/5369, currently subject to third party appeal with An Bord Pleanála, ref. ABP-302924-18) which is located on land within the ownership of the applicant. Upgrades are also proposed to the Carr's Hill/Carrigaline Road (R609) including road widening, traffic calming and footpath connections. A second access point and footpath connections will be provided onto the Carr's Hill/Carrigaline Road (R609) (serving 98 apartments in Blocks B, C & D only) and access will also be provided via the adjoining Temple Grove residential area.

Provision is also made for the diversion of the existing 300mm Irish Water watermain, the construction of an underground wastewater pumping station and rising main to serve Apartment Blocks B, C and D, and all other associated ancillary site development works including ground works and retaining structures, foul drainage, stormwater drainage, water supply, a number of electrical substation kiosks, service ducting and cabling, boundary treatments, access roads including a vehicular and pedestrian bridge over the Moneygurney Stream, gateway treatment/signage on the Carr's Hill/Carrigaline Road (R609), car parking and landscaping. A temporary single storey marketing suite, adjoining the Carr's Hill/Carrigaline Road (R609), and signage (including hoarding) will be provided during the construction phases.

Details of the landscape strategy are provided in the Landscape Strategy Report, prepared by Aecom, and accompanying landscape drawings (reference nos. 60577778-SHT-20-0000-L-1000 to 1003). The Landscape Strategy Report also provides details of the vegetation and tree removal required as part of the proposed development. The public lighting design details are provided in the accompanying lighting design report by O'Connor Sutton Cronin and associated drawings (reference nos. KE-CRC-01 to 03).

A vehicular & pedestrian access bridge is also proposed to provide a crossing over the 30m wide Irish Water (IW) wayleave, which crosses the site along the route of the greenway. A separate pedestrian bridge is proposed, to the eastern edge of the greenway, providing a pedestrian access route from the greenway to the Carr's Hill Apartments. This route provides a full circular connection for pedestrians through the entire site from The Vicarage and Templegrove estates, through the proposed scheme, onto the greenway and back onto the R609 Carrigaline Road / Carr's Hill.



Figure 2.1 – Site layout

The 30m IW wayleave is being retained, and Cork County Council are preparing a Part 8 planning application for the extension of the existing greenway along the subject site, to include the 30m wayleave area, a second 10m IW wayleave also crosses the site, but this watermain is being diverted as part of the proposal and a new 10m wayleave will be reinstated for IW.

The proposed density for the scheme is c. 35.5 units per hectare, falling within the density guidelines for the Medium A zoning requirement. The overall site is c. 22.0 ha, however, large areas of the site are undevelopable due to the many site constraints such as site gradients, greenway route, tree protection area, streams & riparian zones, IW wayleave etc leaving 13.29 ha of developable area.

The layout of the scheme has been carefully considered with these constraints in mind. The design team have endeavoured to produce a residential development consistent with national planning guidelines, the Cork County Development Plan 2014 and the Ballincollig-Carrigaline Municipal District Local Area Plan 2017 (BC_LAP 2017). The development reflects the pattern and grain of the existing adjoining residential developments, while also respecting the amenities of these areas, and having regard to the existing trees and hedgerows. Pedestrian connectivity is provided through the site and through the extension of the Ballybrack greenway, facilitating walking and cycling for end users, giving a development that is sustainable socially & environmentally. The development also provides social infrastructure of a crèche, bus stop, greenway and recreational amenities, while a primary school is being proposed on adjacent lands under the ownership of the applicant.

2.2.3 Cumulative Projects

The assessment of impacts has considered the following projects for their potential cumulative effects:

Table 2.1: Cumulative Projects

Reference	Proposal	Status
Ha 0053	M28	Approved by ABP. Judicial Review of decision underway. Hearing due to be held on 26 th February 2019.
Part 8 pending	Ballybrack Greenway Extension	Detailed design being progressed by Cork County Council
18/5369	24 class-room Primary School	Approved by Cork County Council in October 2018. Appealed, with decision due 19th March 2019.
18/5814	Lidl Discount shop and 5 apartments. c. 1.8 km north on the R609.	Approved by Cork County Council, September 2018.
18/6245	48 residential units at Clarendon Brook. c. 0.8 m north on the R609.	Approved 19 December 2018. First party appeal – due for decision by ABP on 29 May 2019.
18/6246	600 pupil secondary school. c. 1.5 km north on the R609.	Live planning application. Further information requested in October 2018.
16/07271	200 residential units at Maryborough. c. 0.5m to the south east, separated by the N28.	Approved November 2017.

2.3 Construction Activities & Phasing

An indicative construction sequence is outlined below to show the buildability of the project. The actual construction sequence will be confirmed when any conditions of planning are received, and construction appointments confirmed. The main stages of construction will proceed in a general sequence as follows:

- Enabling Works including set-up of site construction facilities, service diversion works and construction access points.
- Site clearance will include cut and fill of existing ground profiles on a phased basis and formation of key site features such as the proposed entrance from Carr's Hill, the primary access bridge over the Moneygurney stream and the proposed entrance from The Vicarage.
- Construction of retaining wall structures to facilitate road construction and development of individual housing areas (in phases).
- Construction of drainage, water supply and utility service distribution network within the site, including diversion of the existing 300mm watermain through the site.
- Construction of buildings (Housing, Apartments, Creche) in defined phases.
- Construction of pedestrian bridge over the Moneygurney stream.
- Landscaping, on a phased basis.
- Building fit-out and commissioning on a phased basis.

The development will be constructed in 4 phases, over c. 4 years as set out in Table 2.2 and Figure 2.2 (accompanying planning application drawing 18203-JBB-1B-XX-DR-C-0115). Phases 1 to 4, inclusive, consist of a total of 472 dwelling units. It is estimated that Phase 1 preliminary works (site set up, establishment of compound) will commence in the 4th quarter of 2019 and Phase 4 will be complete and operational by the 4th quarter of 2024. For the purposes of impact assessment 2024 is assumed to be the 'opening year' (i.e. Phases 1 to 4 inclusive).

The specific machinery that will be used on the site to construct the development is likely to include excavators, dumper trucks, mobile cranes, teleporters and lorries together with small plant. Given the topography of the site there is a requirement for bulk excavation of notable volumes of material (soil and rock) to achieve required road and access routes and development areas, at the levels outlined in Table 2.3. There is also a requirement for an amount of local cut and fill to take place in excavations for foundations, utility ductwork and sewer pipes.

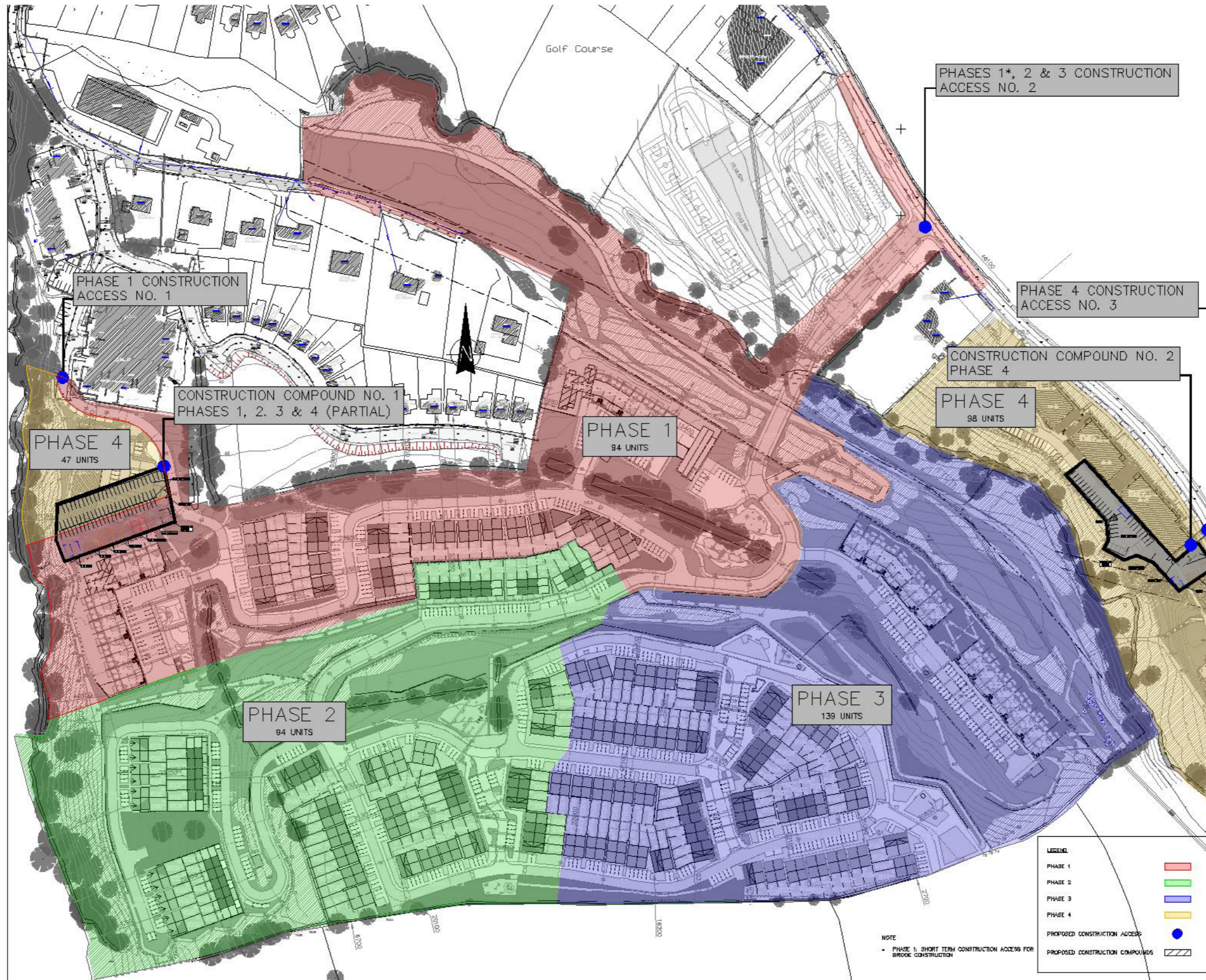


Figure 2.2: Phasing Plan, Construction Access and Construction Compounds

Table 2.2 - Phasing Construction Summary

	Phase 1	Phase 2	Phase 3	Phase 4
Description	94 units, Creche and Bridge	94 Units	139 Units	98 Apartment Units (East) 47 Apartment Units (West)
Detail	<p>Construction of compound, storage area together with offices and associated welfare facilities, cut & fill of land being developed including the removal off site of excess spoil and the storage on site of excess general fill material acceptable for re-use.</p> <p>Construction of houses including roads and services together with all construction works to facilitate the development.</p> <p>Construction of retaining structures to facilitate roads and development areas.</p> <p>Construction of bridge over Moneygurney Stream and Irish Water Infrastructure diversions (specifically diversion of the existing 300mm watermain).</p>	<p>Construction of houses including all roads and services associated with the development of this phase together with the cut & fill of land being developed, the removal off site of excess spoil & including the removal off site of excess general fill material acceptable for re-use from <u>Phase 1 (approx. 70%) and Phase 2.</u></p> <p>Construction of retaining structures.</p>	<p>Construction of houses including all roads and services associated with the development of the phase together with the cut & fill of land being developed & including the removal off site of excess general fill material acceptable for re-use from <u>Phase 1 (approx. 30%) and Phase 3.</u></p> <p>Construction of retaining structures.</p>	<p>Construction of apartments including all roads, services and pedestrian bridge associated with the development of the phase together with the cut & fill of land being developed & including the removal off site of excess spoil and the removal off site of excess general fill material acceptable for re-use.</p>
Estimated Timeline	12 months	12 months	12 months	12 months
Average Construction Workers	80	80	80	60
Peak Construction Workers	100	100	100	80
Average Daily Construction Vehicles (HGV / Vans / Workers)	63 2 HGV 12 Vans 48 Cars	63 13 HGV's 12 Vans 48 Cars	63 6 HGV's 12 Vans 62 Cars	49 2 HGV's 12 Vans 48 Cars
Peak Daily Construction Vehicles (HGV / Vans / Workers)	77 2 HGV's 15 Vans 60 Cars	91 16 HGV's 15 Vans 60 Cars	83 8 HGV's 15 Vans 60 Cars	62 2 HGV's 12 Vans 48 Cars

Estimates of the proposed bulk cut & fill are provided in table 2.3. Material generated on site as a direct consequence of the works undertaken on the site are classified as either acceptable or unacceptable for re-use based on the TII Specification for Road Works Series 600 dated June 2013.

Excavation volumes per Phase are detailed in Table 2.3. There is a requirement to import Engineering Fill material for road construction, reinforced earth bridge construction and backfill to retaining walls also detailed in Table 2.3. Given the topography of the site there is an overall surplus of material which will be required to be exported from the proposed development as detailed in Table 2.3. Phase 1 Export Cut acceptable material surplus to requirement (29,731m³) will be stockpiled on site as detailed in blue in Figure 2.3 (accompanying planning application drawing ref: 18203-JBB-1B-XX -DR-C-0117) until such a time that the Moneygurney Bridge is opened (End of Phase 1 / Start Phase 2) to facilitate transport via the bridge directly to the R609 Carrigaline Road.

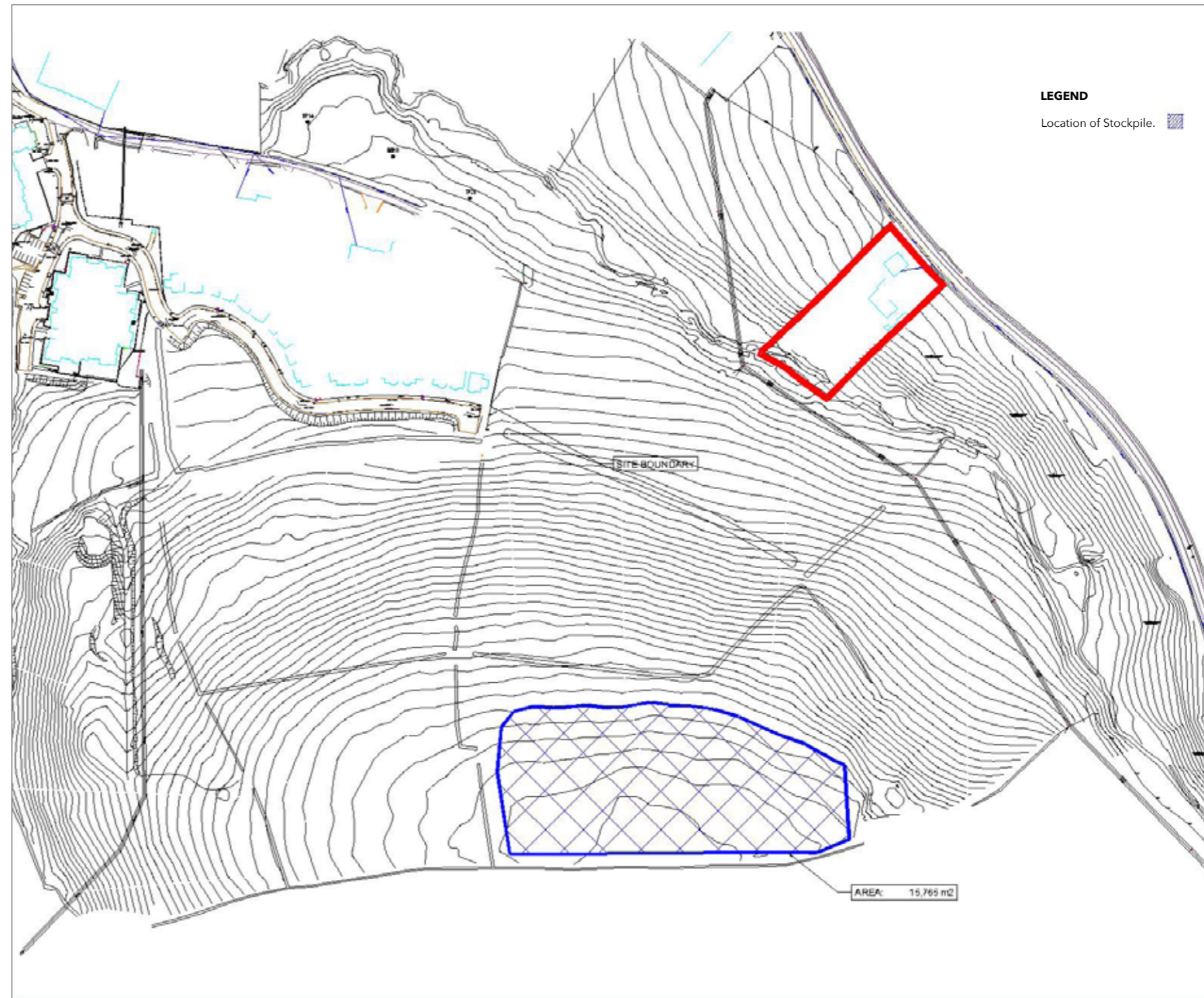


Figure 2.3: Phase 1 Soil Stockpile Area

Table 2.3: Earthworks Cut / Fill Balance

	Phase 1	Phase 2	Phase 3	Phase 4
Bulk FILL (m³) (2+4)	16,027	2,827	8,781	8,910
Bulk CUT (m³) (1+2+3)	46,289	43,423	33,230	11,301
1. <u>Export</u> : Material for Disposal (unacceptable + Topsoil) (m³)	6,879	6,349	6,594	6,320
2. Acceptable Site Won Material Fill Material to be re-used on Site	9,679	0	3,819	6,056
3. <u>Export</u> : Cut acceptable material surplus to requirement	29,731	37,074	22,816	-1,075*
4. <u>Import</u> : Annex E - Engineering Fill material requirement	6,348	2,827	4,962	2,854
*Phase 4 General Fill deficit will be sourced from Phase 3 Surplus.				

The associated traffic impacts associated with the movement of materials (export and import as detailed in Table 2.3) is assessed in Chapter 5B - Traffic and Transport.

2.3.1 Hours of Working

The working hours as stated in the planning permission for the development will be observed.

Core working hours proposed are as below:

07:00 – 18:00 Monday – Friday

08:00 – 14:00 Saturdays

No work permitted on Sundays or bank holidays.

However, it may be necessary to work outside of these hours at night and at weekends during certain activities and stages of the development (e.g. bridge construction, watermain diversion) which will be subject to agreement with the Local Authority and Irish Water.

Deliveries of materials to site will be planned to avoid high volume periods where possible, particularly the am peak hour. There may be occasions, however, when it is necessary to have deliveries within these periods. The Contractor will develop, agree and submit a detailed Traffic Management Plan to the Local Authority for approval prior to commencement of construction works.

Any variations or changes to the working hours will be included in the site-specific developed Construction Stage H&S Plan which will be prepared before the Phase 1 works commences.

2.3.2 Potential Construction Impacts

When considering a development of this nature, the potential sediment runoff, dust, noise & traffic impacts on the surroundings must be considered for the construction phase. The construction phase will involve the preparation of the site, excavation, stockpiling and removal or reuse of on-site material, diversion of Irish Water infrastructure, construction of retaining walls, construction of site roads and the proposed bridge over the Moneygurney Stream and building of the proposed residential units.

With the construction activity there will be an increased number of vehicular movements in the locality, including construction and worker vehicles. The construction at the site will also have the potential of causing surface water runoff and raising dust into the air and depositing or spilling material on adjoining roads during the construction works. Noise will also be emitted from the construction site during the course of the works. The flow of vehicular traffic to and from a construction site is also a potential source of elevated noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces.

Weathered bedrock will generally be encountered in the excavation of underground parking for the apartment blocks to the east of the Moneygurney Stream (Phase 4) and at localised areas of deep excavations for retaining structures throughout the site. The Ground Investigation undertaken indicates that the upper horizons of this type of stratified bedrock, which is extensively encountered in the Cork area, are very to slightly weathered and very fractured, and are easily diggable and/or rippable by heavy construction machinery. For the purpose of this assessment it is deemed that the volume of rock to be removed will be localised, and rippable by an excavator with rock breaking not likely to be required.

The above items detail the potential impacts that may be experienced from the general construction activities of a development of this nature. The proposed Construction Management Plan details measures to avoid, reduce or mitigate these potential impacts.

2.3.3 Construction Entrances and Compound(s).

The construction entrances will be formed immediately on commencement of the works on the site.

The initial construction entrance will be located to the south of the Templegrove Apartments (Site Access No1. as detailed in Figure 2.4, accompanying planning application drawing ref. 18203-JBB-1B-XX-DR-C-0115). It is proposed that the main compound is developed in the vicinity of this entrance as detailed in Figure 2.4.

The initial works will be to construct the site compound, access road and car park area inside this entrance.

During the construction phase it will be necessary to provide contractor welfare facilities for the workers. A site office, staff welfare facilities and parking will be installed at this main compound. All surplus plant and materials shall be stored in this location when not in use. Welfare facilities will include a canteen, drying room, toilets and first aid.

Temporary portable toilet facilities will be provided on site until connections to existing Irish Water services can be made. These units will be maintained, and the waste collected therein will be disposed of using an appropriately licensed contractor.

Storage areas will be clearly identified and agreed with all relevant parties in advance of construction.

The site will be secured with hoarding on all open sides and accessible approaches.

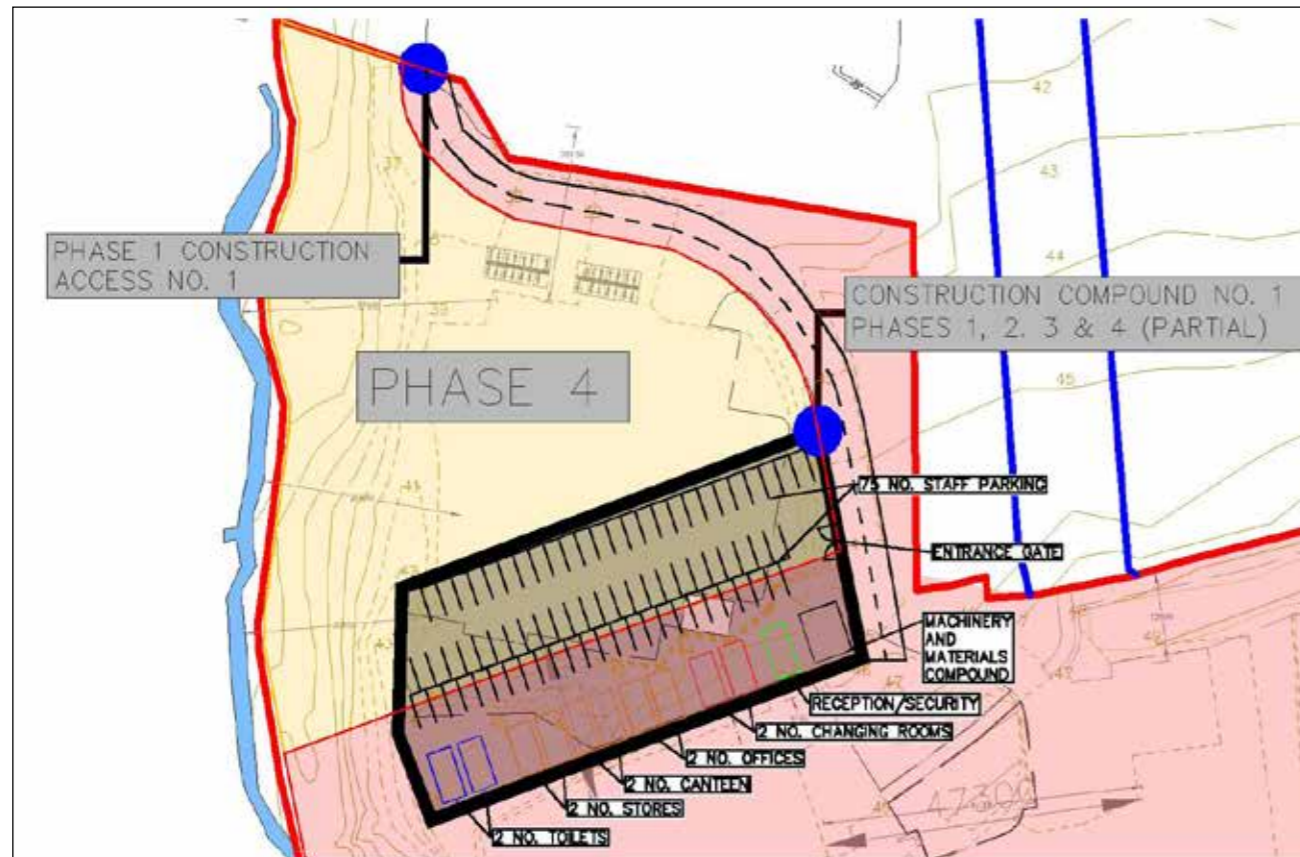


Figure 2.4: Schematic Main Compound

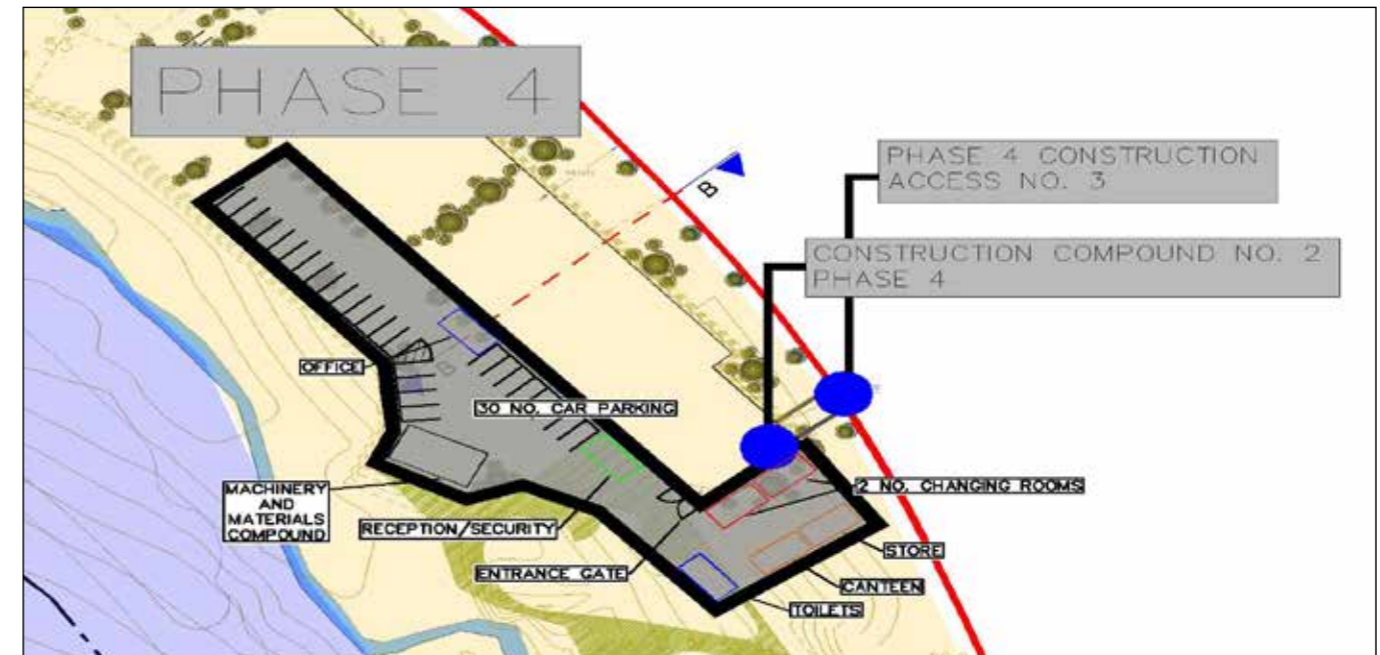


Figure 2.5: Schematic Secondary Compound

The main compound has been strategically selected for proximity to the key construction elements it will serve whilst also being readily accessible from the construction entrance to the site. The site compound consists of the following.

- Site Parking
- Site office
- Meeting Room,
- QS office
- Health & Safety / Engineering office
- Fully serviced canteen Blocks
- Toilet block
- Drying room.
- First Aid Station
- Emergency Assembly point for the project.

A second site entrance will be located directly onto the R609 Carrigaline Road (Site Access No2. as detailed in Drawing 18203-JBB-1B-XX -C-0115). This access point will, on commencement of the project, be to facilitate construction of the proposed bridge (e.g delivery of abnormal loads etc.).

It is proposed that a secondary compound is developed on the eastern (R609, Carrigaline Road) side of the scheme to facilitate construction of Phase 4 as per schematic Figure 2.5 detailed above.

A designated parking area is provided in the site car park at Site Access No.1. It is proposed to cater for up to 75 cars /vans in this area to minimise disruption to local amenities, limit impact on the R609 Carrigaline Road and adjacent residential estates. It is envisaged that Construction Compound No. 1 will reduce in size and scale once the secondary compound is developed on the Carrigaline Road side of the scheme.

A designated parking area is also provided in the site car park at Construction Compound No. 2 for Phase 4 of the construction period. It is proposed to cater for up to 30 cars /vans in this area to minimise disruption to local amenities, limit impact on the R609 Carrigaline Road and adjacent residential estates with the remainder of vehicles parked in a reduced scale Construction Compound No. 1.

2.3.4 Bridge Construction Sequence

Construction Sequence

Provision of a concrete deck lifted in sections to reduce the requirement for temporary works and minimises the requirements for traffic diversions and traffic management.

The following section describes the anticipated construction sequence for the proposed access bridge;

Stage 1: Fabrication of Concrete Spans.

Production of prefabricated bridge - concrete main spans (off-site).

Stage 2: Site clearance and Exclusion Zones.

This involves removing existing vegetation and approx. 15 No. of Trees (Eastern Abutment). This work will be carried out behind the exclusion zones.

Stage 3: Establishment of Surface Water Management Systems

Stage 4: Piling Rig Setup.

Temporary access routes for piling rig and mobile crane to be constructed. Construction of hard standing for piling rig at both the western and eastern bridge abutments and also at the central, reinforced concrete pier.

A containment bund shall be excavated immediately downstream of these 3 No. work areas to stop any silty water in the excavation entering the stream.

The excavation shall be kept dry at all times using a 'silent' pump so that even between shifts there will be no chance of water over-topping the bund. The discharge from the excavation will be sent to a 'Silt-Buster' settlement tank and the discharge from this will be regularly monitored for turbidity and other pollutants before it enters the stream.

Stage 5: Piling Operation.

The pile design will utilise in-situ reinforced concrete rotary-bored piles; these cause less noise and vibration than driven piles. The piling rig will be set up in position and drill into the soil down to a specified depth, dependent upon bearing capacity indicated by the site investigation.

The concrete will be delivered ready-mixed by road-truck and will be poured into the newly bored hole from a position that will not allow any concrete to spill near to the watercourse or its banks.

Any concrete that does spill will be disposed of in a specially designated skip and this skip will also be used to contain the water used for washing out the mixer.

The skip's contents will be disposed of as inert waste when all the cement has cured. Reinforcement will be placed in the wet concrete and the completed pile left to cure before the top is cut off to the correct level to suit the design and disposed at a licensed disposal facility.

When the piling is complete, the piling mat will be removed for re-use for the next location on the site.

Stage 6: Foundations and Reinforced Earth Wall Construction

A layer of blinding concrete will be placed to provide a clean, level working surface on which to construct the reinforced concrete base slab and reinforced earth wall panels. As with the piling operation and all forthcoming concrete placing operations, the same controls will be employed to prevent concrete being deposited in or near the stream. i.e Containment bund with siltbuster.

Fast-setting concrete mixes will be specified.

Commence placement of precast concrete facing panels and commencement of placement of compacted granular backfill class 61/6J and geogrid soil reinforcement. Max thickness of compaction should not exceed 500mm. Continue 61/6J backfill to bankseat level.

Stage 7: Mobile Crane Setup for installation of main spans.

Temporary access routes for craneage as per piling operations. Construction of hard standing including foundations for crane outriggers.

Stage 8: Prefabricated beams transportation. Delivery of precast elements.

Stage 9: Placement of prefabricated main span.

Stage 10: Demobilisation of mobile mobile crane.

Stage 11: Bridge Finishes (Vehicular parapet, footpaths, safety barrier etc..).

2.3.5 Construction of Services

Following on from completion of site clearance and site re-profiling works construction activities will focus on the installation of underground utilities to provide the infrastructure required for storm water drainage, foul water drainage, water supply, power and building utility systems.

This will include laying of a new watermain to allow removal of the existing 300mm watermain where it crosses proposed development areas, including connections to the existing main at each end of this diversion.

This 300mm diameter watermain is running east to west through the middle section of the site. At the early stages of Phase 1 of the development, it will be necessary to re-locate this main to suit the proposed arrangement of roads and houses on the site. The route for this re-aligned main will generally be along new road corridors with connection to the existing main at the eastern and western boundaries of the site.

Within the site, an existing 150mm diameter watermain connects to the existing 300mm diameter watermain and extends northwards to serve The Vicarage area. This watermain will be disconnected from the existing 300mm watermain and re-connected to the re-routed watermain within the site.

Existing 3-phase overhead power lines located along the Moneygurney Stream will be diverted by the ESB to facilitate construction of the access bridge. This will require a temporary overhead diversion initially, prior to the final diversion underground via the proposed Moneygurney Bridge. The finalised route will require to be finalised with the ESB prior to construction.

2.3.6 Site Access Points

As detailed above both site access points 1 and 2 will be utilised during Phase 1.

Until the construction of the bridge over the Moneygurney Stream is completed there is no access to the main site from the R609 Carrigaline Road entrance (No. 2).

The Phase 1 site earthworks, infrastructure and housing will be constructed from the Site Access No. 1 to the south of the Templegrove Apartments and the bridge over the Moneygurney Stream will be constructed using both Site Access no. 1 and Site Access No. 2 (directly from the R609 Carrigaline Road).

It is proposed to stockpile surplus excavated material on-site (as detailed in Drawing Ref: 18203-JBB-1B-XX -DR-C-0117) until such a time that the Construction of the Bridge over the Moneygurney Stream is completed (i.e end of Phase 1 / Commencement Phase 2). The provision of the bridge will facilitate ready access to the R609 thereby limiting impact on the Templegrove, Vicarage and adjoining developments.

Phase 2, 3 and 4 earthworks, infrastructure and housing will then be primarily constructed using Site Access No. 2 (as detailed Drawing Ref: 18203-JBB-1B-XX-DR-C-0115).

However, the eastern section of the Phase 4 development will be accessed by a direct connection to this part of the site from the R609, Carrigaline Road, at Site Access No. 3.

2.3.7 Expected Construction Staff (Peak and Typical)

A peak construction staff of 100 is anticipated for Phases 1-3 of the project with typical construction staff numbers of approximately 80 No. through these phases.

For Phase 4 of the development it is envisaged that peak construction staff will reduce to 80 with typical construction staff numbers of approximately 60 No for this phase. The management of all construction traffic (including the management of staff) is assessed in Chapter 5B - Traffic and Transport.

2.4 Construction Management Plan

2.4.1 Introduction

The Construction Management Plan (CMP) has been prepared to assist with avoiding, reducing or mitigating construction impacts arising from the proposed development.

The Construction Management Plan addresses dust management, waste management, noise and vibration, traffic management, working hours, pollution control, dust control, road cleaning, compound / public health facilities and staff parking, all associated with the construction works.

The Construction Management Plan is necessarily broad at this stage and more detailed site-specific measures will be developed and agreed with Cork County Council prior to the commencement of the permitted development and will take into account any conditions attached to a grant of planning permission from An Bord Pleanála.

2.4.2 General Principles

The general principles of the site logistics are outlined below. These will be developed in greater detail at the construction stage.

Details are provided of the intended construction practice for the development, dust management measures, noise management measures, and the CMP demonstrates how environmental impacts are minimised during the construction phase of the development. Finally, the site compound location, construction traffic routes and parking proposals of workers along with general site considerations are outlined.

2.4.3 Proposed Dust Management Plan

2.4.3.1 Introduction

As construction activities are likely to generate some dust emissions, this dust management plan will be developed and implemented as part of the Environmental Operating Plan for the construction phase of the project. The potential for dust to be emitted depends on the type of construction activity being carried out, the dust controls in place and also meteorological factors such as levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The TII air quality guidelines recommend a semi-quantitative approach to determine the significance of the impact of dust emissions arising from construction activities. Based on a moderate size construction site, the guidelines state that significant effects on dust soiling are unlikely at distances greater than 50 m from the emission source, while significant effects on PM10 concentrations and vegetation are unlikely at distances greater than 15 m from the source.

2.4.3.2 Identification of Dust Sources

The main activities that may give rise to dust emissions during construction include the following:

- Materials Handling and Storage
- Phase 1 Temporary storage stockpile of earthworks material acceptable for re-use.
- Movement of vehicles (particularly Heavy Goods Vehicles) and mobile plant.

Construction traffic, including light vehicles, travelling to and from the proposed development will travel via the Site 1 entrance at TempleGrove/Vicarage (Phase 1) onto the R09. Construction traffic associated with bulk excavation works will be undertaken following completion of the Moneygurney Stream Bridge and will be via the Site 2, R609 Carrigaline Road entrance.

2.4.3.3 Dust Mitigation Measures

The mitigation measures set out below will be put in place during the construction phase. The level of dust control to be implemented will depend on meteorological conditions, the specific construction activities (e.g. earthworks activities, construction activities and site vehicle movements) and the potential for dust nuisance as a result of those activities.

In Phase 1 the temporary storage of material acceptable for re-use, surplus to on site requirements, will be stockpiled, as detailed in Figure 2.3 (accompanying planning application drawing ref: 18203-JBB-1B-XX -DR-C-0117) until the completion of the Moneygurney Bridge is operational. The stockpile will be limited to a maximum height of 2.5m above existing ground levels. Stockpiles to be retained for a period greater than six months will be sown with a grass (a non-perennial ryegrass mix or sterile ryegrass) which will reduce the potential

for weed germination. Topsoil stockpiles will be clearly signposted for easy identification and to avoid any inadvertent losses. Stockpiles will have sediment control measures installed.

Typical mitigation measures which will be required where there is the potential for dust nuisance are detailed in Chapter 10 Air Quality and Appendix 10.3 Dust mitigation Plan.

2.4.3.4 Dust Management Records & Review

An on-site record of all air quality / dust complaints will be maintained. The cause of any complaints will be identified, and the measures taken to reduce emissions will be recorded.

This dust management plan and the control measures in place will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the control measures and to improve these measures where needed.

2.5 Waste Management Strategy

2.5.1 Introduction

A detailed waste management plan will be agreed with Cork County Council and put in place in order to control waste management on site, ensure segregation of waste streams and minimise construction waste costs. Waste arising from the site will be considered in relation to the waste management hierarchy of prevention, reduce, reuse, recycle, energy recovery and disposal.

Construction and demolition waste is the largest “municipal” waste stream contributing to the current pressure on landfill facilities in the region. Unsustainable management and inappropriate disposal of this waste stream can result in impact on natural resources and lead to environmental pollution. The main source of waste material at the site will be construction waste.

Waste is defined as any substances or object belonging to a category of waste specified in the First Schedule (of the Waste Management Act 1996) or included in the European Waste Catalogue, which the holder discards or intends or is required to discard and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste until the contrary is proved.

There are two main types of construction waste - Hazardous and Non-hazardous as detailed below:

Non-hazardous

- Timber Waste
- Scrap Metal
- Plastic
- Paper / Cardboard
- Canteen Waste
- Litter

Hazardous

Hazardous Wastes are defined as wastes which can have a harmful effect on the environment and on human health as they exhibit ignitability, reactivity, corrosivity and/or toxicity and/or are listed as hazardous by the European Waste Catalogue and/or may be identified as hazardous by application of the EPA Waste Characterisation Tool compiled by The Clean Technology Centre.

The hazardous wastes that may be experienced at a development of this nature are as follows:

- Adhesives and Sealants
- Aerosols
- Batteries
- Chemicals
- Cleaning Products
- Oil (Contaminated absorbent Material or debris)
- Paints and Thinner
- Fuels (hydrocarbons such as diesel)

The Castletreasure development will result in the generation of waste material from the following sources:

- Removal of existing boundaries;
- Excavation of soil to foundations, ductwork and sewers/watermains;
- Excavation of stone / made ground fill material as detailed in Table 2.2;
- Excavation of stone / made ground at infrastructure tie-ins to existing water mains, sewers, gas etc...
- Surplus material (off-cuts, damaged materials, packaging etc.) generated during the construction of the new development;

Where feasible acceptable site-won excavation material will be re-used within the proposed scheme as general engineering fill or in landscaping as detailed in Table 2.3. Where excavation material is considered to be a waste material and may not be re-used within the proposed scheme the Contractor will send material for authorised recovery or recycling so far as is reasonably practicable. All wastes generated from the proposed development will be delivered to authorised waste facilities which have a Waste Licence, Waste Facility Permit or Certificate of Registration.

There will also be a requirement to export a significant quantity of surplus clean and inert excavated material due to the topography of the site and the earthworks required (Detailed in Table 2.2).

It is the intention to prevent this surplus material becoming a waste material by planning for this excess soil and stone material to be used elsewhere as a by-product and not discarded as a waste in line with the current EPA public consultation document ‘Regulatory position on soil & stone by-products’ published in October 2018.

This material if considered as by-product would be subject to an Article 27 notification to the EPA in accordance with relevant waste legislation and taking account of the findings of the current EPA public consultation document

‘Regulatory position on soil & stone by-products’ published in October 2018 and ensure all four by-product conditions are met. Ground Investigation undertaken on site and subsequent geotechnical laboratory testing indicates that the material from the Castletreasure site complies with either Class 1 or Class 2 General Fill Material in accordance with TII publication Notes for Guidance on the Specification for Road Works Series NG 600 - Earthworks (including Erratum No. 1, dated June 2013) without any further processing. There are a significant number of construction projects within the Castletreasure region either in planning or at construction stages that could facilitate the acceptance of the material as a by-product e.g Dunkettle Interchange Upgrade Scheme, N22 Macroom Bypass and the N28 Bloomfield to Ringaskiddy Scheme (subject to Judicial Review of An Bord Pleanála’s decision to approve).

Unacceptable material recorded on-site during the site investigation (Detailed in Table 2.3) shall be disposed of in accordance with all relevant legislation including the Waste Management Act, 1996 (as amended) and associated regulations and with regard to Best Practice Guidelines on Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG., June 2006) and TII guidelines including The Management of Waste from National Road Construction Projects (GE-ENV-01101) December 2017.

2.5.2 Noise and Vibration

2.5.2.1 Summary

In order to minimise the noise impact on the adjoining residential properties it is proposed that heavy equipment and machinery including pneumatic drills, construction vehicles and generators only work between the hours shown below. In addition, no deliveries and/or removal of materials will occur outside of these hours, save for exceptional situations when permissions will be sought from the Local Authority. All plant and equipment will be maintained in good working order in accordance with BS.5228 in order to minimise air and noise emissions.

Normal working hours are outlined in Section 2.3.1, however these will be subject to agreement with Cork County Council prior to commencement and may form a condition of the planning permission.

On occasions it may prove necessary to carry out construction activities outside of normal working hours. In such instances prior consultation will be carried out with Cork County Council, local residents, and businesses outlining the nature and reason for the works and their likely duration.

During the construction works the contractor shall comply with:

- BS 5228: 2009 +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1 and Part 2.
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes (NRA, Revision 1, 2004)
- Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 5 Noise and Vibration.

Noise monitors will be erected and data collected to assess sound levels. Ear protection zones will be established and all personnel will be trained on ear protection.

2.6 Water and Wastewater Management Strategy

2.6.1 General

All works carried out as part of these infrastructure works will comply with all Statutory Legislation including the Local Government (Water Pollution) Act, 1977 (as amended) and the contractor will cooperate in-full with the Environmental Section of Cork County Council.

The sections below include an outline Surface Water Management Plan (SWMP) to provide the water management framework for potential Contractors and Sub-contractors and it aims to set out the proposed procedures and operations to be utilised on the proposed Castletreasure development to mitigate against any water related environmental impacts. The mitigation and control measures outlined herein will be employed on site during the construction phase of the development.

The main areas of water related concerns covered by this document are:

- Pre-Construction (Inc Site Clearance / Tree Felling), Construction Phase drainage controls;
- Earthworks (i.e. infrastructure & drainage) and surface water quality protection;
- Temporary stockpiles water management and controls;
- Stream / watercourse crossings;
- Fuel usage, storage and management; and
- Working at or near existing streams / watercourses;

This outline SWMP is considered a live document and will be modified over time as detailed contractor methods of work are developed. If the development is permitted an updated version of this document will be issued to all parties involved in the construction process when appropriate changes are deemed necessary.

2.6.2 Pre Construction Drainage Management

A key pollution prevention measure during the construction phase is initially the avoidance of ecologically sensitive natural water where possible.

A 20 m wide stream/river buffer (which will extend beyond the majority of river woodlands) is proposed for surface water protection. Most of the proposed development areas are significantly away from these zones on the site that have been determined to be hydrologically sensitive.

The measures proposed to be put in place to mitigate any potential damage to the contamination of surface water would be to create a 20m buffer / exclusion zone, by the erection of a visible 1.0m high barrier along the watercourse. This will be formed by means of steel road pins, which will be used to support a PVC 'orange' barrier with warning signs appropriately fixed at regular intervals. The signs shall read 'NOTICE - NO DISCHARGE OF ANY KIND IS PERMITTED IN THIS VICINITY OR BEYOND THIS EXCLUSION ZONE'

Where development occurs within 20m of a watercourse (i.e bridge works) or where there is insufficient space to achieve the desired 20m buffer (i.e extreme western portion of the site adjacent to Douglas Stream), additional mitigation measures will be put in place to ensure maximum protection of the stream or river as outlined below.

There measures which include silt fences, silt bags, sedimats and the provision of a "siltbuster" are described in Section 2.6.3.

2.6.3 Construction Drainage Management

As a standard and best practice approach, surface water runoff attenuation and drainage management are key elements in terms of mitigation against impacts on surface water bodies.

Two distinct methods will be employed in the management of construction surface water runoff.

The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas.

The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, and nutrients, and to route them towards stilling ponds prior to controlled diffuse release over vegetated natural surfaces. There should be no direct discharge to surface waters; and where possible all release of Castletreasure drainage should be done outside of hydrological buffer zones.

A temporary positive drainage system shall be installed prior to the commencement of the construction works to collect surface water runoff from the site during construction. A series of geotextile lined cascading, high level outfall, settling ponds will be installed upstream of the outfall point to vegetated ground (and ultimately to watercourse - See Figure 2.6).

For areas where there is insufficient working space to maintain a 20m buffer zone or where works are required within the buffer zone, a 'siltbuster' silt control unit can be used on the outfall. Both of these temporary surface water management facilities will control runoff rates and allow suspended solids to be settled out and removed before being discharged in a controlled manner to the agreed outfall. All inlets to the cascading settling ponds will be ripped to prevent scour and erosion in the vicinity of the inlet.

A schematic of this approach is presented in Figure 2.6 below. During the construction phase all runoff from works areas (i.e. dirty water) will be attenuated and treated (via cascading settlement ponds) to a high quality prior to being released.

Level Spreader:

A level spreader will be constructed at the outfalls of interceptor drains and settlement ponds to convert concentrated flows into diffuse sheet flow on areas of existing vegetated ground;

The level spreaders will distribute drainage runoff onto vegetated surfaces where the discharge will emerge as diffuse flow. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion;

The level spreader lip over which the water will spill should be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader should be level across the top and bottom to prevent channelised flow leaving the spreader.

Silt Fences:

Silt fences will be emplaced along drains and parallel to access roads edges as required, down-gradient of all new roads and at stream / watercourse bridge crossings. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to water courses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff;

Inspection and maintenance of these structures during construction phase is critical to their functioning to stated purpose. They should remain in place throughout the entire construction phase.

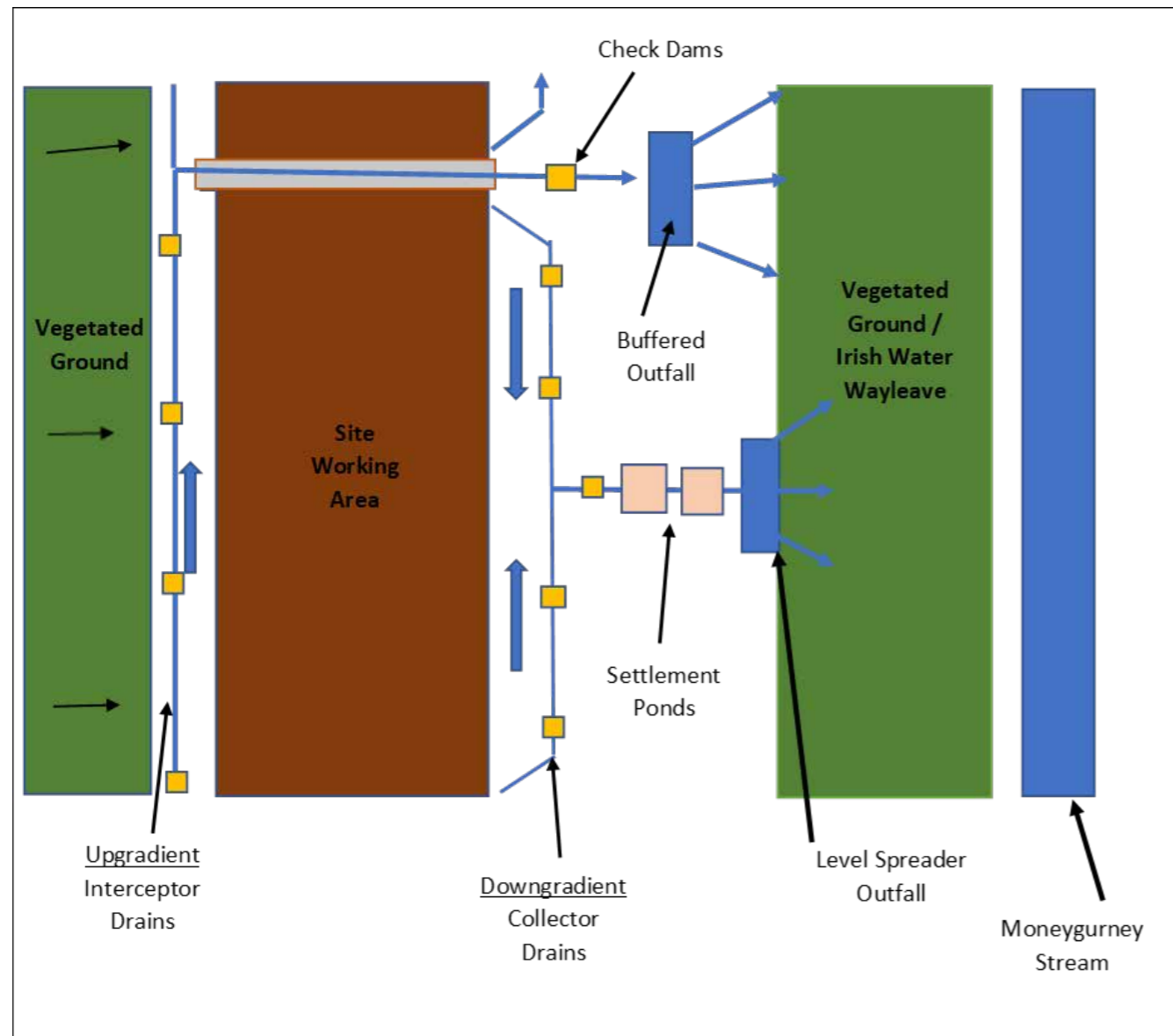


Figure 2.6: Schematic Construction Surface Water management

Double silt fences will be placed where work is required within the 20m hydrological buffer zones.

Check Dams:

The velocity of flow in the interceptor drains and collector drains (see Figure 2.6), particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals to ensure flow is non-erosive;

Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains and swales are being excavated; and,

Check dams will be constructed from a 4/40 mm non-friable crushed rock. Check dams are relatively simple and cost effective to construct.

Works within 20m Buffer:

Additional mitigation measures to those listed above will be put in place for works within the 20m buffer (e.g drainage outfalls, bridge construction) and will include the following:

Silt Bags: Silt bags provide an effective way to collect harmful sediments from dirty water pumped out of excavation works, such as foundations, that would otherwise pollute the surrounding environment. Sediment-laden water is pumped into the high quality filter bags, which trap the solids inside and allow filtered water to flow freely out through the geotextile fabric to disperse into the surrounding ground or another collection point.

Sedimats: Sediment entrapment mats will be placed at the outlet of the silt bag to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.

Silt Fences: Double silt fences will be placed where work is required within the 20m hydrological buffer zones.

2.6.4 Construction Phase Surface Drainage Management

The early establishment of temporary drainage facilities will reduce the risk of pollution problems during construction.

In addition, construction operations will adopt best working practices. The development of the site will be on a phased basis (as detailed in Figure 2.2) and the construction phase surface management will therefore require to be refined and phased accordingly.

Construction Drainage Action Points:

- Establish drainage and runoff controls before starting site clearance and earthworks;
- Minimising the area of exposed ground;
- Retain as much vegetation as possible;
- Delay clearing and topsoil stripping of each phase of work until ready to proceed;
- Establish vegetation as soon as practical on all areas where soil has been exposed,
- Failing this, all exposed surfaces should be sealed with excavator to limit erosion / runoff;
- Close and backfill trenches as soon as practically possible;
- Through consultation with the Construction Manager/Site Supervisor a Schedule for surface water quality monitoring will be drawn up. It will be finalised prior to the start of construction; and,
- Where monitoring parameters are found to exceed the standards laid down the Construction Manager/ Site Supervisor should initiate and report on corrective action(s). This may necessitate the alteration of the environmental control measures and in turn the relevant construction method statement(s).

Measures to control surface water runoff during the construction phase of the Castletreasure Development are as follows.

General Construction / Excavation Areas:

- As detailed in Figure 2.6, Interceptor drains up-gradient and around any excavations to intercept clean surface runoff and divert it around and away from the works will be installed; surface water runoff may also be diverted around the excavation by silt fences, sand bags or similar laid on the surface of the ground;
- The base of the excavation will be constructed level, and water will be gathered in a temporary sump and pumped at a low flow rate into either a temporary settlement pond or downgradient collector drains (See Figure 2.6) for treatment prior to controlled release onto the natural vegetation surface; and;
- The use of a proprietary settlement system such as Siltbuster may be required to treat dirty construction water where additional treatment is required.

Access Roads / Haul Roads:

- Interceptor drains will be placed on the up-gradient side of the road excavations to divert clean runoff away from the road section to be excavated;
- Under road culverts will be installed regularly beneath the road section to allow the flow of clean surface runoff to the down-gradient side;
- Road culverts will be regular to disperse clean surface water runoff onto natural vegetated surfaces on the down-gradient side of the road in a diffuse manner;
- All haul routes will utilise clean 4" - 6" crushed stone in a 300mm to 400mm layer at the base of access track or hardstand platform.
- An impermeable membrane will be required above the porous fill to prevent vertical migration of surface water into the stone track fill [from access track or material storage areas] and to prevent finer material from being washed down and blocking the porous layer;
- The haul routes will be regularly topped up with additional stone in areas that are showing excessive wear, such as at entrances, turning circles or sharp bends.

Soil Storage areas:

- In Phase 1 the temporary storage of material acceptable for re-use, surplus to on site requirements, will be stockpiled, as detailed in Figure 2.3 (accompanying planning application drawing ref: 18203-JBB-1B-XX-DR-C-0117) until the Moneygurney Bridge is operational
- During the initial placement of earthworks material, silt fences and straw bales will be used to control surface water runoff from the storage areas;
- Where areas are deemed suitable for temporary storage (i.e. outside buffer zones), these will be initially marked out on the ground, and an agreed preliminary drainage plan should be drawn up;
- The marked temporary storage areas will also be surrounded on 3 sides with silt fencing, and the area will be filled by access through the open side;
- Once the temporary stockpile is filled to its intended area, silt fencing around the remaining edge will be installed;
- Stockpiles to be retained for a period greater than six months will be sown with a grass (a non-perennial ryegrass mix or sterile ryegrass) which will reduce the potential for weed germination.

Works within 20m Hydrological Buffer Zone - (e.g Bridge Construction, drainage outfalls)

- Similar to as detailed in Figure 2.6, Interceptor drains up-gradient and around any foundation excavations to intercept clean surface runoff and divert it around and away from the works will be installed; surface water runoff may also be diverted around the excavation by silt fences, sand bags or similar laid on the surface of the ground;
- Silt Fences: Down gradient double silt fences will be placed where work is required within the 20m hydrological buffer zones.
- The base of the bridge foundation excavations will be constructed level, and water will be gathered in a temporary sump and pumped at a low flow rate with the use of a proprietary settlement system such as Siltbuster may be utilised to treat dirty construction water. Where additional treatment is required the provision of silt bags and sedimats will be utilised.

Water quality monitoring - It is proposed to implement a programme for monitoring water quality at the outfall as part of the construction of this development, in agreement with the Planning Authority. This programme and locations of sampling will be agreed with Cork County Council.

Over Ground Oil / Diesel Storage - Only approved storage system for oil / diesel within the site will be permitted, (i.e. all oil / diesel storage to be located within a designated area placed furthest away from adjacent watercourses and contained within constructed bunded areas e.g. placed on 150mm concrete slab with the perimeter constructed with 225mm solid blockwork rendered internally). The bunded area will accommodate the relevant oil / diesel storage capacity in case of accidental spillage. Any accidental spillages will be dealt with immediately on site however minor by containment /removal from site. Any accidental spillages will be dealt with immediately on site however minor by containment /removal from site.

Disposal of Wastewater off Site - The Site Management Team will maintain a record of all receipts for the removal of toilet or interceptor waste off site to insure its disposal in a traceable manner. These will be available for inspection by the Environment Section of Cork County Council at all times.

Road Sweepers / Cleaning - The cleaning of public roads in and around the subject site will be undertaken to reduce environmental impacts and care will be taken to prevent any pollution of watercourses from this activity.

2.7 Outline Traffic Management Plan

2.7.1 Introduction

As part of Construction Stage Safety Plan for the works a Traffic Management Plan (TMP) will be prepared in accordance with the principles outlined below and shall comply at all times with the requirements of:

- Chapter 8 of the Department of the Environment Traffic Signs Manual, current edition, published by The Stationery Office, and available from the Government Publications Office, Sun Alliance House, Molesworth Street, Dublin 2;
- Guidance for the Control and Management of Traffic at Road Works (June 2010) prepared by the Local Government Management Services Board;
- Any additional requirements detailed in the Design Manual for Roads and Bridges & Design Manual for Urban Roads & Streets (DMURS).

The site will be accessed initially as detailed above in Section 2.3.3.

Warning signage will be provided for pedestrians and other road users on all approaches in accordance with Chapter 8 of the Traffic Signs Manual and the Contractor's Traffic Management Plan.

All construction activities will be governed by a Construction Traffic Management Plan (CTMP), the final details of which will be agreed with Cork County Council and TII prior to the commencement of construction activities on site.

The principal objective of the CTMP is to ensure that the impacts of all building activities generated during the construction phase upon the public (off-site), visitors to the subject site (on-site) and internal (on-site) workers environments are fully considered and proactively managed/programmed thereby ensuring that safety is maintained at all times, disruption is minimised, and that works are undertaken within a controlled, hazard-minimised environment.

2.7.2 Construction Site Access Arrangements

The final access and egress to the site will be via a new access road and bridge over the Moneygurney Stream to the R609, Carrigaline Road and at the existing TempleGrove/Vicarage development at the north-eastern boundary of the site. These junctions will also serve as construction access for all phases of development and as detailed in Section 2.3.3 are referenced as Construction Access Points No. 1 and 2.

A third final access and egress point is required directly onto the Carrigaline Road (for Phase 4 of the development) as detailed on Figure 2.4 (accompanying planning application drawing ref:18203-JBB-1B-XX -C-0115).

As detailed in Section 2.3.3 both site access points 1 and 2 will be utilised During Phase 1.

The Phase 1 infrastructure and housing will be constructed from the Site Access No. 1 to the south of the Templegrove Apartments and the Bridge over the Moneygurney Stream will be constructed using both Site Access no. 1 and Site Access No. 2 (directly from the R609 Carrigaline Road). Phase 1 earthworks required for export will be stockpiled on site until such a time that the Moneygurney Stream Bridge is open and operational.

Phase 2 and 3 earthworks, infrastructure and housing will be constructed using Site Access No. 2 principally.

Phase 4 will require the construction of a third construction access (No.3) also on the R609 Carrigaline Road (approximately 240m south of access point No. 2). This junction is located remote from sensitive receptors to minimise construction impacts (noise, dust etc.) and will serve as a final access and egress point for the Phase 4 area of the development only.

To reduce the impact of vehicles on the existing properties in the area, the Contractor will provide management of all site traffic movements and parking throughout the duration of the works. The access points will be secured for the duration of the development and safety signage erected on all fences and gates.

During the construction phase a vehicle wash will be provided on each access and egress point, and all vehicles will be washed down prior to exiting onto the public road. All roads and footpaths adjacent to the site where dust, debris or spillage occurs will be cleaned on a regular basis. All vehicles carrying open loads (e.g. skips) will ensure the loads are properly covered to ensure no spillage of waste material occurs.

Furthermore, security personnel will man the access gate to ensure no unauthorised vehicles or personnel will enter the site and will also ensure that vehicles exit safely and without causing disruption to road users and pedestrians.

2.7.3 Anticipated Construction Traffic

As detailed above both site access points 1 and 2 will be utilised During Phase 1.

Construction traffic will consist of the following categories:

- Private vehicles owned and driven by site construction staff and by full time supervisory staff.
- Excavation plant and dumper trucks involved in site development works and material delivery vehicles for the following: granular fill materials, concrete pipes, manholes, reinforcement steel, ready-mix concrete and mortar, concrete blocks, miscellaneous building materials, etc.

It is envisaged that working hours will be from 07:00 to 18:00, Monday to Friday (08:00 to 14:00 Saturday) and the works will engage a peak maximum of 100 construction personnel through each phase of the development.

Generally, construction workers will travel to site before the peak hour of 08:00 – 09:00, to be on site for an 07:00 start-time. A very limited number of construction employees are likely to travel to the site during peak hours. However, in order

to provide a robust assessment, it is considered that 75% of the workers are single-occupier car drivers and 50% of these will arrive during the morning peak hour (08:00 – 09:00), i.e. a total of 38 one-way trips are likely to take place during the morning peak hour. In addition, another 2-3 one-way trips for supervisors are envisaged each day during each phase of the construction period. It is expected that the estimated construction traffic will have a greater impact on the AM peak compared to the PM peak.

It is anticipated that heavy goods vehicles, HGV's, will be restricted to movements on the local road network during the off-peak periods. However, for the purposes of the traffic assessment, we have assumed 20% of HGV's may arrive/depart with deliveries of material/equipment during the peak hour.

It is estimated that truck movements and general deliveries would arrive/leave at a steady rate during the course of the day. Peak delivery rates / truck movements per hour throughout the day for each of the construction phases are detailed in Chapter 5B – Traffic & Transportation.

As detailed in Section 1.1, during Phase 2 the stockpiled surplus excavated material from Phase 1 will be exported from site via Construction Access No. 2 (over the Phase 1 constructed Moneygurney Stream bridge) as detailed in Chapter 5B – Traffic & Transportation.

It is estimated that at peak Phase 2 development up to 60 no. truck movements throughout the day, equating to 6 movements per hour (maximum) will be generated by HGV's removing surplus acceptable spoil from the site to allow for the construction of the development.

In general, the impact of construction traffic will be temporary in nature and less significant than the final development operational stage.

2.7.4 Construction staff travel plan / onsite parking arrangement

To reduce the impact of vehicles on the existing properties in the area, the Contractor will provide management of all site traffic movements and parking throughout the duration of the works. The access points will be secured for the duration of the development and safety signage erected on all fences and gates.

75 No. designated parking spaces will be provided within the site boundary to mitigate the risk of vehicles causing disruption to the local area and the local amenities. Parking of construction vehicles in adjoining residential estates will be prohibited.

The location of the designated parking area will be within the site boundary, within the designated site compound No.1 and No.2 (As detailed Drawing Ref: 18203-JBB-1B-XX -C-0115 and Figueres 2.1 and 2.2). This proposed parking area has taken account of the needs of construction staff but is not be of a quantum that will discourage the use of sustainable modes of transport or car-pooling, and these alternative transport measures will be encouraged where possible/feasible.

2.7.5 Details of any abnormal loads for delivery to site

Approximately 12 No. abnormal loads will be delivered to site for the construction of the Moneygurney Bridge during Phase 1. These loads will access the site via Construction Access Point No. 2 on the Carrigaline Road R609 and will be the subject of detailed agreement with the relevant national and local roads authorities.

2.7.6 Traffic Management during Construction

A Traffic Management Plan will be prepared prior to the commencement of construction work on site. This plan will be prepared in consultation with Cork County Council in order to agree on traffic management and monitoring measures (at a minimum) as outlined below:

- During the pre-construction phase, the site will be securely fenced off from adjacent properties, public footpaths and roads.
- The surrounding road network will be appropriately signed to define the access and egress routes for the development.
- The traffic generated by the construction phase of the development will be strictly controlled in order to minimise the impact of this traffic on the surrounding road/housing estate environment.
- All road works will be adequately signposted and enclosed to ensure the safety of all road users and construction personnel.
- All employees and visitor vehicle parking demands will be accommodated on-site.
- Provision will be made for the cleaning by road sweeper etc. of all access routes to and from the site during the course of the works. Road cleaning shall be undertaken as required during the completion of the works. All road sweeping vacuum vehicles will be emptied off site at a suitably licensed facility.

Chapter 3

Alternatives

3

Environmental Impact Assessment Report (EIAR)

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CHAPTER 03 ALTERNATIVES

3.1 Alternative Lands

The proposed site falls within the Metropolitan Cork Strategic Planning Area. Cork County Council's Core Strategy, as outlined in the 2014 County Development Plan, notes that the County Metropolitan Cork Strategic Area will be the main engine of growth for the region. It notes that it is essential to ensure sufficient lands are available to support the ambitious population growth targets for Metropolitan Cork.

The broad parameters of the scheme are set by the principles for the site under the Zoning Objective SE-R-06, in the Ballincollig Carrigaline Municipal District Local Area Plan, as detailed in section 1.3 of the EIAR.

As the land is zoned for 'Medium A density residential development' and development of the site is consistent with the Core Strategy of the 2014 County Development Plan, alternative lands were not considered in the site selection process.

3.2 Alternative Layouts

The scheme proposed has undergone rigorous appraisal and through a number of changes as part of the design development process, while taking into account the particular site constraints and opportunities, the parameters and requirements of the Ballincollig Carrigaline Municipal District Local Area Plan, other statutory requirements, and environmental mitigation measures.

Intermediate design progressions of the scheme, that illustrates the evolution of the concept from initial design to its final stage, are set out in this chapter. A layout of each stage is provided in Figures 3.1 to 3.7.

3.2.1 Design Progression - February 2018 (Figure 3.1)

The proposal for the scheme has its only access point from the R609 Carrigaline Road/Carr's Hill with a spine road linking all areas of the site. The road rises through the site to minimise the intervention on the steep gradients.

A number of revisions were required following consultations through Design Team meetings:

- Crèche to be relocated to maintain the existing tree & hedgerow;
- Layout of dwellings revised to move away from root protection zone of the existing trees;
- Road layout to be revised to retain more existing trees/ ditches/ hedgerows;
- Dwellings to be removed from riparian zone & green-way;

A secondary access point was also to be added.

3.2.2 Design Progression - March 2018 (Figure 3.2)

The proposal for the scheme has a secondary access point from the existing Vicarage development included in addition to the R609 Carrigaline Road/Carr's Hill access. The spine road linking all areas of the site was revised to help accommodate this addition.

The layout of dwellings was revised, where required, to move them away from the root protection zone of the existing trees following consultations through Design Team meetings.

3.2.3 Design Progression - April 2018 (Figure 3.3)

The proposal for the scheme continued its evolution and a greater variety of house typologies to achieve higher densities were introduced. Pedestrian priority homezones were also introduced to the scheme. Revisions were again required following consultations through Design Team meetings:

- Apartment building layout & access points to be redesigned to protect woodland to the west;
- Road layout to be revised to retain existing trees & hedgerows;
- Access road to be revised to protect existing tree root zone & hedgerow;
- Road layout revised to increase separation to existing trees & hedgerow.

3.2.4 Design Progression - July 2018 (Figure 3.4)

This proposal for the scheme included the greenway cycle & walk paths as well as local play pockets. Revised apartment blocks were included in the western part of the site.

Revisions required following consultations through Design Team meetings were to:

- Move western pedestrian pathway to avoid tree root protection zone;
- Move greenway cycle & pedestrian pathway to avoid riparian zone.

3.2.5 Design Progression - August 2018 (Figure 3.5)

A number of further play & amenity areas were introduced to the scheme along with pedestrian connectivity routes. Revisions required included the following:

- Layout, type & orientation of dwellings to be revised to reduce amount of cut & retaining structures required to the existing ground at higher level;
- Layout of dwellings to be revised to retain the existing trees & hedgerow;
- Layout of apartments to be revised to give improved relationship with riparian zone;
- Layout of apartments to be revised to give improved relationship with western woodland & riparian zone.

3.2.6 Design Progression - November 2018 (Figure 3.6)

A number of further play & amenity areas were introduced to the scheme along with pedestrian connectivity routes. Revisions required included the following: -

- Apartment types, no's & layout to be revised to increase density in the scheme, create street-scape to Carr's Hill road, remove large areas of surface parking & retaining structures & increase separation distance to riparian zone & existing trees;
- Pedestrian route to be revised to reduce cut into existing ground & improve relationship with the proposed higher & lower levels;
- Move western pedestrian pathway to avoid tree root protection zone.

3.2.7 Final Scheme - January 2019 (Figure 3.7)

The final scheme layout was agreed following agreement for the full Design Team, taking account of the objectives to provide an appropriate density of development, while avoiding, reducing and mitigating any environmental impacts. Further minor amendments resulted in the final amendment and development boundary as detailed in Chapter 2 and drawings accompanying the planning application.

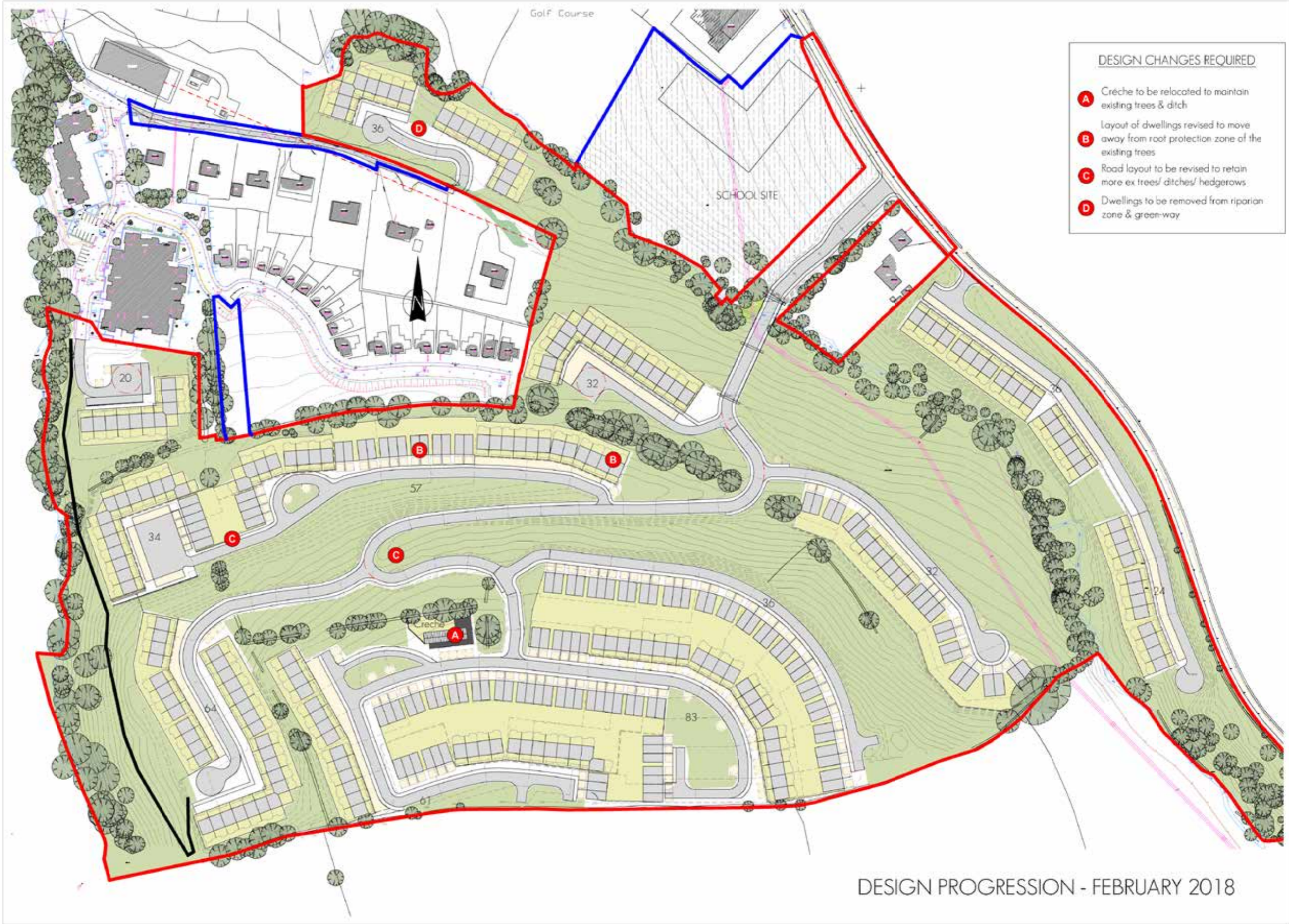


Figure 3.1

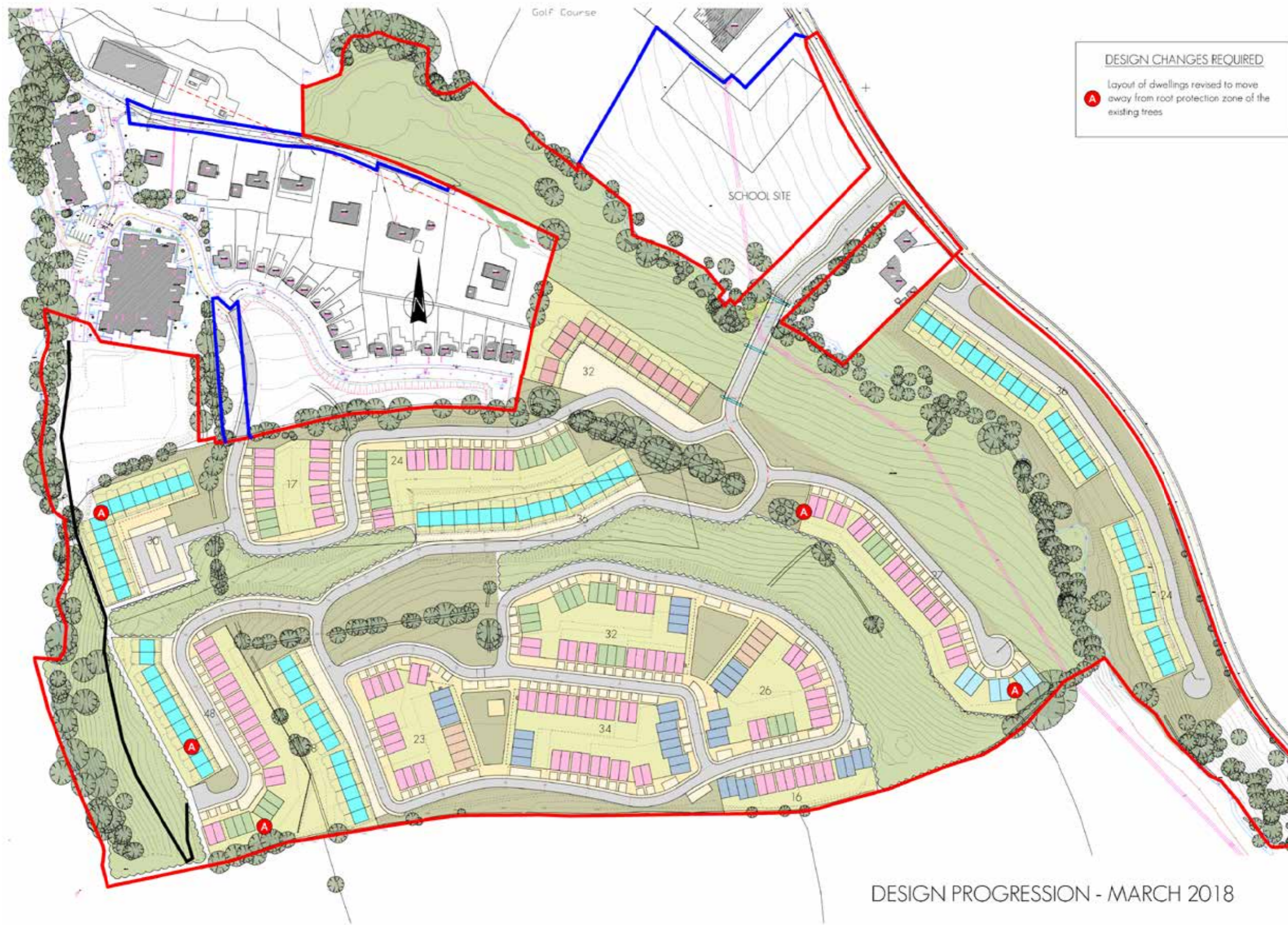


Figure 3.2

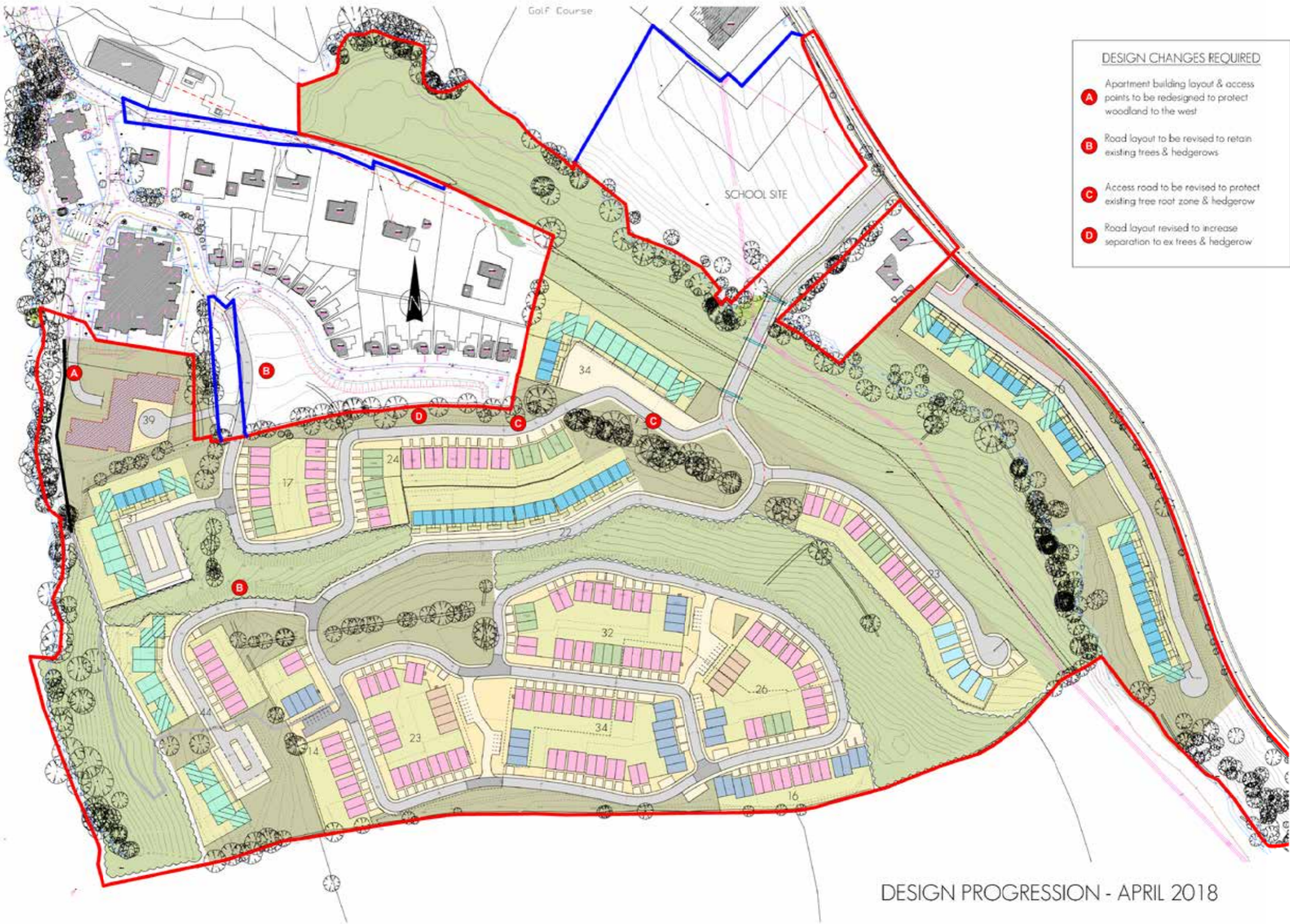


Figure 3.3



Figure 3.4



Figure 3.5



Figure 3.6



FINAL SCHEME - JANUARY 2019

Figure 3.7

3.3 Alternative Bridge Designs

The appraisal of the options for bridge design considered environmental impacts, buildability and cost to select the preferred option. Five bridges designs were examined comprising:

- Option no. 1 (2 Span concrete beam bridge), see Figure 3.8;
- Option no. 2 (2 Span concrete arch bridge), see Figure 3.9;
- Option no. 3 (single span concrete bridge), see Figure 3.10;
- Option no. 4 tied arch bridge, see Figure 3.11; and
- Option no. 5 was a single span concrete bridge with Moneygurney Stream Culverted, see Figure 3.12

From an ecological point of view the objective was to reduce the impact on the river bank and river bed as much as possible in line with current guidelines on permanent water crossing structures by Inland Fisheries Ireland (Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, 2016). The impact of removing associated wet woodland scrub / trees was comparable across all 5 options due to space restrictions on the north-eastern side of the Moneygurney Stream. It should be noted that options 1 - 4 avoid the requirement for any instream works thereby minimising environmental impacts during construction on the Moneygurney Stream for each option. From the perspective of river bank and river bed protection options 3 & 4 would involve the least amount of works in the vicinity of the river bank. However, given the size of the steel and concrete beams required to construct Options 3 & 4 there would be associated constructability issues regarding the delivery of larger / abnormal loads, associated larger crane and hardstanding areas etc. Options nos. 1 & 2 would be the next best options from the perspective of works in the vicinity of the river bank, while also utilising more conventional bridge construction techniques suitable for the sensitivities of this scheme. Option 2 would cast more shade on the water, which would potentially have greater impacts on river biodiversity. Option 5 would be the most negative from an environmental perspective, as it is effectively a large culvert and would involve the removal of a large section of river bank with its associated riparian zone woodland vegetation.

Following a detailed review by the design team of the bridge options, and considering environmental impacts, buildability and cost, option 1 was chosen as the preferred option. Option 1 provides a reinforced earth wall, backfilled on the north-eastern river bank; and piled foundations on both sides of the abutment and pier. The bridge works are to be undertaken as part of the first phase of the development. Works on the bridge will take approximately 2-3 months. The bridge has been designed so as not to require In-stream works. The mitigation measures to be put in place to avoid, reduce or mitigate impacts on the Moneygurney Stream during construction of the bridge are detailed in Chapter 2 (Project Description); these measures are also in line with current guidelines by Inland Fisheries Ireland (Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, 2016).

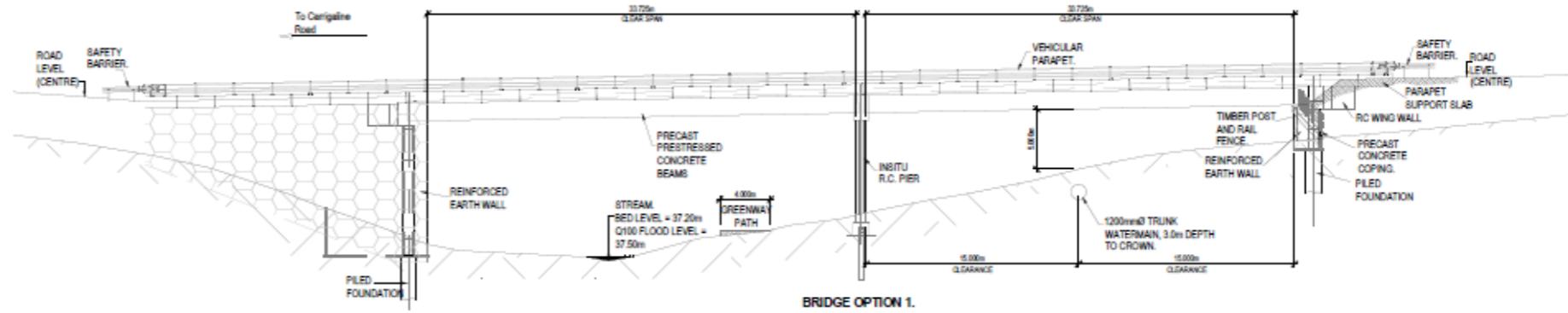


Figure 3.8: Options Considered - Bridge Option No. 1 (Preferred Option)

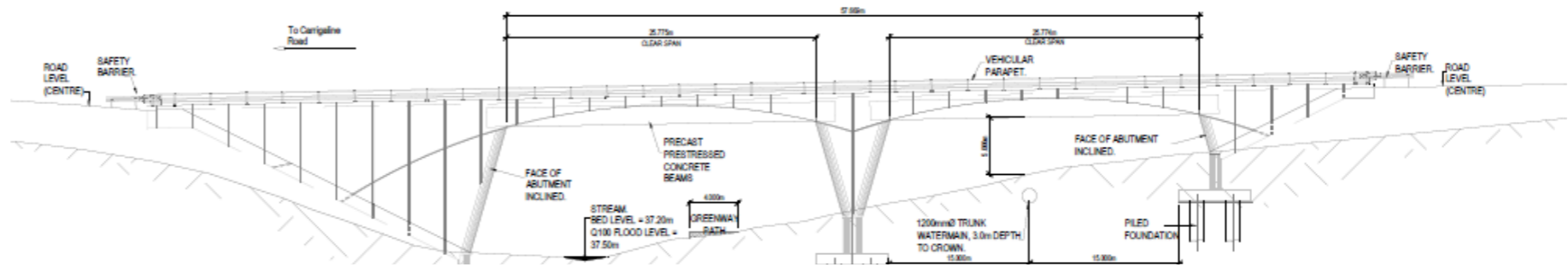


Figure 3.9: Options Considered - Bridge Option No. 2

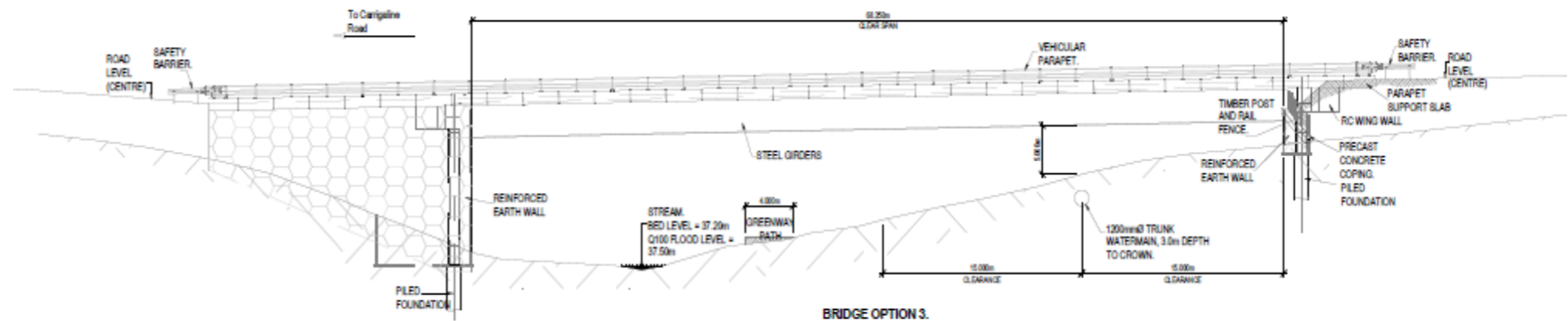


Figure 3.10: Options Considered - Bridge Option No. 3

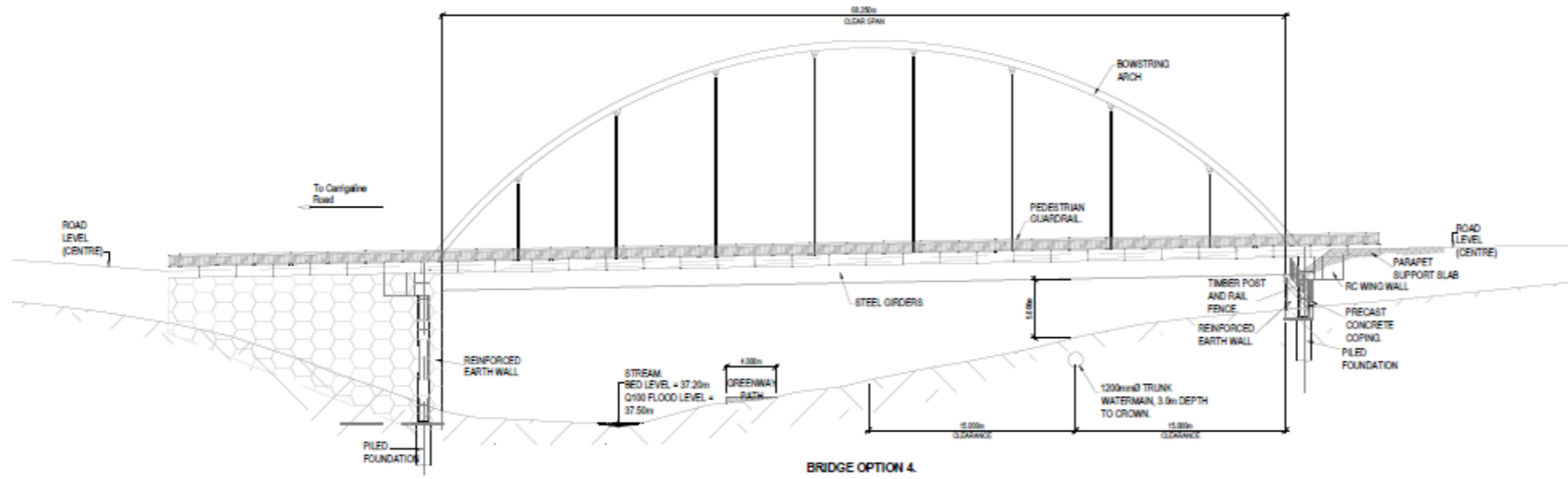


Figure 3.11: Options Considered - Bridge Option No. 4

3.4 Summary

As noted, several layouts and bridge design options have been considered during the design process. The Planning & Design Summary and Statement of Consistency which accompany the planning application provide a detailed planning rationale for the development of the final layout. In terms of environmental impacts, the design has been informed by:

- Providing an appropriate density to achieve sustainable development of the lands;
- Minimising the amount of cut and retaining structures within the site;
- Minimising impacts to the existing trees and hedgerows within the site;
- Minimising impacts to the riparian zone and green-way;
- Minimising impacts on watercourses;
- Establishing effective root protection zones for existing trees;
- Providing biodiversity corridors within the layout;
- Providing high-quality landscaping and recreational space for future residents; and
- Minimising the visual impacts of the proposed development.

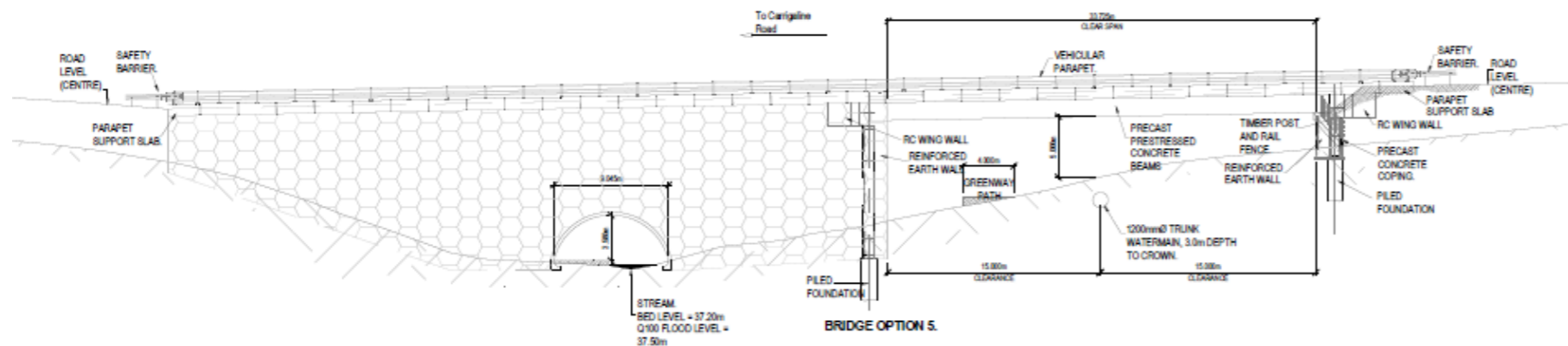


Figure 3.12: Options Considered - Bridge Option No. 5



Chapter 4

Landscape and Visual Impact Assessment

4

Environmental Impact Assessment Report (EIAR)

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CHAPTER 04 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

4.1 Introduction

This chapter identifies and assesses the potential effects of the proposed residential housing development at Castletreasure, County Cork on the landscape and visual resource of the study area. It identifies the mitigation and compensation measures that will be implemented to prevent, reduce or offset potential adverse landscape and visual effects or enhance potential beneficial effects, where possible.

In the context of this project 'landscape' includes also sub-urban townscape.

This Landscape and Visual Impact Assessment (LVIA) is supported by the following technical documents, which are enclosed as Appendices:

Appendix 4.1:

- Booklet of Planning Application Photomontages prepared by Innovision

Appendix 4.2:

- 60577778-CST-LA-FIG-1 / FIGURE 1: Landscape Character and Designations County Cork
- 60577778-CST-LA-FIG-2 / FIGURE 2: Landscape Designations Cork City.

Please note that references to landscape designation figures in the text will be made as 'Figure 1' and 'Figure 2'.

4.1.1 Author Information

Name: Joerg Schulze

Title: Principal Landscape Architect, AECOM

Qualifications: Dipl. - Ing. (FH) Landscape Architecture, MILI

Joerg is a Principal Landscape Architect with over 16 years' professional experience working for clients in the private and public sector. He has a comprehensive track record in developing and managing landscape and visual impact assessments of large commercial, residential, infrastructural, renewable energy, tourism and civic developments throughout the island of Ireland. He has extensive experience in all stages of the planning, design, tender and implementation process, contract management and as consultant for Part 8 and EIA / EIAR processes. His masterplanning experience includes advice on mitigation measures to minimise landscape and visual impacts, the preparation of detailed mitigation planting schemes and general landscape design within proposed development sites to facilitate staff, visitor, tourism and/or local community requirements.

As part of the LVIA process, Joerg is also an expert in developing constraints studies, site suitability assessments, feasibility studies and associated mapping. He has prepared residential visual impact assessments, manages the production of photomontages and the preparation of ZTV/TVI mapping. He has been supervising site works and required maintenance periods for mitigation planting schemes.

Joerg is a regular expert witness at Oral Hearings/Public Inquiries and prepared affidavits for renewable energy developments. He is an experienced team leader and works closely with other disciplines. He undertakes stakeholder engagements, consultations with communities and planning authorities, and has organised and participated in public workshops.

4.2 Methodology

This section sets out the methodology for the Landscape and Visual Impact Assessment (LVIA) as a result of the Proposed Development.

4.2.1 Guidance and other Information

The following sources and guidelines were used in the assessment:

- Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports', EPA, August 2017;
- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), 3rd Edition, 2013, Landscape Institute (UK) & IEMA
- 'Photography and Photomontage in Landscape and Visual Impact Assessment', Landscape Institute Advice Note 01/2011;
- Cork County Development Plan 2014;
- Cork County Draft Landscape Strategy 2007;
- Cork County Council Municipal District Local Area Plans 2017 (Map Viewer);
- National Parks and Wildlife Service (NPWS), <http://www.npws.ie/>;
- Garden Surveys as part of the National Inventory of Architectural Heritage, <http://www.buildingsofireland.ie/>
- Irishtrails; <http://www.irishtrails.ie/>; and
- Ordnance Survey Ireland, 1:50,000 Discovery Mapping.

4.2.2 Landscape and Visual Impact Assessment Criteria

This chapter has been prepared in accordance with the Environmental Protection Agency (EPA) Draft guidance document 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports, 2017'¹, EPA guidance documents. Best practice guidance, such as the "Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, 2013, Landscape Institute (UK) & IEMA" provide specific guidelines for landscape and visual impact assessments. Therefore, a combination of the draft EPA guidelines, the Landscape Institute guidelines and professional experience has informed the methodology for the assessment herein.

¹ EPA, (2017) EPA Guidelines on the information to be contained in Environmental Assessment Reports, Draft, August 2017; Environmental Protection Agency, Co. Wexford, Ireland

The Landscape Institute guidelines require the assessment to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessment is based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor. For clarity, and in accordance with best practice, the assessment of potential effects on landscape character and visual amenity, although closely related, are undertaken separately.

The assessment acknowledges that landscape and visual effects change over time as the existing landscape external to the Proposed Development evolves and proposed planting establishes and matures.

The significance of an effect is determined by two distinct considerations:

1. The nature of the RECEPTOR likely to be affected, namely:
 - The **susceptibility** of the receptor to the type of change arising from the Proposed Development; and
 - The **sensitivity** to change is related to the **value** attached to the receptor.
2. The nature or magnitude of the EFFECT likely to occur, namely:
 - The **size and scale** of the landscape and visual effect (for example, whether there is a complete or minor loss of a particular landscape element);
 - The **geographical extent** of the areas that will be affected;
 - The **duration** of the effect and its **reversibility**; and
 - The **quality** of the effect - whether it is neutral, beneficial or adverse.

4.2.3 Assessment Process

The assessment is undertaken based on the following key tasks and structure:

- Establishment of the Baseline or receiving environment;
- Appreciation of the Proposed Development; and
- Assessment of effects.

4.2.4 Establishment of the Receiving Environment

A baseline study has been undertaken through a combination of desk based research and site appraisal in order to establish the existing conditions of the landscape and visual resources of the study area. Desk based research has involved a review of mapping and aerial photography, relevant planning and policy documents, the relevant Landscape Character Assessments and other relevant documents and publications.

4.2.5 Appreciation of the Proposed Development

In order to be able to accurately assess the full extent of likely effects on landscape character and visual amenity it is essential to develop a thorough and detailed knowledge of the Proposed Development. This includes a comprehensive understanding of its location, nature and scale and is achieved through a review of detailed descriptions of the Proposed Development and drawings (see Planning Application Drawings accompanying the application) and an on-site appraisal.

4.2.6 Assessment of Effects

The landscape and visual impact assessment seeks to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessments are based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor.

The assessment acknowledges that landscape and visual effects change over time as the existing landscape internal and external to the Proposed Development evolves. The assessment therefore reports on potential effects during both construction/operation and completion of the Proposed Development. The prominence of the Proposed Development in the landscape or view will vary according to the existing screening effects of local topography, intervening existing vegetation and building structures.

4.2.7 Landscape Effects

Landscape effects describe the impact on the fabric or structure of a landscape or landscape character.

The assessment of landscape effects firstly requires the identification of the components of the landscape. The landscape components are also described as landscape receptors and comprise the following:

- Individual landscape elements or features;
- Specific aesthetic or perceptual aspects; and
- Landscape character, or the distinct, recognisable and consistent pattern of elements (natural and man-made) in the landscape that makes one landscape different from another.

The assessment will identify the interaction between these components and the Proposed Development during construction and operational phases. The condition of the landscape and any evidence of current pressures causing change in the landscape will also be documented and described.

Landscape Value

Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory and planning agencies. However, absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource. The quality and condition is also considered in the determination of the value of a landscape. The evaluation of landscape value is undertaken with reference to the definitions stated in table 4-1.

Table 4-1 Landscape Value

Landscape Value	Classification Criteria
High	Nationally designated or iconic, unspoilt landscape with few, if any, degrading elements.
Medium	Regionally or locally designated landscape, or an undesignated landscape with locally important landmark features and some detracting elements.
Low	Undesignated landscape with few if any distinct features or with several degrading elements.

Landscape Susceptibility

Landscape susceptibility relates to the ability of a particular landscape to accommodate the Proposed Development. Landscape susceptibility is appraised through consideration of the baseline characteristics of the landscape, and in particular the scale or complexity of a given landscape.

The evaluation of landscape susceptibility is undertaken with reference to a three-point scale, as outlined in table 4-2.

Table 4-2 Landscape Susceptibility Criteria

LANDSCAPE SUSCEPTIBILITY	CLASSIFICATION CRITERIA
High	Small scale, intimate or complex landscape considered to be intolerant of even minor change.
Medium	Medium scale, more open or less complex landscape considered tolerant to some degree of change.
Low	Large scale, simple landscape considered tolerant of a large degree of change.

Landscape Sensitivity

Landscape sensitivity to change is determined by employing professional judgment to combine and analyse the identified landscape value, quality and susceptibility and is defined with reference to the scale outlined in table 4-3.

Table 4-3 Landscape Sensitivity to Change Criteria

LANDSCAPE SENSITIVITY	CLASSIFICATION CRITERIA
High	<ul style="list-style-type: none"> Landscape characteristics or features with little or no capacity to absorb change without fundamentally altering their present character. Landscape designated for its international or national landscape value or with highly valued features. Outstanding example in the area of well cared for landscape or set of features that combine to give a particularly distinctive sense of place. Few detracting or incongruous elements.
Medium-High	<ul style="list-style-type: none"> Landscape characteristics or features with a low capacity to absorb change without fundamentally altering their present character. Landscape designated for regional or county-wide landscape value where the characteristics or qualities that provided the basis for their designation are apparent or a landscape with highly valued features locally. Good example in the area of a well-cared for landscape or set of features that combine to give a clearly defined sense of place.
Medium	<ul style="list-style-type: none"> Landscape characteristics or features with moderate capacity to absorb change without fundamentally altering their present character. Landscape designated for its local landscape value or a regional designated landscape where the characteristics and qualities that led to the designation of the area are less apparent or are partially eroded or an undesignated landscape which may be valued locally - for example an important open space. An example of a landscape or a set of features which is relatively coherent, with a good but not exceptional sense of place - occasional buildings and spaces may lack quality and cohesion.
Medium-Low	<ul style="list-style-type: none"> Landscape characteristics or features which are reasonably tolerant of change without detriment to their present character. No designation present or of little local value. An example of an un-stimulating landscape or set of features; with some areas lacking a sense of place and identity.
Low	<ul style="list-style-type: none"> Landscape characteristics or features which are tolerant of change without detriment to their present character. An area with a weak sense of place and/or poorly defined character /identity. No designation present or of low local value or in poor condition. An example of monotonous unattractive visually conflicting or degraded landscape or set of features.

Magnitude of Landscape Change

Magnitude of change is an expression of the size or scale of change in the landscape, the geographical extent of the area influenced and the duration and reversibility of the resultant effect. The variables involved are described below:

- The extent of existing landscape elements that will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;
- The extent to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones;
- Whether the effect changes the key characteristics of the landscape, which are integral to its distinctive character;
- The geographic area over which the landscape effects will be felt (within the Proposed Development site itself; the immediate setting of the Proposed Development site; at the scale of the landscape type or character area; on a larger scale influencing several landscape types or character areas); and
- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

Changes to landscape characteristics can be both direct and indirect. **Direct change** occurs where the Proposed Development will result in a physical change to the landscape within or adjacent to the Proposed Development site. **Indirect changes** are a consequence of the direct changes resulting from the Proposed Development. They can often occur away from the Proposed Development site (for example, off-site construction staff parking) and may be a result of a sequence of interrelationships or a complex pathway (for example, a new road or footpath construction may increase public access and associated problems e.g. littering). They may be separated by distance or in time from the source of the effects. The magnitude of change affecting the baseline landscape resource is based on an interpretation of a combination of the criteria set out in table 4-4.

Table 4-4 Magnitude of Landscape Change Criteria (Landscape Effects)

MAGNITUDE	CLASSIFICATION CRITERIA
None	<ul style="list-style-type: none"> No change.
Negligible	<ul style="list-style-type: none"> Little perceptible change.
Low	<ul style="list-style-type: none"> Minor change, affecting some characteristics and the experience of the landscape to an extent; and Introduction of elements that is not uncharacteristic.
Moderate	<ul style="list-style-type: none"> Noticeable change, affecting some key characteristics and the experience of the landscape; and Introduction of some uncharacteristic elements.
High	<ul style="list-style-type: none"> Noticeable change, affecting many key characteristics and the experience of the landscape; and Introduction of many incongruous developments
Very High	<ul style="list-style-type: none"> Highly noticeable change, affecting most key characteristics and dominating the experience of the landscape; and Introduction of highly incongruous development.

4.2.8 Visual Effects

Visual effects are determined by the extent of visibility and the nature of the visibility (i.e. how a development is seen within the landscape); for example, whether it appears integrated and balanced within the visual composition of a view or whether it creates a focal point.

Negative visual effects may occur through the intrusion of new elements into established views, which are out of keeping with the existing structure, scale and composition of the view. Visual effects may also be beneficial, where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The significance of effects will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.

Receptors

For there to be a visual impact, there is the need for a viewer. Views experienced from locations such as settlements, recognised routes and popular vantage points used by the public have been included in the assessment. Receptors are the viewers at these locations. The degree to which receptors, i.e. people, will be affected by changes as a result of the Proposed Development depends on a number of factors, including:

- Receptor activities, such as taking part in leisure, recreational and sporting activities, travelling or working;
- Whether receptors are likely to be stationary or moving and how long they will be exposed to the change at any one time;
- The importance of the location, as reflected by designations, inclusion in guidebooks or other travel literature, or the facilities provided for visitors;
- The extent of the route or area over which the changes will be visible;
- Whether receptors will be exposed to the change daily, frequently, occasionally or rarely;
- The orientation of receptors in relation to the Proposed Development and whether views are open or intermittent;
- Proportion of the developments that will be visible (full, sections or none);
- Viewing direction, distance (i.e. short-, medium- and long-distance views) and elevation;
- Nature of the viewing experience (for example, static views, views from settlements and views from sequential points along routes);
- Accessibility of viewpoint (public or private, ease of access);
- Nature of changes (for example, changes in the existing skyline profile, creation of a new visual focus in the view, introduction of new man-made objects, changes in visual simplicity or complexity, alteration of visual scale, landform and change to the degree of visual enclosure);
- Nature of visual receptors (type, potential number and sensitivity of viewers who may be affected)

Value of the View

Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey of tourist maps and in guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. The value of the view is determined with reference to the definitions outlined in table 4-5.

Table 4-5 Value of the View

VALUE	CLASSIFICATION CRITERIA
High	Nationally recognised view of the landscape, with no detracting elements.
Medium	Regionally or locally recognised view, or unrecognised but pleasing and well composed view, with few detracting elements.
Low	Typical or poorly composed view often with numerous detracting elements.

Visual Susceptibility

The GLVIA guidelines identify that the susceptibility of visual receptors to changes in views and visual amenity is a function of:

- The occupation or activity of people experiencing the view at a particular location; and
- The extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations.

For example, residents in their home, walkers whose interest is likely to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience often indicate a higher level of susceptibility. Whereas receptors occupied in outdoor sport, where views are not important, or at their place of work, are often considered less susceptible to change. Visual susceptibility is determined with reference to the three-point scale and criteria outlined in table 4-6.

Table 4-6 Visual Susceptibility

SUSCEPTIBILITY	CLASSIFICATION CRITERIA
High	Receptors for which the view is of primary importance and are likely to notice even minor change.
Medium	Receptors for which the view is important but not the primary focus and are tolerant of some change.
Low	Receptors for which the view is incidental or unimportant and is tolerant of a high degree of change

Visual Sensitivity

Sensitivity to change considers the nature of the receptor; for example a person occupying a residential dwelling is generally more sensitive to change than someone working in a factory unit. The importance of the view experienced by the receptor also contributes to an understanding of the susceptibility of the visual receptor to change as well as the value attached to the view.

A judgement is also made on the value attached to the views experienced. This takes account of:

- Recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations;
- Indicators of the value attached to views by visitors, for example through appearance in guidebooks or on tourist maps, provision of facilities for their enjoyment (sign boards, interpretive material) and references to them in literature or art; and

- Possible local value; it is important to note that the absence of view recognition does not preclude local value, as a view may be important as a resource in the local or immediate environment due to its relative rarity or local importance.

The visual sensitivity to change is based on interpretation of a combination of all or some of the criteria outlined in table 4-7.

Table 4-7 Sensitivity to Change Criteria

VISUAL SENSITIVITY	CLASSIFICATION CRITERIA
High	<ul style="list-style-type: none"> • Users of outdoor recreational facilities, on recognised national cycling or walking routes or in nationally designated landscapes. • Residential buildings.
Medium-high	<ul style="list-style-type: none"> • Users of outdoor recreational facilities, in highly valued landscapes or locally designated landscapes or on local recreational routes that are well publicised in guide books. • Road and rail users in nationally designated landscapes or on recognised scenic routes, likely to be travelling to enjoy the view.
Medium	<ul style="list-style-type: none"> • Users of outdoor recreational facilities including public open space in moderately valued landscapes. • Users of primary transport road network, orientated towards the Proposed Development, likely to be travelling for other purposes than just the view.
Medium-Low	<ul style="list-style-type: none"> • People engaged in active outdoor sports or recreation and less likely to focus on the view. • Primary transport road network and rail users likely to be travelling to work with oblique views of the project or users of minor road network.
Low	<ul style="list-style-type: none"> • People engaged in work activities indoors, with limited opportunity for views of the Proposed Development.

Magnitude of Visual Change

Visual effects are direct effects as the magnitude of change within an existing view will be determined by the extent of visibility of the Proposed Development. The magnitude of the visual effect resulting from the development at any particular viewpoint or receptor is based on the size or scale of change in the view, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described overleaf.

- The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the development;
- The degree of contrast or integration of any new features or changes in the landscape form, scale, mass, line, height, skylining, back-grounding, visual clues, focal points, colour and texture;
- The nature of the view of the Proposed Development, in relation to the amount of time over which it will be experienced and whether views will be full, partial or glimpses;
- The angle of view in relation to the main activity of the receptor, distance of the viewpoint from the development and the extent of the area over which the changes will be visible; and
- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

The magnitude of visual effect resulting from the development at any particular viewpoint or receptor is based on the interpretation of the above range of factors and is set out in table 4-8.

Table 4-8 Magnitude of Visual Change Criteria (Visual effects)

MAGNITUDE	CLASSIFICATION CRITERIA
None	No change in the existing view.
Negligible	The development will cause a barely discernible change in the existing view.
Low	The development will cause very minor changes to the view over a wide area or minor changes over a limited area.
Moderate	The development will cause modest changes to the existing view over a wide area or noticeable change over a limited area.
High	The development will cause a considerable change in the existing view over a wide area or a significant change over a limited area.
Very High	The development will cause significant changes in the existing view over a wide area or a change which will dominate over a limited area

4.2.9 Duration and Quality of Effects

Table 4-9 below provides the definition of the duration of landscape and visual effects:

Table 4-9 Definition of Duration of Effects

DURATION	DESCRIPTION
Temporary	Effects lasting one year or less.
Short Term	Effects lasting one to seven years.
Medium Term	Effects lasting seven to fifteen years.
Long Term	Effects lasting fifteen to sixty years.
Permanent	Effects lasting over sixty years.

The quality of both, landscape and visual effects, can be Beneficial (Positive), Adverse (Negative) or Neutral according to the definitions set out in table 4-10.

Table 4-10 Definition of Quality of Effects

QUALITY OF EFFECTS	DESCRIPTION
Neutral	This will neither enhance nor detract from the landscape character or view.
Beneficial (Positive)	This will improve or enhance the landscape character or view.
Adverse (Negative)	This will reduce the quality of the existing landscape character or view.

4.2.10 Significance Criteria

The objective of the assessment process is to identify and evaluate the potentially significant effects arising from the Proposed Development. The assessment will identify the residual effects likely to arise from the finalised design taking into account mitigation measures and change over time.

The significance of effects will be assessed by considering the sensitivity of the receptor and the predicted magnitude of effect in relation to the baseline conditions to the definitions set out in table 4-11.

Table 4-11 Categories of Significance of Landscape and Visual Effects

SIGNIFICANCE CATEGORY	DESCRIPTION OF EFFECT
Major Beneficial	<p>The project will:</p> <ul style="list-style-type: none"> • Greatly enhance the character (including quality and value) of the landscape; • Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development; • Enable a sense of place to be created or greatly enhanced; and • Cause a very noticeable improvement in the existing view; and open up a new view of local landscape dominating the future view.
Moderate Beneficial	<p>The project will:</p> <ul style="list-style-type: none"> • Enhance the character (including quality and value) of the landscape; • Enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development; • Enable a sense of place to be restored; and • Cause a noticeable improvement in the existing view.
Minor Beneficial	<p>The project will:</p> <ul style="list-style-type: none"> • Complement the character (including quality and value) of the landscape; • Maintain or enhance characteristic features and elements; • Enable some sense of place to be restored; and • Cause a barely perceptible improvement in the existing view. This will typically occur where the viewer is at some distance from the development and the development newly appears in the view, but not as a point of principal focus. It will also occur where the development is closely located to the viewpoint but is seen at an acute angle and at the extremity of the overall view.
None	No change resulting from the development
Negligible Effect (applies to both, adverse and beneficial)	<p>The project will:</p> <ul style="list-style-type: none"> • Maintain the character (including quality and value) of the landscape; • Blend in with characteristic features and elements; • Enable a sense of place to be retained; and • Not result in a discernible improvement or deterioration in the existing view.
Minor Adverse	<p>The project will:</p> <ul style="list-style-type: none"> • Not quite fit the character (including quality and value) of the landscape; • Be at variance with characteristic features and elements; • Detract from a sense of place; and • Cause a barely perceptible deterioration in the existing view. This will typically occur where the viewer is at some distance from the development and the development newly appears in the view, but not as a point of principal focus. It will also occur where the development is closely located to the viewpoint but is seen at an acute angle and at the extremity of the overall view.
Moderate Adverse	<p>The project will:</p> <ul style="list-style-type: none"> • Conflict with the character (including quality and value) of the landscape; • Have an adverse impact on characteristic features or elements; and • Diminish a sense of place; and cause a noticeable deterioration in the existing view.
Major Adverse	<p>The project will:</p> <ul style="list-style-type: none"> • Be at complete variance with the character (including quality and value) of the landscape; • Degrade or diminish the integrity of a range of characteristic features and elements; • Damage a sense of place or cause a sense of place to be lost; • Cause the integrity of characteristic features and elements to be lost; and • Cause a very noticeable deterioration in the existing view; and obstruct an existing view of local landscape and the development will dominate the future view.

The significance of the effects is determined by the matrix shown in table 4-12.

Table 4-12 Significance of Effects Matrix²

SIGNIFICANCE OF EFFECTS <i>(effects rated Moderate & above are considered significant)</i>		SENSITIVITY				
		High	Medium-High	Medium	Medium-Low	Low
MAGNITUDE OF CHANGE	Very High	Major	Major	Moderate-Major	Moderate	Moderate
	High	Major	Moderate-Major	Moderate-Major	Moderate	Minor-Moderate
	Moderate	Moderate-Major	Moderate	Moderate	Minor-Moderate	Minor
	Low	Moderate	Moderate	Minor-Moderate	Minor	Minor-Negligible
	Negligible	Minor	Minor-Negligible	Minor-Negligible	Negligible	Negligible

Effects will be assessed for all phases of the Proposed Development. Construction effects are considered to be temporary, short term effects which occur during the construction/decommission phase only. Operational/residual effects are those long term effects, which will occur as a result of the presence or operation of the development.

The quality of each effect is based on the ability of the landscape character or visual receptor to accommodate the Proposed Development, and the impact of the development within the receiving context. Once this is done, the quality of the effect then is assessed as being neutral, beneficial or adverse. A change to the landscape or visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation.

4.2.11 Cumulative Effects

The approach used to determine cumulative effects has drawn on guidance on cumulative impact assessment published by the GLVIA3. Cumulative townscape and visual effects may result from additional changes to the baseline townscape or views as a result of the Proposed Development in conjunction with other developments of a similar type and scale.

The cumulative assessment includes developments that are consented but not constructed, that are the subject of undetermined applications, or are currently at scoping which are similar in type and scale to the Proposed Development.

The list of cumulative developments has been compiled from known planning applications available on Planning Search of Cork City Council's website and known proposed public sector projects.

Magnitude of Cumulative Effects

The principle of magnitude of cumulative effects makes it possible for the proposed scheme to have a major impact on a particular receptor, while having only a minor cumulative impact in conjunction with other existing developments.

The magnitude of cumulative effects arising from the proposed scheme is assessed as **very high, high, medium, low or negligible, with intermediate categories**, based on interpretation of the following parameters:

- The additional extent, direction and distribution of existing and other developments in combination with the Proposed Development;

² Note that the matrix is a guide - the determination of significance of effects also requires an element of professional judgement

- The distance between the viewpoint, the Proposed Development and the cumulative developments; and
- The townscape setting, context and degree of visual coalescence of existing and Proposed Development and cumulative developments.

Significance of Cumulative Effects

As for the assessment of townscape and visual effects, the significance of any cumulative effects follows a similar classification and will be assessed as **major, moderate, minor or negligible, with intermediate categories**. This considers both receptor sensitivity and the predicted magnitude of change.

Limitations of Cumulative Assessment

The cumulative assessment focuses on potential cumulative effects relating to the main permanent structure of each cumulative development. This is due to the uncertainty of the timing of construction activities for each of the identified developments. As a result, temporary structures and activity relating to construction have not been considered within the cumulative assessment.

4.2.12 Selection of Viewpoints

Viewpoint selection has been carried out according to the current best practice standards and the following industry guidelines:

- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/2011.

It is not feasible to take photography from every possible viewpoint located in the study area. Photography has been taken from viewpoints, which are representative of the nature of visibility at various distances and in various contexts. Viewpoint photography is used as a tool to come to understand the nature of the potential residual effects. The selection process of viewpoint locations is as follows:

- The location of viewpoints within the study area is informed by desktop and site surveys;
- Identification and selection of representative viewpoints showing typical open or intermittent views within a local area, which will be frequently experienced by a range of viewers; and
- Identification and selection of specific viewpoints from key viewpoints in the landscape such as routes or locations valued for their scenic amenity, main settlements etc.

4.2.13 Field Work

Site surveys of the study area and beyond were carried out on 28th April 2018 and 22nd January 2019 identifying the potential visibility of the Proposed Development and key viewpoints within the core study area and the wider landscape / townscape. Photomontages showing the existing view and the superimposed development on photomontages have been produced from key representative viewpoints, taking into account topography, existing buildings, screening vegetation and other localised factors. The Booklet of Planning Application Photomontages by Innovision, included in Appendix 4.1, provides details on viewpoint locations and includes Photomontages 1 - 12. The photomontage locations are also indicated in Figures 1 & 2.

4.2.14 Photomontages

Photomontages are photorealistic visualisations produced using specialist software. They illustrate the likely future appearance of the Proposed Development from a specific viewing point. They are useful tools for examining the impact of the development from a number of critical viewpoint positions along the public road network within the study area.

However, photomontages in themselves can never provide the full picture in terms of potential impacts, they can only inform the assessment process by which judgements are made. A visualisation can never show exactly what the Proposed Development will look like in reality due to factors such as; different lighting, weather and seasonal conditions which vary through time and the resolution of the image. As the photomontages are representative of viewing conditions encountered, some of them may show existing buildings or vegetation screening some or all parts of the developments. Such conditions are normal and representative.

The images provided give a reasonable impression of the scale of the development and the distance to the development, but can never be 100% accurate. It is recommended that decision-makers and any interested parties or members of the public should ideally visit the viewpoints on site, where visualisations can be compared to the 'real life' view, and the full impact of the Proposed Development can be understood.

The visual impact assessment on site identified a range of viewpoints located within the study area at varying distances from the Proposed Developments to show the effect of the development in key close, middle and distant views.

Viewpoints / Photomontages 1 - 12 show the Proposed Development including the following information:

- Existing View, showing the baseline image; and
- Photomontage, showing the Proposed Development including all visible components at full height.

Photomontage images have been produced with reference to best practice and the following industry guidelines:

- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/2011, 2011;
- Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition, Landscape Institute and Institute of Environmental Management and Assessment, IEMA, 2013; and
- Visual Representation of Wind Farms, Version 2.2, Scottish Natural Heritage, February 2017 (in relation to viewpoint selection, technical equipment, function and limitations of visualisations).

4.2.15 Zone of Theoretical Visibility (ZTV)

Mapping the extent of the area from which a development is likely to be visible is commonly referred to as a Zone of Theoretical Visibility (ZTV). ZTV prediction does not take into account the effects of seasons, lighting, weather conditions or visibility over distance. Moreover, a ZTV does not take into account the screening effects of existing vegetation or built structures and can omit topographical variations of up to 10m. Therefore, in reality, ZTV mapping's principal use is to identify viewing points for further analysis.

Considering the varied topography of County Cork, and Cork City as well as the absence of sufficient 3D data of existing building structures located within the study area, the production of a ZTV would not have been useful in the identification of viewpoints within the study area. The assessment relied therefore on comprehensive site surveys to establish the nature of visibility within the study area and to identify and review key viewpoint locations.

4.3 Characteristics of the Proposed Development

The Proposed Development consists of circa 475 no. dwelling units, a crèche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 - Project Description.

The proposed school site, adjacent to the north-eastern portion of the site, is subject to a separate planning application (reference number 18/536) and is further considered in the cumulative impacts section of this report.

4.4 Scope

4.4.1 Study Area

A study area of 2 km radius from the boundary of the Proposed Development has been selected to identify potential significant landscape and visual effects within County Cork and Cork City (refer to Figure 1 & 2 - Landscape Designations). The extent of the study area has been identified through a review of maps, aerial photographs of the development site and subsequently verified during site surveys.

It is acknowledged that the Proposed Development may be visible from locations beyond the study area, mainly from elevated locations, and as such it is important to note that the 2km study area defines the area within which potential effects could be significant, rather than defining the extent of visibility.

Photomontages have been produced to describe and illustrate views from representative viewpoints located within the study area.

4.4.2 Consultation

Consultations have been undertaken with Cork County Council from an early stage in the Landscape and Visual Impact Assessment (LVIA) process. This has enabled the desk study and data collection to be supplemented. An agreement was made on the list of representative viewpoints from which photomontages were produced. Table 4-13 provides an overview of consultations carried out.

Table 4-13 Consultation Overview

Consultee and Date	Consultation matter	Issue Raised	Response / Action taken
Cork County Council May 2018	Review of a selection of viewpoints for photomontages.	The viewpoint locations proposed were accepted and a request was made to include one additional viewpoint from the N28 at the interchange with the R609	The viewpoint from the N28 at the interchange was included.

4.4.3 Temporal Scope

The type and duration of landscape and visual effects falls within two main stages as follows:

Construction (temporary and of short duration)

- Potential physical effects arising from construction of the development on the landscape resource within the development application boundary area;
- Potential effects to landscape character or visual amenity within the wider study area as a result of visibility of construction activities or the development during construction;
- Effects of temporary site infrastructure such as - site traffic; construction compounds; and
- Potential effects of partially built development in various stages of construction.

Operational

- Potential effects of the Proposed Development on landscape resources and landscape character, including the perceptual qualities of the landscape;
- Potential effects of the Proposed Development on views and visual amenity; and
- Potential cumulative effects of the development in combination with other planned and Proposed Developments of a similar type and scale upon the landscape and visual resource of the study area.

4.4.4 Effects Scoped Out

The Proposed Development will become a permanent feature in the landscape following the completion of construction works. The assessment takes account of this in the determination of residual landscape and visual effects.

Landscape designations identified in the Cork City Development Plan have been reviewed as part of this assessment. However given the nature of the development, location, scale and setting, it is considered that likely significant impacts will occur within the boundaries and remit of Cork County Development Plan area.

4.5 Receiving Environment**4.5.1 Site Context**

The study area is located southeast of Cork city centre, at the interchange between suburban Cork city and rural Cork County. The site is located at Carrs Hill, Douglas, approximately 1 km south from Douglas village at the southern fringe of large scale suburban developments. The study area is located within undulating topography with steep hills and narrow valleys. The land slopes downhill to the north until reaching the Douglas River estuary. The R609 / Carrigaline Road runs to the east of the site and connects to the N28. The 'Vicarage' housing development and a number of detached houses are located

to the north / north-west of the site and are accessed from the R609. Ardarrig and Maryborough Woods housing estates are located further north of the site (circa 500m) and are accessed from the R609. Douglas Pitch and Putt is located approximately 350m north of the proposed development. Douglas Golf Club is located approximately 500m (centre to centre of sites) northwest of the Proposed Development. The lands to the west are an established and large suburban residential housing area (Donnybrook), while the lands immediately to the south are identified as Strategic Land Reserve (SLR). It is likely that at least part of the SLR site will be zoned for residential development in the short to medium term. The lands are in a valley that falls to the north and west. Two streams run along wooded valleys to the west, north and northeast of the site converging within the site and join the Douglas Estuary further north. Existing bands of hedgerows and trees or clusters of trees mark the field boundaries of the site which continues south.

4.5.2 Landscape Character**Landscape Character Assessment of County Cork**

The Cork County Draft Landscape Strategy, included within Cork County Development Plan 2014, identifies 16 Landscape Character Types (LCT). The development site and the majority of the study area is located within LCT 1: 'City Harbour and Estuary' character type. This LCT is considered to be of Very High Landscape Value, Very High Landscape Sensitivity and to be of National Landscape Importance. One Landscape Character Area is located within this Landscape Character Type - LCA 19 - 'Cork City and Harbour'.

The southern and western parts of the study area include a portion of LCT 6a; Landscape Type 'Broad Fertile Lowland Valleys' (Blarney-Ballincollig-Carrigaline-West to Dunmanway). This LCT is considered to be of High Landscape Value, High Landscape Sensitivity and to be of County Landscape Importance. There are four Landscape Character Areas located within this Type and the southern portion of the subject site study area traverses the LCA 58 - Enniskeane / Bandon / Ballinhassig (Broad Shallow Patchwork Lower Valley). The relevant Landscape Character Types of County Cork have been indicated in Figure 1 - Landscape Character and Designations County Cork included in Appendix 4.2.

Landscape Character Assessment of Cork City

The Cork City Development Plan 2015 - 2021 utilises the findings of the Cork City Landscape Study 2008 which identifies and describes the Landscape Character Areas and Key Landscape Assets of Corks City.

The Landscape Character Assessment contained within the Cork City Landscape Study 2008, identifies 8 Landscape Character Areas within the city as follows:

- Estuarine / Riverine
- Natural harbour
- Historic urban core
- Fine-grained inner-city residential
- Suburban residential

- Urban sylvan character
- Urban industrial / commercial
- Rural agricultural

According to Cork City Landscape Study 2008 the most northern section of the 2km study area includes the following Landscape Character Areas:

- Urban sylvan character
- Sub-urban residential
- Urban industrial / commercial

Due to the distance, nature of topography, visibility and type and scale of the Proposed Development it is unlikely for the development to have significant impacts on LCAs identified within the CCDP and therefore Cork County Landscape Character Assessment has been used as the basis for determination of the landscape value of the study area.

4.5.3 Landscape Designations

The Proposed Development and the majority of the study area is located within the Cork County Council's jurisdiction, as of March 2019. The northern extent of the 2km radius study area reaches into the administration area of Cork City Council. Therefore, the development plan objectives and designations of both, Cork County Council and Cork City Council, have been considered in this assessment and are illustrated in the following figures included in Appendix 4.2:

- Figure 1 - Landscape Character and Designations County Cork - landscape designations contained within Cork County Development Plan 2014
- Figure 2 - Landscape Designations Cork City - landscape designations contained within Cork City Development Plan 2015 - 2021

4.5.3.1 Cork County Development Plan 2014 (CDP)

The following designations have been considered for the purpose of this assessment:

- High Value Landscape
- Prominent and Strategic Metropolitan Greenbelt Areas
- Scenic Routes

High Value Landscape

Cork County Development Plan 2014 identifies "High Value Landscape" which includes the development site and the majority of the 2km study area as illustrated in Figure 1 - Landscape Character and Designations County Cork. Landscape character types which have a very high or high landscape value and high or very high landscape sensitivity and are of county or national importance are designated as High Value Landscapes (HVL).

Prominent and Strategic Metropolitan Greenbelt Areas

Cork County Development Plan 2014 identifies "Prominent and Strategic Metropolitan Greenbelt Areas". Objective GI 8-1 states that "Prominent and Strategic Metropolitan Greenbelt Areas require Special Protection". It states further to "Protect those prominent open hilltops, valley sides and ridges that define the character of the Metropolitan Cork Greenbelt and those areas which form strategic, largely undeveloped gaps between the main Greenbelt settlements".

A segment of the Prominent and Strategic Metropolitan Greenbelt Areas runs through the southern portion of the study area and borders along the southern boundary of the Proposed Development as indicated in Figure 1.

Scenic Routes

Cork County Development Plan 2014 identifies a number of scenic routes. None is located within the 2km study area radius.

The nearest scenic route (S55) is located approximately 2.5km north-east of the Proposed Development site as indicated in Figure 1. Due to the distance of this route, it will not be affected by the Proposed Development.

4.5.3.2 Cork City Development Plan 2015 - 2021 (CCDP)

The following designations have been considered for the purpose of this assessment:

- Areas of High Landscape Value (AHLV)
- Landscape Preservation Zones (LPZ)
- Views and Prospects
- Amenity Routes
- Proposed Amenity Routes
- Public Open Space

Areas of High Landscape Value (AHLV)

Areas of High Landscape Value comprise one or more of landscape assets identified in the Cork Landscape Study 2008 and typically, combine one of the primary landscape assets with other landscape assets.

The most northern extent of the 2km radius study area reaches over an AHLV at Laharn, on the northern edge of Douglas River, north of N28 / N40 interchange.

Landscape Preservation Zones (LPZs)

Landscape Preservation Zones (LPZs) are areas in need of special protection as their character and amenity value is considered to be to highly sensitive to development and as such have limited or no development potential. Typically the landscape character of LPZs combines distinctive landscape assets such as topography / slope, tree cover, setting to historic structures / other types of open spaces and other landscape assets.

LPZ SE 2 - Douglas Estuary is contained within the most northern extent of the 2km radius study area, east of SE2 the study area boundary traverses a south-west portion of LPZ SE 4 - Bessboro House.

Views and Prospects

The CCDP states: "Cork City benefits from the prominent ridges which provide a series of striking viewing points of the city. This important resource helps define the character and identity of the city" and that "In general, the city is appreciated by most people along viewpoints such as the River Lee and panoramic views from elevated sites. Amenity views and prospects are defined as those views which significantly contribute to the character and amenity of the city, namely:

- the visual envelope of the city defined by the ridges to the north and south;
- the city skyline;
- the built and natural heritage of the city"

According to 'Map 16 - Views and Prospects: South-East' of the CCDP there are three Landscape / Townscape views (LT14, LT22 and LT23) that originate in the 2km radius study area. These views however are orientated towards Cork City, to the north and north-west direction, thus opposite to the Proposed Development as indicated shown on Image 4-1.

Amenity Routes and Proposed Amenity Routes

Amenity routes provide attractive and functional connectivity to areas of public open space and recreational amenity areas including panoramic viewing points.

A number of New Amenity Routes are also proposed to ensure connectivity between City Parks and recreational infrastructure outside the city boundary.

The Objective 10.10 provides the standard for the consideration of riverside and waterway corridors, including amenity routes while Objective 11.13 states the need to pursue the creation of network of new high quality amenity routes.

The north-eastern extent of the 2km radius study area contains sections of existing Amenity Routes and Proposed Amenity Routes in the vicinity of Tramore Valley Park as indicated in Figure 2. Other Amenity Routes indicated in the Figure 2 are outside of the study area.

Public Open space

Chapter 11 of the CCDP identifies a number of Objectives in relation to provision and management of Public Open Space within Cork City.

A south-eastern portion of Tramore Valley Park, land zoned as Public Open Space in the CCDP, falls within the north-western extent of the 2km radius study area.

Local Area Plan

The 'Ballincollig Carrigaline Municipal District - Local Area Plan' (2017) sets out the detailed planning strategy and land use zoning as appropriate for the towns and villages in the Municipal District.

The local area plan contains details of the proposed upgrade of the N28 and to construct a new M28 motorway from Cork to Ringaskiddy from the existing N28 / N40 Bloomfield interchange on the South Ring Road to Ringaskiddy village. It states that "the new road will remain online using the existing N28 from the Bloomfield interchange to Carrs Hill and from there the route will go off line to the west of the existing N28 passing between the existing Shannonpark roundabout and Carrigaline. From there the route will pass to the south of Shanbally and Ringaskiddy villages where it will terminate at the new Port of Cork facility at Ringaskiddy".

Local Area Plan Objective IN-02 sets out the following: "M-28 Cork to Ringaskiddy Motorway Scheme. Finalisation of this route and development of the road will be subject to Environmental Impact Assessment and where necessary a Habitats Directive Assessment. Regard will be had in the design of the route to avoiding and mitigating impacts on sensitive environmental and heritage resources, as well as impacts on communities".

The proposed online widening of the existing N28 to motorway standard will be in close proximity of the proposed housing estate. It will likely result in cumulative landscape and visual effects when seen in conjunction with the Proposed Development. A detailed assessment of potential cumulative effects is included in Section 4.6.7 herein.

The Development Management Chapter in the current Cork City Development Plan sets out objectives for future development, which include:

Walking Routes and Cycling Routes

There are two cycling routes close to the Proposed Development. Ballybrack Valley Greenway is on the western side and a Douglas to Crosshaven cycle route exists on the eastern side, along the Carrigaline Road (R609). The Proposed Development is likely to have an effect on these routes as they run along the western and eastern boundaries of the Proposed Development.

4.5.4 Likely Future Receiving Environment / Do nothing scenario

All components of the environment are constantly changing due to a combination of natural and human processes. When predicting likely direct and indirect effects it is important to remember that there are two available for comparison: the existing environment and the environment as it will be in the future if no development of any kind were to take place - the 'do nothing' impact.

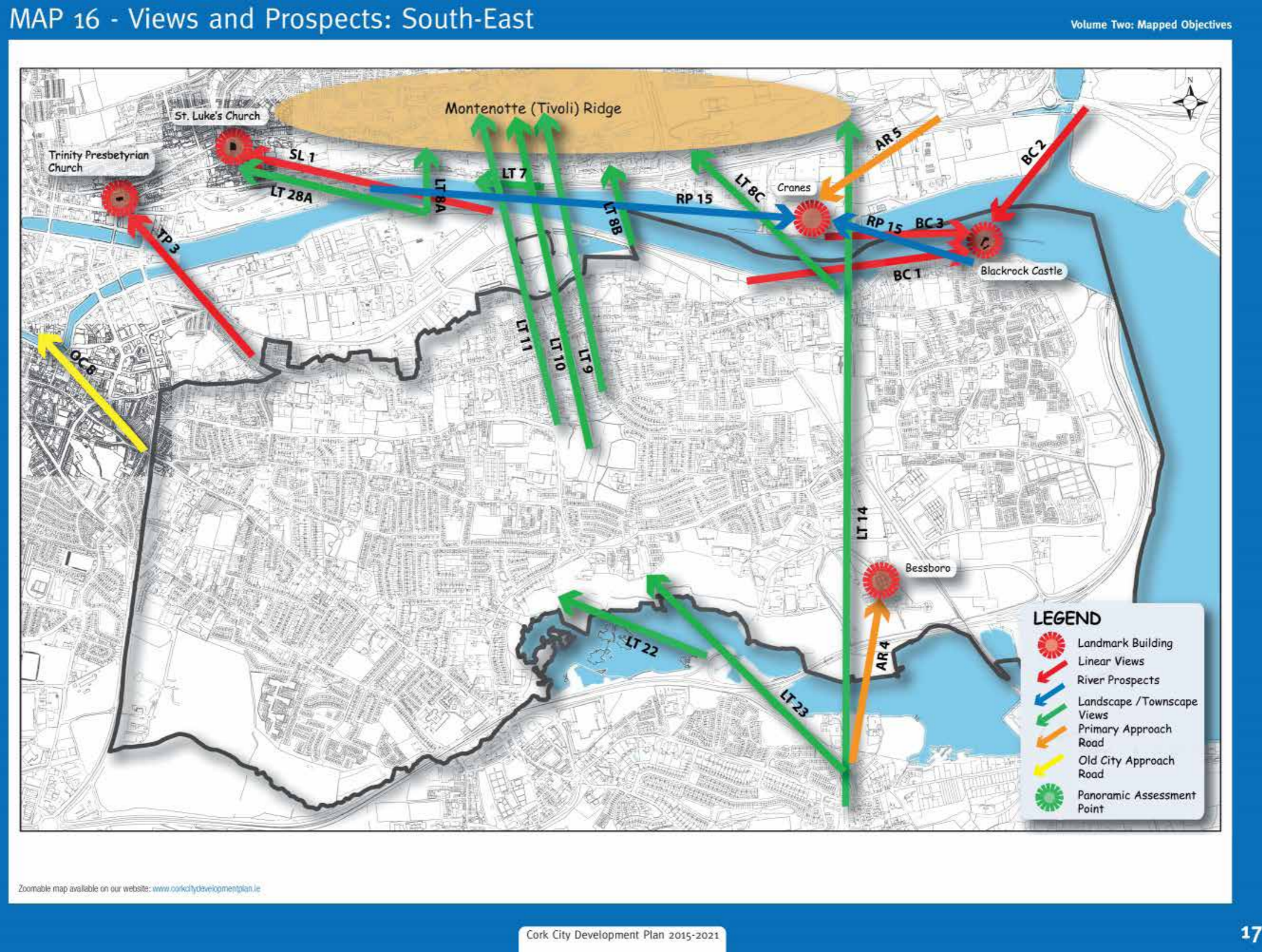


Image 4-1 Map 16 - Views and Prospects: South-East (extract from CCDP 2015 - 2021 Volume Two, Mapped Objectives)

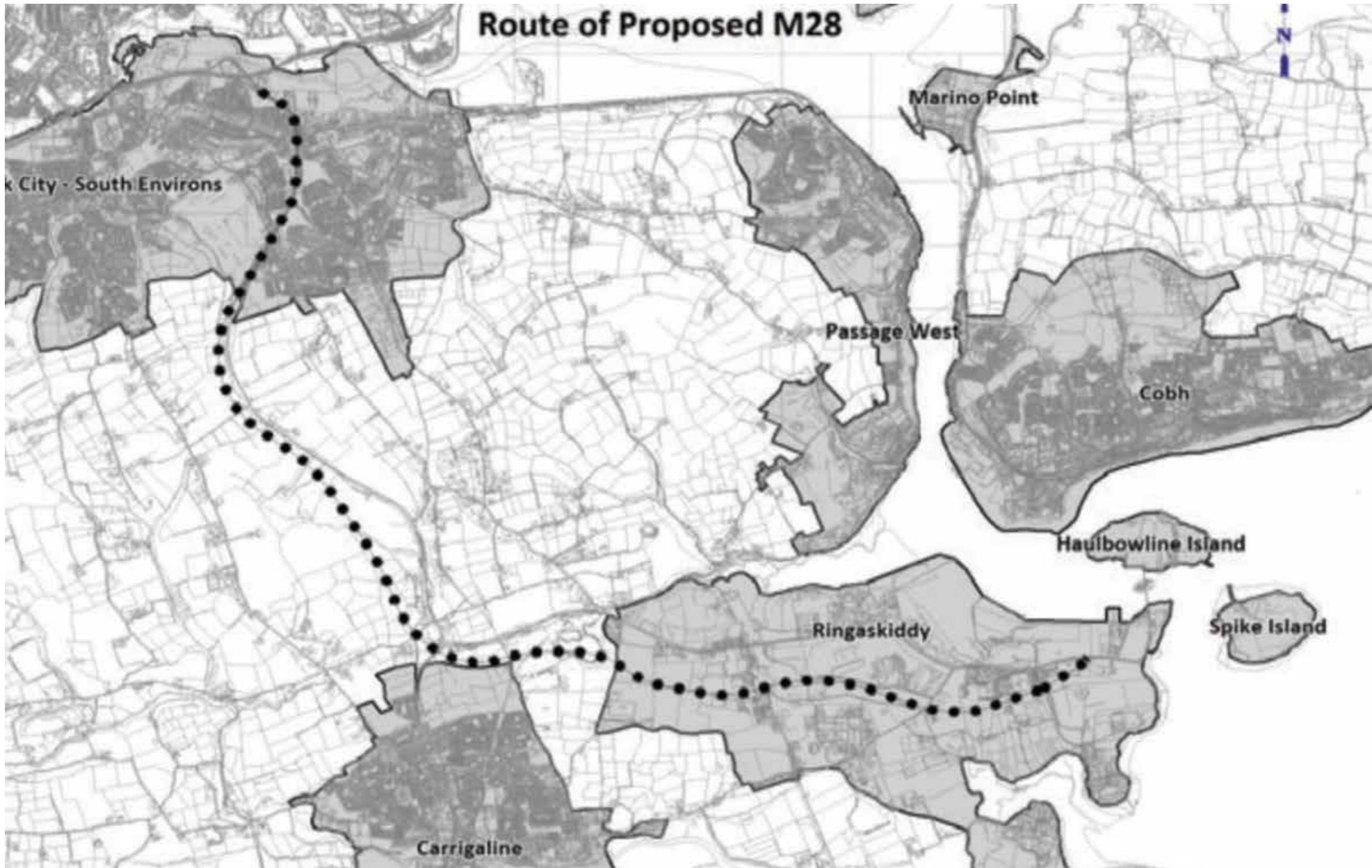


Image 4-2 Route of proposed M28 (as shown in Figure 1.4 of the Ballincollig Carrigaline District LAP)

In landscape terms, if the development did not go ahead, the Proposed Development site will remain as an area of agricultural land. The existing hedgerows and mature trees on site will remain unaltered.

In visual terms, the content in available views of the development site will remain the same, although changes would occur to existing vegetation due to maturing, pruning or natural decay.

4.6 Potential Landscape and Visual Effects

The following potential direct visual effects, direct and indirect landscape effects, as well as the duration and nature of effects arising from the Proposed Development, have been identified. Photomontages 1-12 illustrate the Proposed Development from representative viewpoint locations within the study area. A description of each photomontage is included in Section 4.6.5 herein.

4.6.1 Effects at Construction

Effects arising from the process of construction of the Proposed Development are considered to be of a similar nature and duration to those arising from the decommissioning process and therefore have not been considered separately. Where this assessment refers to potential construction effects, these are also representative of predicted decommissioning effects.

Generally, construction effects will be temporary, short term effects which occur during the construction phase only. Areas experiencing visual effects during the construction stage will vary considerably, depending on the active construction phase (refer to Chapter 2 - Project Description).

The site entrances will be formed immediately on commencement of the works on the site. However, not every entrance will be utilised immediately as it will depend on the construction phase that is active.

The initial entrance will be located to the south of the Templegrove Apartments. The initial works will include the construction of the site compound, access road and car park area inside this entrance. This site entrance is likely to affect the local residents in the Templegrove Apartments as construction traffic, including heavy and light vehicles, travelling to and from the Proposed Development will travel via this entrance for Phase 1 only. The existing vegetation buffer will provide a degree of screening between the site and the receptors thus minimising the construction impact. The residents of the houses in 'The Vicarage' are likely to be more affected by the construction phase. There will be a greater level of visibility of the site from this area, especially during the winter months.

A second site entrance will be located directly off Carrigaline Road / R609. The effects of this entrance will be experienced by road users and single dwellings along the R609. On commencement of the project, this access point will facilitate the construction of the proposed Moneygurney Stream Bridge. The

construction works will require a crane to be on site, which will be visible from the surrounding areas. Construction traffic associated with bulk excavation works will be undertaken following completion of the Moneygurney Stream Bridge and will be via Carrigaline Road / R609. There will be some minor disturbances along Carrigaline Road during the construction. It is estimated that a very limited number of construction employees are likely to travel to the site during peak hours. The construction traffic will have a greater impact in the AM peak time traffic rather than the PM peak. The second entrance will stay active during phase two and three but phase four will require the construction of a third construction access also on the Carrigaline Road (approximately 240m south of the second entrance / access point). As there are less construction workers and HGV's anticipated to be required for phase 4, the effects along the Carrigaline Road are likely to be negligible during Phase 4.

Landscape and visual effects during the construction stage will be experienced in the vicinity of the development site, from locations with views of the Proposed Development site and along the roads where construction traffic will travel. Existing intervening vegetation will partially screen the site clearance, earthworks, construction compound, construction works and the associated machines moving on the construction site. The removal of vegetation during site clearance and earthworks will be a permanent effect. During the construction works, portions of the proposed works, associated machinery and plant machinery will be visible from a number of often elevated viewpoints within the study area and potentially from beyond the study area. Due to the movements of construction staff and equipment, it may be more noticeable to a receptor in comparison to a relatively static site at operation.

The effects arising during construction will result from machinery, personnel, excavations, traffic and material movements. Landscape and visual effects will be highest within 500m radius from the Proposed Development site boundary. The visibility of construction works within the wider study area (beyond 500m from the Proposed Development boundary) is limited and may include the upper sections of machinery (for example cranes or containers). The landscape and visual effects and their significance at construction stage will be temporary, adverse and range from minor adverse in the wider study area to moderate - major adverse for areas in close proximity, up to a 500m radius from the Proposed Development site boundary.

4.6.2 Effects at Operation

Potential landscape and visual effects will be assessed for the Operational Stage, i.e. upon completion of the scheme. In addition, residual effects will be assessed, which take into account effects arising from the development following implementation and establishment of proposed mitigation measures.

Operational effects will result in:

- Potential and residual effects of the development on landscape resource and landscape character, including the perceptual qualities of the landscape;
- Potential and residual effects of the development on views and visual amenity of the area including likelihood of the development to alter the

composition of views within the study area; and

- Potential cumulative effects of the development in combination with other planned and Proposed Developments of similar type and scale upon the landscape and visual resource of the study area.

4.6.3 Landscape Effects

The following potential direct and indirect landscape effects arising from the Proposed Development have been identified, along with their duration and quality.

Direct or indirect effects on the fabric of the landscape and its receptors are closely related to the nature and extent of visibility. The Proposed Development is located within a green field site, bounded by and traversed by a number of existing mature hedgerows and bands of trees. The Proposed Development site is located in Landscape Character Type 1 'City Harbour and Estuary' (LCT1), which according to Cork County Draft Landscape Strategy is of very high landscape value and sensitivity and of National Landscape Importance. According to Cork County Development Plan 2014 the site, in its entirety, is also a part of an area designated as 'High Value Landscape' (HLV). The site is located outside an area designated as 'Prominent and Strategic Metropolitan Greenbelt'. The southern site boundary will border along this designation. Lands immediately to the south are identified as Strategic Land Reserve (SLR), which is likely that sections of this area will be zoned for residential development in the short to medium term. Key features surrounding the Proposed Development include a strip of mature woodland to along the western site boundary and undulating topography of the adjacent areas together with built up residential housing estates to the north, east and west of the Proposed Development.

A significant alteration in landscape character will occur at the site location. Direct and long term change will occur locally where the Proposed Development will be physically located. The landscape character at site location will change from rural agricultural to a suburban residential. The Proposed Development aims to retain a significant number of existing trees on site. A detailed landscape masterplan includes the retention of existing vegetation and proposes new planting to supplement the site with additional woodland, hedges and parkland trees thus minimising the impact on tree cover within the area and supporting the integration of the Proposed Development into its environs. At the site location, the magnitude of landscape change is considered very high and the resulting significance is major adverse.

In the context of the wider area, the Proposed Development will be perceived in conjunction with adjacent existing large scale residential developments, which are located to the north, east and west of the site across valleys and hills. The Proposed Development will be seen as an extension of the suburban fringe further to the south. The Proposed Development is therefore not in contrast with the existing overall landscape character of the study area. The proposed development will result in an intensification of the suburban character already prevailing in the eastern, western and parts of the northern study area. Indirect change will occur outside of the Proposed Development site boundary, where the visibility of the Proposed Development influences the perception of the

character of the landscape. The indirect change in landscape character will be greatest in its immediate and nearby surroundings as it will extend the suburban fringe of the Douglas area and therefore of suburban Cork further south. The magnitude of change for nearby areas (within approximately 300m) is considered moderate to high as the development will introduce additional suburban elements to the area at elevation, which is not uncharacteristic to the wider area. The significance of landscape effects on the landscape character in nearby areas is therefore considered to be moderate adverse at operation.

Indirect change and the significance of landscape effects will reduce quickly with approximately 300-500m distance from the site boundary, due to intervening vegetation, topography and built structures. Landscape effects will range between low to moderate adverse with increasing distance from the Proposed Development. The significance is considered to range between minor - moderate adverse.

Changes to the landscape character in the remaining study area, beyond approximately 500m are considered low to negligible. The significance is considered to range between minor adverse to negligible neutral. While a change in landscape character may be noticeable in the distance, particularly from elevated locations, the Proposed Development will be seen in conjunction with other existing similar developments. It will integrate therefore into the existing prevailing suburban landscape character particularly in views from the north, west and east. The alteration to the landscape character in views from the south is mainly screened by intervening vegetation and topography at this distance. The Proposed Development will therefore not result in a change or modification of the wider landscape character. The landscape change at middle or long distances (1km and beyond) will range from negligible to none, with exception of elevated areas with views of the site. The significance is considered minor to negligible neutral as the development site will integrate in the overall pattern of the surrounding landscape. Table 4-14 summarizes the landscape effects.

Table 4-14 Summary of Landscape Effects

RECEPTOR	SUSCEPTIBILITY	SENSITIVITY	MAGNITUDE OF LANDSCAPE CHANGE	DIRECT/INDIRECT	SIGNIFICANCE OF LANDSCAPE CHANGE
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) within the Proposed Development site	Medium	High	Very High	Direct	Major Adverse
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) outside the Proposed Development within approximately 300m of the Proposed Development site boundary	Medium	High	Moderate - High	Indirect	Moderate Adverse
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) outside the Proposed Development within approximately 300-500m of the Proposed Development site boundary	Medium	High	Low - Moderate	Indirect	Minor - Moderate Adverse
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) outside the Proposed Development beyond approximately 500m of the Proposed Development site boundary	Medium	High	Low - Negligible	Indirect	Minor Adverse, Negligible Neutral
Landscape character type 'Broad Fertile lowland Valleys' for areas located beyond approximately 500m from the Proposed Development site boundary	Medium	High	Low - Negligible	Indirect	Minor Adverse, Negligible Neutral
Prominent and Strategic Metropolitan Cork Greenbelt Areas - adjacent to Proposed Development site	Medium	High	Moderate	Indirect	Moderate Adverse
High Value Landscape within the Proposed Development site	Medium	High	Very High	Direct	Major Adverse
High Value Landscape within approximately 300m of the Proposed Development site	Medium	High	Low-Moderate	Indirect	Moderate Adverse
High Value Landscape beyond approximately 300-500m of the Proposed Development	Medium	High	Negligible	Indirect	Negligible Neutral

4.6.4 Visual Effects

The Proposed Development is located on an elevated and sloping agricultural site. Existing vegetation can quickly provide partial or full screening to receptors when moving away from the site due to the undulating topography of the surrounding landscape. Visual effects resulting from the Proposed Development will be experienced from private and publicly accessible places. The majority of significant views will be experienced within the core study area where open or partial views of the development are possible, particularly in views from close proximity and at elevation, up to approximately 300-500m radius.

Highest visual effects will likely occur in short and middle distance views, particularly from elevated areas, where there are no or few intervening existing building structures and / or vegetation. The magnitude of visual effects is considered to range from moderate to high. The resulting significance is considered to range from moderate to major adverse.

In addition, visibility resulting in significant effects from locations along the local road network within the study area will be limited to areas in close proximity to the development site as views will become quickly partially or fully obstructed by intervening building structures, vegetation or topography when moving further away from the site. Receptors that are using the local road network will be less sensitive to change to those that are in residential or amenity areas.

Existing large residential housing estates are located in the immediate context of the Proposed Development. Likely locations experiencing significant effects will be those with views of the site from Maryborough Ridge, Maryborough Woods and Donnybrook. Views of the Proposed Development will also open from areas within Douglas Golf Club. Visibility from the national (N28, N40) and regional road network (R609, R610, R851) located within the study area will be mainly fully or partially screened by intervening vegetation and topography. However, sections of the R609 will experience open views when passing the north-eastern site boundary. Short intermittent and partially screened views of the Proposed Development will be experienced from the N28 when passing the junction with the R609. The receptor groups made up of local residents will have a higher sensitivity to change than the road users, which focus on traffic and not primarily on the view.

Long distance views from the wider study area beyond 500m and further will likely be possible from elevated locations or tall buildings as far as from Cork City. However, considering the distance to the Proposed Development and existing sub-urban developments including housing estates adjacent to the proposal, the development will only form a small part in overall wide, panoramic views and therefore integrate into the prevailing existing urban / sub-urban character of the view. The magnitude of visual effects is considered to range from moderate to low in views within 500m to 1km and low to negligible in views beyond 1km. The significance is considered to range from moderate adverse to minor neutral within 500 to 1km and minor to negligible neutral in views beyond 1km. It is considered that the visibility of the proposal will not be material in long distance views.

A detailed description and analysis of visual effects illustrated in 12 photomontages produced from representative viewpoints located within the core study area of 1km, as well as a summary table is provided in Section 4.6.5 below.

4.6.5 Viewpoint / Photomontage Descriptions

Photomontages 1-12 illustrate a range of existing views from representative viewpoints within the core study area of 1km together with superimposed computer images depicting the Proposed Development. A description of visual effects in Year 1 at completion of construction works and prior to the establishment of landscape mitigation measures on visual receptors is described herein. The Booklet of Photomontages is included in Appendix 4.1. The change of visual effects following the establishment of landscape mitigation measures is described in Section 4.8 - Residual Effects.

Viewpoint 1 - View southeast from Templegrove Housing Estate

This viewpoint is representative of views looking southeast from 'The Vicarage'. The distance to the nearest section of the Proposed Development boundary from this viewpoint is approximately 10m. This road is used by residents living along this cul-de-sac.

This view has been assessed at community level, as it is shared among residents approaching their houses, the value of this view is considered to be medium. The visual receptors are mainly local residents looking southeast of the northern development site boundary. The sensitivity and susceptibility to change is considered high as the main receptor groups will be local residents who experience this view on a daily basis.

The Proposed Development will not significantly alter this view as the majority will be screened by existing mature vegetation. The outlines of houses will become slightly more visible during the winter months when foliage is absent. The magnitude of visual change is considered low. The resulting significance of the visual effects is considered to be minor neutral.

Viewpoint 2 - View east from Templegrove Housing Estate

This viewpoint is representative of views looking east from the eastern end of 'The Vicarage' Cul de Sac. The distance to the nearest site boundary from this viewpoint is approximately 30m. This road is used by local residents.

This view has been assessed at community level, as it is shared among residents approaching their houses, the value of this view is considered to be medium. The visual receptors are local residents looking east towards the Proposed Development. The sensitivity and susceptibility to change is considered high as the receptor will experience this view on a daily basis.

A portion of the northern section of the Proposed Development will be visible in this view. The upper sections of the crèche building will become visible in the middle distance as well as the upper sections of the proposed apartment buildings in the background. The Proposed Development will alter this view due to the introduction of the Proposed Development, the replacement of existing woodland and the partial obstruction of the view into the distance. The magnitude of visual change will be moderate-high. The Proposed Development will extend the suburban character of the foreground to the middle ground and background and alter the existing view. The significance of visual effects is considered moderate-major adverse. The Proposed Development will intensify and extend the current suburban character seen in the foreground across the majority of this view.

Viewpoint 3 - View south from R609 / Carrigaline Road adjacent to Darraglynn Nursing Home

This viewpoint is located adjacent to Darraglynn Nursing Home, Carrigaline Road and is representative of views looking south when traveling along the Carrigaline Road (R609) and from the entrance to Darraglynn Nursing Home. The distance to the nearest site boundary from this viewpoint is approximately 20m.

The value of this view is considered to be medium. The visual receptors are residents and visitors to the adjacent nursing home, road users, pedestrians and cyclists traveling along the Douglas to Crosshaven cycle route. This view is experienced as a sequence of views while moving along the R609. The susceptibility to change is considered high as views experienced by the residents of Darraglynn Nursing Home are likely to be focused on the Proposed Development. The sensitivity is considered high due to static views experienced by residents of the nursing home.

The Proposed Development will result in a considerable change to the existing view. Upper areas of the Proposed Development will be seen along the ridgeline against the sky in the background. Sections of the proposed green walls / reinforced slopes and houses at lower elevations will also become visible in the middle ground of this view. The Proposed Development will change the existing rural landscape in this view to a suburban context extending views of existing suburban housing estates nearby into this view. The magnitude of change is considered high and resulting significance of visual effects is considered to be moderate to major adverse as the Proposed Development will be the main focus in this view.

Viewpoint 4 - View southwest from R609 / Carrigaline Road

This viewpoint is representative of views looking southwest when traveling along the Carrigaline Road (R609). The distance to the nearest site boundary from this viewpoint is approximately 20m.

The value of this view is considered to be medium. The visual receptors are residents of the adjacent properties, road users, pedestrians and cyclists traveling along the Douglas to Crosshaven cycle route. (R609). For road users this view is experienced as a part of a sequence of views moving through the area, however, residents of the adjacent properties will experience this view statically and on a daily basis. The susceptibility and sensitivity of residential receptors to change is considered high as views will be experienced daily by residents of the adjacent properties.

Road users will experience mainly open views of the development along this section of the R609. Residents will also experience open views of the eastern part of the development from their back gardens and rear facing windows. However, existing retained vegetation will obscure sections of the Proposed Development. The proposal will result in a considerable change in this view replacing rural landscape with a suburban landscape. However, the retention of existing trees will help integrating the development in this view. The magnitude of change is considered to be moderate to high and the resulting significance of effects is considered to be moderate to major adverse.

Viewpoint 5 - View northwest from R609 / Carrigaline Road in the vicinity of the south-eastern end of the Proposed Development

This viewpoint is representative of views looking northwest when traveling along the Carrigaline Road (R609) on the south-eastern end of the Proposed Development. It is also representative of views from front garden entrances experienced by residents of the adjacent properties. The distance to the nearest section of the site boundary from this view point is approximately 10m.

The value of this view is considered to be medium. Visual receptors are residents of the adjacent properties, road users and cyclists traveling along the Douglas to Crosshaven cycle route. (R609). Road users will experience this view as a part of a sequence of views moving through the area, however, for residents of the adjacent properties the view will be static and experienced daily. The susceptibility and sensitivity to change is considered to be high because views will be experienced by residents of the adjacent properties on a daily basis.

The Proposed Development will be screened by existing vegetation in views from this and similar locations in the vicinity. The majority of existing vegetation in this view will be retained. During the winter months, shapes of the Proposed Development will likely become noticeable through the road side vegetation. However, the Proposed Development is well set back from the existing road side vegetation, and potential winter visibility is therefore not considered significant. Overall, the Proposed Development will not alter this view. The magnitude of visual effects is considered negligible and the resulting significance of visual effects is considered negligible neutral.

Viewpoint 6 - View west / northwest from The Oaks within Maryborough Ridge Housing Estate

This viewpoint is representative of views looking northwest from the most western part of The Oaks within Maryborough Ridge housing estate. The distance to the nearest section of the site boundary from this viewpoint is approximately 270m.

The value of this view is considered medium; it depicts a view shared among residents of the most western portion of this residential estate. The visual receptors are mainly residents of the adjacent buildings when approaching their properties; similar but more elevated views will be experienced from the upper windows of the adjacent houses. The sensitivity and susceptibility to change is considered high as receptors will experience this view on a daily basis.

Views of the Proposed Development will be mainly screened by the existing mature vegetation, which will not be affected by the Proposed Development. Sections of the Proposed Development may become visible during the winter months through mature vegetation in the middle ground. The magnitude of visual effects is considered to be negligible and the resulting significance of the visual effects is considered to be negligible neutral.

Viewpoint 7 - View northwest from the N28 road bridge over the R609.

This viewpoint is representative of views looking northwest when traveling along the N28 at the Douglas turn off connecting to the R609. The distance to the site boundary from this viewpoint is approximately 200m.

The value of this view is considered to be medium, it is usually seen at a glimpse while travelling along the N28. The visual receptors are primarily road users traveling at high speeds and focusing on traffic rather than the view. The susceptibility and sensitivity to change is considered to be medium. This view is considered to be a glimpsed view over a short distance when approaching and crossing the bridge. View prior and shortly after this location are screened by intervening vegetation.

The upper sections of the Proposed Development (rooftops) will become visible towards the centre of this view in the middle ground. The upper most sections of the proposed apartment blocks along Carrigaline Road will also become visible in the middle distance. The rooftops of the Proposed Development will be seen against the skyline behind the hill in the middle ground, this will intensify slightly the suburban features in this view. However, the Proposed Development will mainly be screened by topography and mature trees in the middle distance. The magnitude of visual effects is considered low and the resulting significance of visual effects is considered to be minor neutral.

Viewpoint 8 - View northeast from an elevated green space within Bracken Court Housing Estate at Donnybrook Hill

This viewpoint is representative of views looking northeast from an elevated green space within the Bracken Court Housing Estate. The distance to the nearest site boundary from this viewpoint is approximately 300m.

This view is shared by the local community, as the view is taken along the main access road to the wider estate. The value of this view is considered to be medium. The visual receptors are local residents and pedestrians. The susceptibility and sensitivity to change is therefore considered to be high.

The majority of the Proposed Development will be screened by existing intervening vegetation. However, a number of properties will become visible along the upper slopes of the Proposed Development on the hill in the background. This will extend suburban structures of the fore and middle ground into the currently rural background. Existing retained vegetation will help integrating the proposal. The Proposed Development will not alter the overall character of the view. The magnitude of visual change is considered to be low-moderate and the resulting significance of visual effects is considered to be minor-moderate neutral.

Viewpoint 9 - View east from Calderwood Heights (Donnybrook)

This viewpoint is representative of views looking east from Calderwood Heights in the Donnybrook area. The distance to the nearest site boundary from this viewpoint is approximately 70m.

The value of this view is considered to be medium. Visual receptors are local residents and pedestrians. The view depicts an open space within the development seen against a high canopy of a tree lined boundary. The sensitivity and susceptibility to change is considered high as the main receptor groups will be local residents which experience this view on a daily basis.

Tall existing vegetation will screen the majority of the Proposed Development. However, the proposal will become partially visible during the winter months as absent foliage will allow for views through the existing vegetation. Sections of the Proposed Development, visible during winter, will result in a discernible change in this view as the Proposed Development will introduce an additional suburban element to the view. The magnitude of change is considered to be negligible during the summer months. The resulting significance of visual effects is negligible neutral. The magnitude of change during the winter months will be low resulting in a minor adverse significance.

Viewpoint 10 - View southeast from Grange Park Housing Estate

This viewpoint is representative of an open view looking southeast from Grange Park. The distance to the nearest section of the Proposed Development boundary is approximately 750m. The view contains existing residential housing estates in the foreground, middle ground and background including uphill on nearby hills.

The value of this view is considered to be medium; the visual receptors are the local residents. The sensitivity and susceptibility to change is considered to be high as wide angle, panoramic views can be experienced from viewpoints along this road and upper storey windows of the adjacent south, southeast facing properties.

The most elevated portions of the Proposed Development will be seen along the ridge of an existing hill in the background of this view. The proposed houses will be seen against a backdrop of existing vegetation and just below the

current skyline. While it will be discernible, the Proposed Development will not become a new focus in this view. It continues the visibility of residential housing estates further into the background integrating into the existing prevailing character of this view. The magnitude of visual change is therefore considered low to moderate and resulting significance of visual effects is considered to be minor to moderate neutral.

Viewpoint 11 - View south from a green off a footpath linking Maryborough Mall and Welwyn Road within Maryborough Woods Housing Estate.

This viewpoint is representative of open views looking south. The distance to the nearest section of the Proposed Development boundary from this viewpoint is approximately 370m.

The value of this view is considered to be medium-high. The visual receptors are pedestrians who also are likely to be local residents. Similar views are experienced from upper storey windows of the south east facing properties located along Maryborough Mall.

The susceptibility and sensitivity to change are considered high as local residents will experience this or similar open views on a daily basis.

The closest part of the Proposed Development boundary is located approximately 750m from this viewpoint. The Proposed Development will be visible in the middle distance and alter sections of currently rural landscape into a suburban townscape intensifying the prevalence of residential housing estates in this view. Views of the hills in the background will remain unobstructed. Residents of properties along Maryborough Mall together with residents of Augusta Drive and Welwyn Road will experience open views of the Proposed Development, particularly the upper sections. The magnitude of visual change is considered to be high and resulting significance of visual effects is considered to be moderate to major adverse.

Viewpoint 12 - View northwest from Carrigaline Road R609 when travelling north, approximately 400m south east from Darraglynn Nursing Home.

This viewpoint is representative of views looking northwest when travelling along the Carrigaline Road (R609). The viewpoint is located adjacent (10m) to the eastern site boundary.

The value of this view is considered to be medium and the visual receptors are mainly road users. The susceptibility and sensitivity to change are considered to be medium as the users of the R609 are likely to focus on traffic rather than on views on this curving section of the R609.

The Proposed Development will require removal of some existing hedgerow vegetation along the western road verge. The removal of vegetation together with the proposed buildings will change the character of this view over a limited area from a rural road in the countryside to a road entering a suburban area. During the winter time, partially obscured views open up towards the central part of the Proposed Development, located west of the R609. The magnitude of visual change is considered to be high. The resulting significance of visual effects is considered to be moderate to major adverse.

Table 4-15 summarizes the visual effects from representative viewpoint locations.

RECEPTOR	SUSCEPTIBILITY	SENSITIVITY	YEAR 1 - excluding mitigation	
			MAGNITUDE	SIGNIFICANCE
Photomontage 1	High	High	Low	Minor Neutral
Photomontage 2	High	High	Moderate to High	Moderate to Major Adverse
Photomontage 3	High	High	High	Moderate to Major Adverse
Photomontage 4	High	High	Moderate to High	Moderate to Major Adverse
Photomontage 5	High	High	Negligible	Negligible Neutral
Photomontage 6	High	High	Negligible	Negligible Neutral
Photomontage 7	Medium	Medium	Low	Minor Neutral
Photomontage 8	High	High	Low to Moderate	Minor-Moderate Neutral
Photomontage 9	High	High	Negligible (Summer) Low (Winter)	Negligible Neutral (Summer) Minor Adverse (Winter)
Photomontage 10	High	High	Low to Moderate	Minor to Moderate Neutral
Photomontage 11	High	High	High	Moderate to Major Adverse
Photomontage 12	Medium	Medium	High	Moderate to Major Adverse

4.6.6 Cumulative landscape and visual effects

Cumulative landscape and visual effects may result from additional changes to the baseline landscape / townscape or views as a result of the Proposed Development being seen in conjunction with other developments similar in scale, type and nature. A list of cumulative schemes that have planning consent or are in the planning process is enclosed overleaf. Developments that are currently under construction are considered to be part of the landscape and visual baseline.

Table 4-16 Cumulative developments identified

PLANNING REFERENCE	PROPOSAL	STATUS	LOCATION IN RELATION TO PROPOSED DEVELOPMENT	RELEVANCE TO THIS ASSESSMENT
18/5369	24 Class-Room Primary School	Approved by CCC in October 2018. Appealed, with decision due 19th March 2019	Adjacent to north-eastern site boundary	Relevant
18/6245	48 Residential units at Clarendon Brook	Approved 19 December 2019. First party appeal - due for decision by ABP on 29 May 2019.	Approx. 0.8km northwest along the R609	Relevant
16/07271	200 Unit Residential Scheme at Maryborough Ridge Moneygurney Douglas, Co. Cork	Approved in November 2017	Approximately 500m to the southeast on the hillside of Maryborough	Relevant
Part 8 pending	Greenway improvements	Progression to detailed design with Cork County Council (CCC)	Within the application site	Development different in scale, type and nature. However, sections of the proposed Greenway is located within site proposed site boundary and have therefore been considered further in this assessment
Ha 0053	M28	Approved by ABP. Judicial Review of decision underway. Hearing due to be held on 26th February 2019.	Within 300m from the nearest site boundary	Development different in scale, type and nature. However located in close proximity hence considered further in this assessment
18/5814	Lidl Discount Supermarket and 5 apartments.	Approved by CCC in September 2018. Appeal invalidated	Approx.1.8km north along the R609	No combined visibility / not relevant
18/6246	600 Pupil Secondary School.	Live planning application. Further information requested in October 2018. Response not yet received. Key relevant issue on FI is request for revised school travel plan and updated transport assessment.	Approx.1.5km north along the R609	No combined visibility / not relevant

Cumulative effects with 24 Class-Room Primary School development

The proposed primary school will be located adjacent to the Proposed Development resulting in combined views. Both developments could be seen as part of each other in the emerging new suburban context of the area. The magnitude of cumulative effects is considered medium. The significance is considered moderate adverse as the visibility of both developments together will increase the prevalence of suburban development / character in available views.

Cumulative effects with 48 residential units at Clarendon Brook development

Combined views of the Proposed Development and the Clarendon Brook development will be possible from sections along Carrigaline Road / R609. Cumulative effects will be low as both developments will be seen in conjunction with surrounding existing residential housing estates. The significance is considered to be minor adverse.

Cumulative effects with 200 residential units at Maryborough Ridge

Combined views of the Proposed Development and the permitted development will be limited to elevated locations within the proposed and permitted development sites or from elevated locations west of the Castletreasure development, such as Donnybrook Housing Estate or Grange Park Housing Estate as well as in views south from Douglas Golf Club. These views are mainly long or middle distance views. Cumulative effects will be low as both developments will be seen in conjunction with surrounding existing residential housing estates. The significance is considered to be minor adverse. Successive views will be experienced when travelling along the N28, in the vicinity of the junction with Carrigaline Road / R609, where intermittent views of the permitted development or the Proposed Development will be possible. However, the viewer will need to turn its head to see either one or the other development.

Cumulative effects with Greenway Improvements development

Sections of the proposed Greenway are located within the Proposed Development site. They will be located within a valley along the eastern and north-eastern side. A proposed bridge into the proposed Castletreasure development from Carrigaline Road will traverse the proposed Greenway. The Greenway alignment will remain largely unaffected by the Proposed Development. Linkages to the proposed development are planned in order to connect both developments with each other.

The Greenway development is different in scale and nature when compared with the Proposed Development. However, the Castletreasure development includes a number of footpaths and walking routes through the various parts of the estate. Therefore, there will be cumulative effects resulting from the intervisibility of both developments, particularly at proposed connecting points between both schemes and where the proposed bridge will traverse the Greenway. The magnitude of change is considered moderate. The significance of the intervisibility between both developments will be moderate beneficial. The valley, where the Greenway will be located, will remain largely unchanged

apart from the bridge development and access ramps to the Greenway from the Proposed Development. The interconnection of both developments is positive as it provides an opportunity to integrate both developments together enhancing the nature, character and amenity value of the subject site.

Cumulative effects with M28 development

Combined views of the proposed M28 development and the proposed Castletreasure residential development will likely increase following the construction of the M28 due to substantial earthworks and vegetation removal required to facilitate the M28 junction with the R609. Views of the Proposed Development will be available for a longer stretch when travelling along the M28 at this section.

The main receptor group will be road users who are focused on traffic rather than the view. However, the M28 development is not of similar type, nature and scale when compared to the residential development at Castletreasure. Therefore, there will be no cumulative effects resulting from the intervisibility of both developments.

4.6.7 Lighting Effects

The Proposed Development is located in an area where the night sky changes over from a medium district brightness of large scale housing estates to the darkness of the rural hinterland, which in this area is still affected by the general glow of Cork City to the north. The existing night sky of the Proposed Development site is considered to be mainly dark. The fringes of the site to the northeast, north and west are affected by lights of nearby or adjacent housing estates particularly during the winter season. The Proposed Development with street lighting and lights coming from the proposed buildings will move the transition area between suburban medium district brightness to darkness further to the south.

The introduction of lighting as part of the Proposed Development will introduce a lit environment to the night sky at the Proposed Development site. Additional lighting will likely be recognisable in areas up to approximately 500-1000m radius from the site. It will be recognisable from locations mainly to the east, north and west of the site. The magnitude of change in visual effects within approximately 500m from the Proposed Development boundary will be moderate to high as a currently dark night landscape will be replaced by a lit environment. The significance of these effects is considered moderate adverse. The significance of effects will reduce to minor adverse and negligible neutral with increasing distance from the Proposed Development. The site will also be seen in conjunction with other lit up intervening housing estates and the general glow of Cork City in views to the north, northeast and northwest.

4.7 Mitigation Measures

Mitigation is a term used to describe the measures or actions that may be taken to minimise environmental effects. The purpose of mitigation is to avoid, reduce and where possible remedy or offset, any significant adverse direct and indirect effects on the environment arising from the Proposed Development.

The principal mitigation for the Proposed Development is inherent in the design of its architecture, public realm and open space, which has evolved through an iterative process of assessment and consultation. There are no operational management measures required in respect of landscape and visual issues.

The proposed mitigation measures have been developed through a landscape masterplan and a Green Infrastructure Landscape Strategy, as a result of collaboration between the multi-disciplinary design team throughout preliminary stages of this project and comprises of the following avoidance, reduction and remediation measures. The main goals are described below:

4.7.1 Avoidance Measures

The site selection process and alternatives considered is set out in Chapter 2 - Project Description and Chapter 3 - Alternatives Considered.

- Retention and protection of the existing mature woodland and greenways along the site boundary. Existing trees to be retained and protected will be protected during the construction stage in accordance with recommendations of the Arboricultural Assessment and the BS 5837:2012. Prior to commencement of construction, existing trees which are to be retained will be protected by erection of timber post and wire fence to BS 5837:2012 to ensure no works are carried out under reach of their canopies. Unstable trees should be removed under direction of the arborist.
- Avoidance of most elevated portion of land as a location for tallest buildings (apartment blocks)

4.7.2 Reduction Measures

- Location of taller residential apartment blocks at lower parts of the slope to reduce visibility.
- The Proposed Development will be fenced off during the construction phase to reduce the visual impact of the works
- Vehicles exiting site during the construction stage should be subject to wheel wash facilities or road sweepers shall be used in order to maintain clean roads;
- Any lighting used during the construction process should be kept to a minimum, providing for site safety only and shall be directed into the site and away from adjacent residential properties. Lighting shall be shielded to avoid light spill onto adjacent properties and roads;
- Disturbance of existing vegetation will be minimised where possible. Proposed planting will help integrating the Proposed Development into the surrounding landscape, provide screening where needed, reflect vegetation patterns of local habitats, and minimise the effect on the landscape character of the area;

4.7.3 Remediation Measures

- Enhancement of site tree cover by introduction of additional tree and woodland planting.
- Provide a permeable design by creating connections to other amenities, such as the Ballybrack Greenway and the proposed extension.
- Landscape works to be carried out as per associated Site Landscape Layout ;
- Appropriate new native plant species to be used throughout the scheme;
- Landscape management and maintenance plan to be drawn up and approved up by qualified professional.
- Ensure that ongoing landscape maintenance and debris cleaning is carried out during the operational period within the site; and
- Ensure that ongoing maintenance and replacement of failing or failed plant material.

The review of photomontages allowed for the assessment of how effective the proposed mitigation will be in regard to residual landscape and visual effects arising from the development.

Six landscape character typologies are incorporated within the design across the development site, each offering a distinct character, purpose and program. These character areas function as part of a site-wide landscape architectural framework, ensuring suitable screening, visual and aesthetic interest, recreation and integration of the Proposed Development into its adjoining environs. The 6 typologies are described in detail in the Green Infrastructure Landscape Strategy, included in this submission, and comprise the following

- Dubhghlaise Valley Nature Park;
- Homezones;
- Village Park;
- Castle Terrace Linear Park;
- Parklets; and
- Streetscapes.

The aim of the proposed landscape mitigation measures is to minimise the visual effects on identified receptors within the study area, in particular residential receptors. The landscape mitigation will complement the space by adding new landscape elements helping to integrate the Proposed Development into its existing environs over time. The overarching design intention is to propose open spaces designed to resemble the existing vegetative fabric of the site. These high value amenity spaces contain trails and walks that weave through the woodland and wildflower meadows offering contrast to the suburban grain that exists within typical residential developments.

4.8 Residual Effects

Following the completion of construction works and the implementation of the proposed landscape mitigation measures, the development will become a long term feature extending the suburban fringe of south-eastern Cork City.

Effective execution and establishment of the proposed landscape mitigation / green infrastructure will have a positive impact and help to 'soften' landscape and visual effects associated with the Proposed Development considerably, particularly for elevated areas and areas located within close proximity of the Proposed Development site. In the medium to long term, the perception of adverse landscape and visual effects will reduce in tandem with the maturing of the proposed planting.

4.8.1 Residual Landscape Effects

Long term residual landscape effects will arise from the change in landscape character from rural to suburban and subsequent alterations to existing landscape pattern and vegetation of the site. The proposed development will alter significantly and permanently the landscape character within the proposed development site and in available views from within approximately 300-500m radius of the site. Considering the undulating landscape of the site itself and that of the surrounding landscape, the landscape change will remain recognisable from locations adjacent to the site boundaries to the east, north and west as well as from elevated locations such as Maryborough Woods, Douglas Golf Club and Donnybrook where sections of the development will be visible in close to middle distance. The change in landscape character will be prominent but not totally uncharacteristic when seen in conjunction with large areas of suburban townscape character spreading across valleys and hills of adjacent or nearby the Proposed Development. Identified adverse landscape effects at close distance will reduce, in tandem with the maturing of the existing and retained vegetation as well as the proposed planting within the Proposed Development site, which will help to integrate the proposal into its environs.

Landscape effects reduce with further distance from the site (approximately 500m-1km and beyond). Intervening topography and built structures will screen the proposed development from many locations within the wider study area. The change in landscape character will be experienced mainly from elevated locations. The Proposed Development will extend the existing suburban townscape character further south in available views. The residual change in landscape effects will not vary greatly from the time when the development is completed due to the effects of distance. The greening of planting areas and the growth of the proposed planting will be barely discernible in the distance as mainly the upper sections of the Proposed Development will be visible. However, retained and proposed vegetation will develop, mature and further integrate the proposed development in available views. Table 4-17 lists the residual landscape effects.

Table 4-17 Summary of Residual Landscape Effects

RECEPTOR	SUSCEPTIBILITY	SENSITIVITY	MAGNITUDE OF LANDSCAPE CHANGE	DIRECT/ INDIRECT	SIGNIFICANCE OF LANDSCAPE CHANGE
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) within the Proposed Development site	Medium	High	Moderate	Direct	Moderate Adverse
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) outside the Proposed Development within approximately 300m of the Proposed Development site boundary	Medium	High	Moderate	Indirect	Moderate Adverse
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) outside the Proposed Development within approximately 300-500m of the Proposed Development site boundary	Medium	High	Low - Moderate	Indirect	Minor - Moderate Adverse
Landscape Character Type 1 'City Harbour and Estuary' (County Cork) outside the Proposed Development beyond approximately 500m of the Proposed Development site boundary	Medium	High	Negligible	Indirect	Negligible Neutral
Landscape character type 'Broad Fertile lowland Valleys' for areas located beyond approximately 500m from the Proposed Development site boundary	Medium	High	Negligible	Indirect	Negligible Neutral
Prominent and Strategic Metropolitan Cork Greenbelt Areas - adjacent to Proposed Development site	Medium	High	Low - Moderate	Indirect	Minor - Moderate Adverse
High Value Landscape within the Proposed Development site	Medium	High	High	Direct	Moderate Adverse
High Value Landscape within approximately 300m of the Proposed Development site	Medium	High	Low	Indirect	Minor Adverse
High Value Landscape beyond approximately 300-500m of the Proposed Development	Medium	High	Negligible	Indirect	Negligible Neutral

4.8.2 Residual Visual Effects

Residual visual effects will be highest in short and middle distance views from the adjacent road network as well as from elevated areas, where there are no or few intervening existing building structures and / or vegetation.

Residual visual effects in close distance views will remain similar along parts of Carrigaline Road adjacent to the development site boundary where sections of the Proposed Development will remain openly visible. Visual effects from elevated locations in short to middle distance within approximately 500m will decrease with the maturing of the proposed landscape mitigation planting and the establishment of the proposed green infrastructure.

Residual effects in longer distance views beyond 500m to 1km and beyond will remain largely similar as in Year 1 as the visibility is mainly confined to elevated locations where the Proposed Development will form a small part in the distance in panoramic views across an existing sub-urban townscape.

A summary of residual visual effects from individual viewpoints is included in table 4-18.

Table 4-18 Summary of Residual Visual Effects

RECEPTOR	SUSCEPTIBILITY	SENSITIVITY	Residual visual effects following establishment of mitigation	
			MAGNITUDE	SIGNIFICANCE
Photomontage 1	High	High	Low	Negligible Neutral (Summer) Minor Adverse (Winter)
Photomontage 2	High	High	Moderate	Moderate Neutral
Photomontage 3	High	High	Moderate-High	Moderate Adverse
Photomontage 4	High	High	Moderate to High	Moderate Adverse
Photomontage 5	High	High	Negligible	Negligible Neutral
Photomontage 6	High	High	Negligible	Negligible Neutral
Photomontage 7	Medium	Medium	Low	Minor Neutral
Photomontage 8	High	High	Low	Minor Neutral
Photomontage 9	High	High	Negligible (Summer) Low (Winter)	Negligible Neutral (Summer) Minor Adverse (Winter)
Photomontage 10	High	High	Low	Minor Neutral
Photomontage 11	High	High	Moderate	Moderate Adverse
Photomontage 12	Medium	Medium	Moderate-High	Moderate Adverse (Winter) Minor Adverse (Summer)

4.9 Conclusion

The principal mitigation for the proposed development is inherent in the design of its architecture, public realm, green infrastructure and open space, which has evolved through an iterative process of assessment and consultation. There are no operational management measures required in respect of landscape and visual issues. A full set of the landscape architectural master planning as well as a Green Infrastructure Landscape Strategy design rationale is included in the planning application.

4.9.1 Effects at Construction

Construction effects will be temporary, short term effects which occur during the construction phase only. Areas experiencing visual effects during the construction stage will vary considerably, depending on the active construction phase.

Landscape and visual effects will be highest within the immediate vicinity of the site and within the principal visual zones with a radius of approximately 500m from the boundary of the Proposed Development site. Effects arising during construction will mainly result from machinery, personnel, excavations and traffic and material movements.

Existing intervening vegetation will partially screen the site clearance, earthworks, compounds, construction works and the associated machines moving on the construction site. The removal of vegetation during site clearance and earthworks will be a permanent effect. During the construction works, portions of the proposed works, associated machinery and plant machinery will be visible from a number of often elevated viewpoints within the study area and potentially from beyond the study area particularly during the construction of the proposed Moneygurney Stream Bridge, which will require a crane to be on site.

The visibility of construction works within the wider study area (beyond 500m from the Proposed Development boundary) is limited and may include the upper sections of machinery (for example cranes or containers). The landscape and visual effects and their significance at construction stage will be temporary, adverse and range from minor adverse in the wider area to moderate - major adverse for areas in close proximity, up to a 500m radius from the Proposed Development site boundary.

4.9.2 Landscape Effects

Direct and long term significant change will occur locally where the Proposed Development will be physically located. The landscape character at site location will change from rural agricultural to a suburban residential. The Proposed Development aims to retain significant number of existing trees on site. A detailed landscape masterplan includes the retention of existing vegetation and proposes new planting to supplement the site with additional woodland and parkland trees thus minimising the impact on tree cover within the area and supporting the integration of the Proposed Development into its environs.

Indirect change and the significance of landscape effects will reduce quickly with approximately 300-500m distance from the site boundary, due to intervening vegetation, topography and built structures.

Changes to the landscape character in the remaining study area, beyond approximately 500m are considered not significant. While a change in landscape character may be noticeable in the distance, particularly from elevated locations, the Proposed Development will be seen in conjunction with other existing similar developments. It will integrate therefore into the existing prevailing suburban landscape character particularly in views from the north, west and east. The alteration to the landscape character in views from the south is mainly screened by intervening vegetation and topography at this distance.

In the context of the wider area the Proposed Development will be perceived in conjunction with the adjacent existing large scale residential developments which are located to the north, east and west of the site across valleys and hills. The Proposed Development will be seen as an extension of the suburban fringe further to the south. This effect will be reinforced if lands immediately to the south, identified as Strategic Land Reserve (SLR), will be zoned for residential development in the short to medium term. The Proposed Development stands therefore not in contrast with the existing overall landscape character of the study area. The proposed development will result in an intensification of the suburban character already prevailing in the eastern, western and parts of the northern study area. Indirect change will occur outside of the Proposed Development site boundary, where the visibility of the Proposed Development influences the perception of the character of the landscape. The indirect change in landscape character will be greatest in its immediate and nearby surroundings as it will extend the suburban fringe of the Douglas area and therefore of suburban Cork further south.

4.9.3 Visual Effects

The Proposed Development is located on an elevated and sloping agricultural site. Existing vegetation can quickly provide partial or full screening to receptors when moving away from the site due to the undulating topography of the surrounding landscape.

The majority of significant views will be experienced within the core study area where open or partial views of the development are possible, particularly in views from close proximity and at elevation, up to approximately 300-500m radius. Highest visual effects will likely occur in short and middle distance views, particularly from elevated areas, where there are no or few intervening existing building structures and / or vegetation. In addition, visibility resulting in significant effects from locations along the local road network within the study area will be limited to areas in close proximity to the development site boundary as views will become quickly partially or fully obstructed by intervening building structures, vegetation or topography when moving further away from the site.

Existing large residential housing estates are located in the immediate context of the Proposed Development. Likely locations experiencing significant effects will be those with views of the site from Maryborough Ridge, Maryborough Woods and Donnybrook. There will also be open views of the Proposed

Development from areas within Douglas Golf Club. Visibility from the national (N28, N40) and regional road network (R609, R610, R851) located within the study area will be mainly fully or partially screened by intervening vegetation and topography. However, sections of the R609 will experience open views when passing the north-eastern site boundary. Short intermittent and partially screened views of the Proposed Development will be experienced from the N28 when passing the junction with the R609.

Long distance views from the wider study area and beyond will likely be possible from elevated locations or tall buildings as far as from Cork City. However, considering the distance to the Proposed Development and existing sub-urban developments including housing estates adjacent to the proposal, the development will only form a small part in overall wide, panoramic views and therefore integrate into the prevailing existing urban / sub-urban character of the view. It is considered that the visibility of the proposal will not be significant in long distance views.

4.9.4 Cumulative Effects

There are the following three relevant consented projects, which may result in cumulative landscape and visual effects when seen together with the Proposed Development:

- 24 Class Room Primary School, located adjacent to the north-eastern site boundary;
- 48 Residential Unit Development at Clarendon Brook, which is located approximately 800m northwest of the site boundary;
- Cumulative effects with 200 residential units at Maryborough Ridge; and
- Proposed Greenway, located within the Proposed Development site. It will be located within a valley along the eastern and north-eastern side.

The proposed primary school will be located adjacent to the Proposed Development resulting in combined views. Both developments could be seen as part of each other in the emerging new suburban context of the area. Combined view will be significant as the visibility of both developments together will increase the prevalence of suburban development / character in available views.

Combined views of the Proposed Development and the Clarendon Brook residential development will be possible from sections along Carrigaline Road / R609. Cumulative effects will be low and not significant as both developments will be seen in conjunction with surrounding existing residential housing estates.

Combined views of the Proposed Development and the permitted development will be limited to elevated locations within the proposed and permitted development sites or from elevated locations within existing housing estates west of the Castletreasure development as well as in views south from Douglas Golf Club. Combined views are considered not significant as both developments will be seen in conjunction with surrounding existing residential housing estates. Successive views will be experienced when travelling along the N28, in the vicinity of the junction with Carrigaline Road /

R609, where intermittent views of the permitted development or the Proposed Development will be possible. However, the viewer will need to turn its head to see either one or the other development.

The Greenway development is different in scale and nature when compared with the Proposed Development. However, the Castletreasure development includes a number of footpaths and walking routes through the various parts of the estate. Therefore, there will be cumulative effects resulting from the intervisibility of both developments, particularly at proposed connecting points between both schemes and where the proposed bridge will traverse the Greenway. The significance of the intervisibility between both developments will be beneficial. The valley, where the Greenway will be located, will remain largely unchanged apart from the bridge development and access ramps to the Greenway from the Proposed Development. The interconnection of both developments is positive as it provides an opportunity to integrate both developments together enhancing the nature, character and amenity value of the subject site.

The proposed M28 development will be located within approximately 300m of the Proposed Development. However, is not similar in type, nature and scale when compared to the residential development at Castletreasure. It has been reviewed as there are glimpsed views from the existing N28 of the Proposed Development at the junction with the R609 / Carrigaline Road. Combined views of the proposed M28 development and the proposed Castletreasure residential development will likely increase following the construction of the M28 due to substantial earthworks and vegetation removal required to facilitate the M28 junction with the R609. Views of the Proposed Development will be available for a longer stretch when travelling along the M28 at this section. Considering the difference in development types, there will be no cumulative effects resulting from the intervisibility of both developments.



Chapter 5A

Material Assets (Traffic & Transport)

A5

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

CHAPTER 5A MATERIAL ASSETS (TRAFFIC & TRANSPORT)

5A.1 Introduction

This material assets (Traffic and Transport) chapter assesses and evaluates the likely impact the proposed development will have on the existing transportation network in the vicinity of the site, as well as identifying proposed mitigation measures to minimise any impacts. This chapter was prepared by Adrian O' Neill BEng MSc MIEI and reviewed by Tim Finn CEng MIEI of JB Barry & Partners, Consulting Engineers.

The assessment reviews the existing road network, including pedestrian/cycle facilities, and public transport provision in the region of the site, estimates the traffic generated by the proposed development and describes the access strategy for the site. The predicted traffic impact on the local road network will be assessed in terms of capacity to identify the impact the development will have on the surrounding road network.

The Traffic and Transport Assessment includes the following tasks:

- Review of the existing infrastructure and traffic conditions;
- Review of the proposed development;
- Estimation of the trips generated from the proposed development in the AM and PM peak hours and the distribution onto the local road network;
- Estimation of the traffic growth rates and calculation of predicted future traffic volumes;
- Assessment of impacted junctions surrounding the proposed development (including scenarios accounting for separately proposed public network upgrades); and
- Proposed mitigation measures (if required) to help offset any impact the development may have.

5A.2 Methodology

The transport assessment was prepared based on Transport Ireland Infrastructure's (TII formerly NRA) *Traffic and Transportation Assessment Guidelines' (2014)* and is developed using data from commissioned traffic counts at key junctions and the *'Trip Rate Information Computer System'* (TRICS) database. Other relevant documents referenced include:

- South West Regional Planning Guidelines (2010-2022)
- Ballincollig Carrigaline Municipal District Local Area Plan;
- Cork County Council's - Cork Cycle Network Plan (2017);
- Smarter Travel - A New Transport Policy for Ireland 2009-2020;
- M28 Cork to Ringaskiddy Project - Environmental Impact Statement - RPS;
- Waterman Moylan - Traffic & Transport Assessment, Proposed School, Carr's Hill, Douglas Cork;
- Douglas Land Use and Transportation Strategy (DLUTS) and
- SYSTRA - Post Primary School Transport Assessment (2018)

To assess the construction and operational traffic implications of the proposed development on the local road network the following methodology has been applied, which incorporates a number of key inter-related stages. These following steps were used to identify and assess traffic and transport impacts:

- **Background Review:** This important exercise incorporated a number of tasks which include (a) an examination of the local regulatory and development management documentation, namely the Ballincollig Carrigaline Municipal District Local Area Plan and the Douglas Land Use and Transportation Strategy (DLUTS) (b) an analysis of previous 'transport' related, strategic and site-specific studies of development and transport infrastructure in the Cork area (c) a review of Cork County Council's online planning enquiry system, and to establish any third party schemes that have applied or been granted planning permission within the study area.

- **Site Audit:** A site audit was undertaken to quantify any existing road network issues and identify local infrastructure characteristics, in addition to establishing the level of accessibility to the site in terms of walking, cycling and public transport.
- **Traffic Counts:** Traffic counts were completed for the agreed 'affected junctions' with the objective of establishing local traffic characteristics in the immediate area of the proposed residential development. Junction were agreed during consultation with Cork County Council.
- **Trip Generation:** A trip generation exercise was carried out to establish the potential level of vehicle trips generated by the proposed school and residential development.
- **Trip Distribution:** Based on both the existing and future (following development completion) network characteristics, a distribution exercise has been undertaken to assign site generated vehicle trips across the local road network.
- **Network Analysis:** Further to quantifying the predicted impact of vehicle movements across the local road network and for the proposed site accesses, traffic modelling has been completed to assess the operational performance of the key junctions in the post-development years.
- **New M28 Motorway:** The existing N28 is due to be upgraded to motorway status with a proposed new "full movement" interchange to replace the existing sub-standard junction to the south-east of the site. The impact of this motorway on the traffic in the vicinity of the proposed development has been considered and assessed. As such, two different scenarios have been assessed; all analysis has been completed for the road network (as is) and also for the proposed layout (incl. M28). Appendix A.5A.1 provides preliminary drawings of the proposed interchange south of the development site.

The transport assessment assesses both the operational and construction stages of the proposed development. However, the detailed analysis is mainly focused on the operational stage of the project, which has a greater impact on the prevailing environment compared to the short-term nature of the construction phases of the project.

5A.3 Existing Environment

5A.3.1 Land Use

The proposed development site is located at Carr's Hill, Douglas. It is currently characterized as a greenfield site and has been zoned for 'residential use' within the Ballincollig, Carrigaline Municipal District Local Area Plan. The surrounding area to the north (Maryborough) and west (Donnybrook) consists predominantly of residential housing estates with recreational space in the form of Douglas Golf Course to the north-east. The lands directly to the south are currently identified as a Strategic Land Reserve (SLR).

5A.3.2 Existing Road Network

The nature of the area/road network to the north and west of the site is semi-urban, with roads comprising local residential streets and the regional Carrigaline Road (R609) towards Douglas Village to the north. To the south, the landscape is more rural with Douglas Golf Course located to the east of the R609. The R609 runs adjacent to the eastern boundary of the proposed residential development towards Carrigaline to the south-east. Southbound access (only) to the N28, via a slip-road, is located close to the south-east corner of the site. Northbound access from the N28 to the R609 is also available at this junction.

Figure 5A.1 illustrates the principal vehicular access routes surrounding the proposed development site. The routes can be categorized into national, regional and local access routes comprising:

- **N28** - this is a national dual carriageway National Primary road connecting Carrigaline and the port and village of Ringaskiddy to Cork City. It leaves Cork from an interchange on the N40 South Ring Road near Douglas and runs southwards towards Carrigaline and on to Ringaskiddy. It is proposed to upgrade the N28 to a motorway with the introduction of a full grade-separated interchange at Carr's Hill. Construction of the motorway is scheduled for 2021 with planned completion by 2023, subject to the completion of the planning process.
- **R609** -The R609 is a single carriageway regional route linking the N28 to the Fingerpost junction in Douglas Village. It serves as the primary access route to the residential area of Maryborough Woods and various other developments. The roadway is approximately 7.0m to 9.0m wide and has a footpath along the western side of the carriageway only from Douglas to the site. There is a speed limit of 60kph from the N28 interchange which reduces to 50kph on approach to the build-up residential areas.
- **L2470 Maryborough Hill** - Maryborough Hill is a single carriageway local road which runs from the Fingerpost Roundabout in Douglas Village to the N28 overbridge. It runs adjacent to the eastern boundary of the Douglas Golf Course serving numerous residential estates. The road varies in width along the route with pedestrian and cyclist facilities, however, only a northbound cycle lane is provided on the route. There are numerous bus stops positioned on the road.
- **The Vicarage/Ardarrig Lawn/Maryborough Woods Road** - These local residential roads serve a number of residential estates, particularly to the north of the proposed site. All local/residential roads in the immediate vicinity of the site branch from the R609.

The principal road junctions (see Figure 5A.1) surrounding the site on the existing road network include:

- **Junction 1 - Fingerpost Roundabout:** This is a five-arm priority roundabout serving the R609 (Carrigaline Road); the R610 (Douglas Relief Road); the R610 (Rochestown Road); Maryborough Hill and East Douglas Street. All approaches have two-lane entries with single lane exits. East Douglas Street is a one-way street with no access from the roundabout and Maryborough Hill has a continuous bus corridor to the R609 travelling southbound. The R609, Maryborough Hill and the R610 (Rochestown Road), provides pedestrian facilities in the form of a zebra crossings set back from the junction. The R610 (Douglas Relief Road) provides an uncontrolled crossing point at the junction with a splitter island. Similarly, the one-way East Douglas Street provides an uncontrolled crossing at the junction.
- **Junction 2 - Maryborough Woods Road/Maryborough Hill:** This is a four-arm signalized junction with pedestrian crossings on all arms. The junction is shaped as a standard T-junction, with a fourth arm providing access into the Maryborough Hotel and Spa. Advance stopping lines are provided on all arms of the junctions except on the Maryborough Hotel arm.
- **Junction 3 - Maryborough Hill/ (Northbound) N28 Slip Road:** This is a three-arm priority junction just north of the N28 overbridge. Maryborough Hill forms the major arm of the junction. The single lane slip road provides northbound access to the N28. There is a footpath on the eastern side of the major arm with a southbound cycle lane on approach to the junction. There are no pedestrian/cycle facilities on the minor arm (N28 slip road).
- **Junction 4 - R609 Carrigaline Road/(Southbound) N28 On-Slip Road/Northbound N28 Off-Slip Road:** This is a grade-separated junction with free-flowing slip roads onto and off the N28. The R609 southbound travels underneath the N28 prior to accessing the slip road. Southbound access only is available at this junction.
- **Junction 5 - R609 Carrigaline Road/The Vicarage; Berkely; Templegrove:** This is a priority T-junction with the Carrigaline Road (R609) forming the major arm of the junction. These roads are single lane on all approaches with footpaths on all arms of the junctions. The minor arm provides access to the residential housing estates of Temple Grove and the Vicarage.
- **Junction 6 - R609 Carrigaline Road/Maryborough Woods Road:** Like junction 5, this junction is a priority T-junction with the major arm on the R609. The minor arm of Maryborough Woods Road provides a through road to Maryborough Hill serving the Maryborough Woods residential area. There are no pedestrian crossings at this junction, however, there are footpaths on each arm.

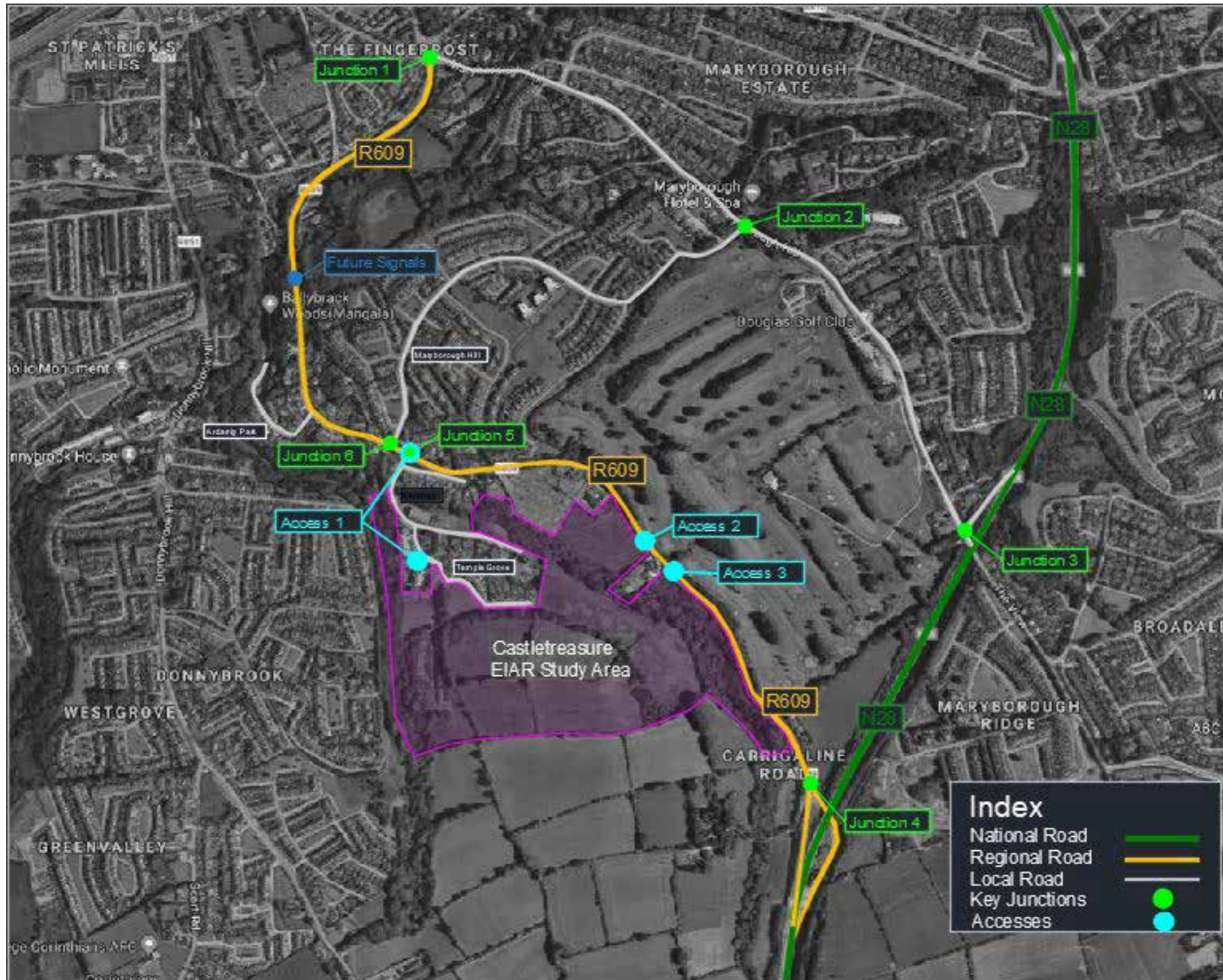


Fig. 5A.1 Principal existing road junctions in the vicinity of the site

5A.3.3 Existing Public Transport and Pedestrian/Cycle Facilities

Bus Eireann provides five services linking the wider Douglas area to Cork City and surrounding areas on a daily basis, operating on 15, 30 and 60-minute frequencies (route dependent). These comprise:

- Route 206 – Grange to South Mall operating every 15 minutes on weekdays and Saturdays and 30 minutes on a Sunday;
- Route 207 – Donnybrook to Glen Heights Park operating every 30 minutes all week;
- Route 216 – Cork University Hospital to Mount Oval operating every 30 minutes Mon-Sat and every 60 minutes on Sundays;
- Route 220 – Ballincollig to Fountainstown operating every 30 minutes all week; and
- Route 223 – South Mall to Haulbowline operating every 60 minutes all week.

Currently, only one bus route (Route 216) is reasonably close/accessible from the proposed site. The nearest bus stop is located on Maryborough Hill within the Maryborough Woods development. It is less than 500m (5-10min walk) from the edge of the proposed development to this bus stop. A separate bus stop is also located on the Carrigaline Road, north-west of the site. Figure 5A.2 presents the location of the bus stop and the approximate walking time from the proposed site boundary.

The development of this proposed site will afford an opportunity to consider improvements to the local bus service to improve connectivity and capacity between the proposed site including surrounding areas to the city centre.



Fig. 5A.2 Public transport facilities (Route 216) serving study area

There are a number of existing pedestrian/cyclist facilities neighbouring the proposed site. To the west, the Ballybrack Valley (Mangala) pedestrian and cycle route provide a safe off-road link through the Mangala valley from Donnybrook and Maryborough into Douglas Village. To the east, there is a continuous footway on the southern side of the R609 (only) to Douglas Village, however, it is narrow in places and lacks accessibility features. Recent upgrades provide improved pedestrian facilities, on both sides of the R609, on approach to the Church Road overbridge.

As part of the Cork Cycle Network Plan 2017, there is a proposed greenway route linking the existing Ballybrack Greenway and the future inter-urban route on the M28 as per Figure 5A.3.



Fig. 5A.3 Current and proposed pedestrian/cyclist facilities

5A.3.4 Existing Traffic Pattern

As part of this material assets, traffic and transport assessment, traffic counts were completed for junctions, agreed with Cork County Council with the objective of establishing local traffic characteristics in the immediate and surrounding areas of the proposed residential development. Junction Turn Counts (JTC) were completed on Tuesday 15th May 2018 at all six junctions:

- Junction 1 - Fingerpost Roundabout;
- Junction 2 - Maryborough Woods Road/Maryborough Hill (incl. Maryborough House Hotel access);
- Junction 3 - Maryborough Hill/ N28 Slip Road (on-ramp T-junction);
- Junction 4 - Carrigaline Road/N28 Slip Road (off-ramp T-junction);
- Junction 5 - Carrigaline Road/Berkley; The Vicarage; Templegrove; and
- Junction 6 - Carrigaline Road/Maryborough Hill.

The surveys were carried out over a 12-hour period (07:00-19:00) and were used to establish the morning and evening peak travel times on the surrounding road network. The AM peak period was determined to be 08:00 to 09:00 while the PM peak period was 17:00 to 18:00. These time periods have been used to assess the impact of the development on traffic at these locations. A diagrammatic illustration of the AM and PM peak traffic on the existing road network, including junction movements is outlined in Figures 5A.4 and 5A.5. The figures in brackets represent the percentage of Heavy Goods Vehicles (HGVs).

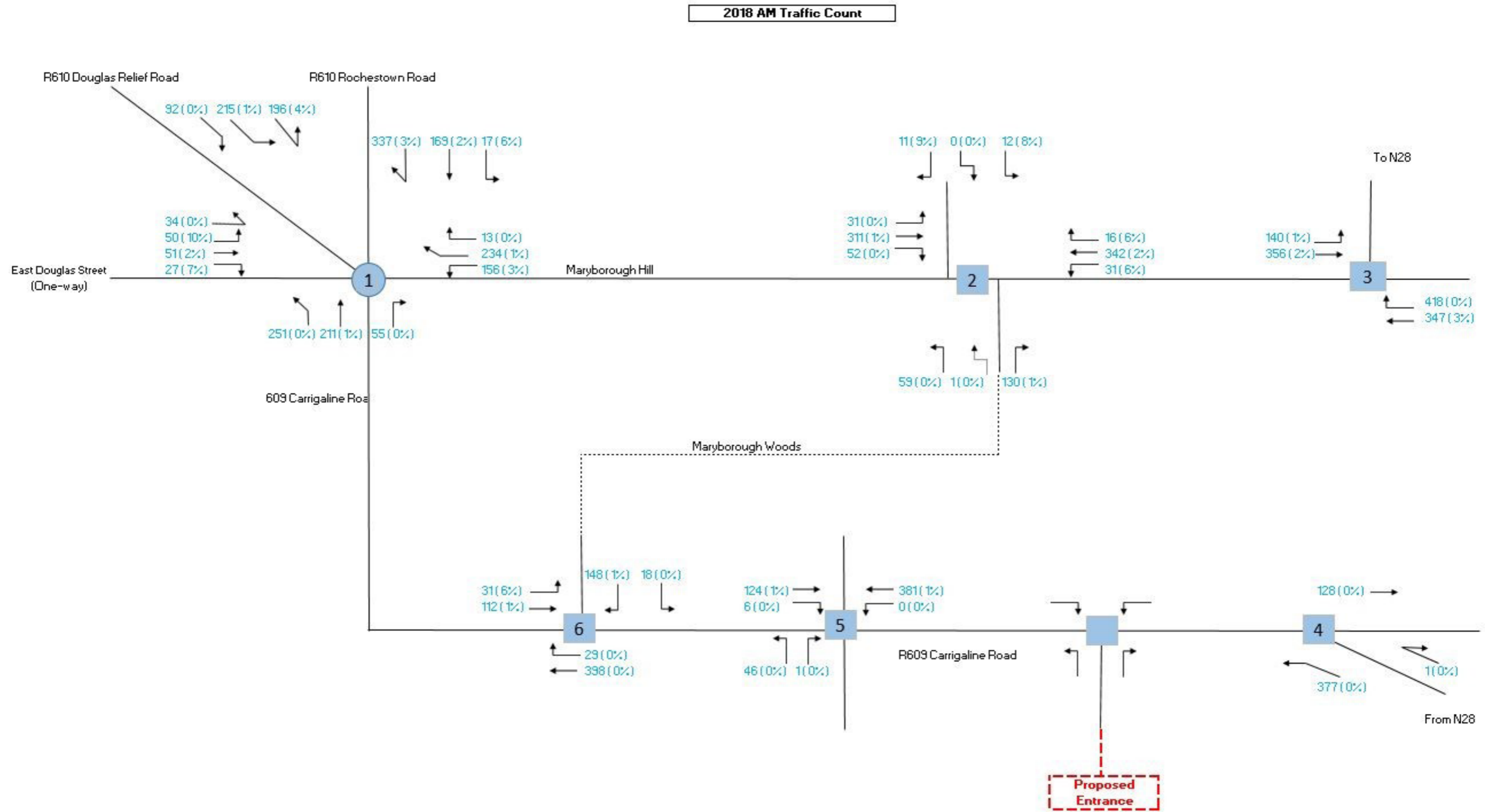


Figure 5A.4: 2018 AM Junction Movements (Refer to Fig 5A.1)

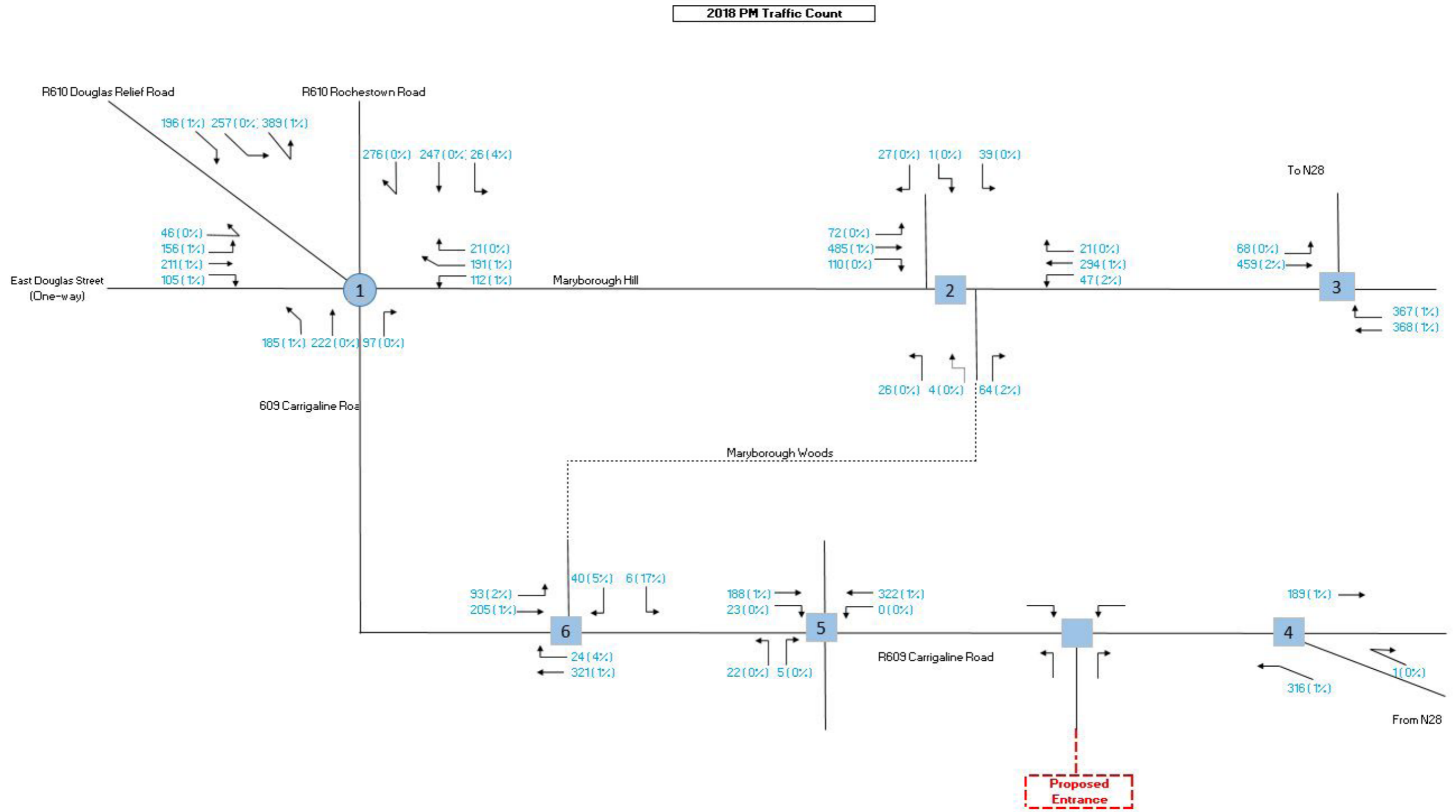


Figure 5A.5: 2018 PM Junction Movements

5A.3.5 Other Permitted Developments

Prior to the commencement of the Traffic and Transport Assessment (TTA), a planning application for a primary school (624 pupils and 46 staff) within the overall site boundary has been lodged separately by the Department of Education and construction of same is anticipated to begin on a similar timescale to the commencement of the residential development (subject to separate planning approvals).

It is proposed that the residential development will share its main access with the entrance to the proposed school. Therefore, the assessments of the generated traffic from the proposed Castletreasure development takes cognisance of the school traffic to ensure 'worst case scenario' is assessed.

As part of the background review, a check of Cork County Council's online planning enquiry system was carried out to establish any third-party schemes that have applied or been granted planning permission within the study area. A number of notable developments in the region of the proposed site have been identified:

- File Ref: 16/07271 - Construction of 200 no. residential units at Maryborough Ridge, Moneygurney, Douglas, Co. Cork.
- File Ref: 17/6784 - Construction of a solar farm consisting of circa 159,100m² of solar panels on ground mounted frames and all associated works at Ballinrea, Carrigaline, Co. Cork.

Furthermore, the team were made aware of a possible future Post-Primary School on the R609 towards Douglas Village. A TTA has been completed by consultants SYSTRA as part of the planning application for the post-primary school. The capacity assessments undertaken by SYSTRA form part of the operational analysis outlined in section 5A.5.3.12.

Operational traffic from the solar farm is anticipated to be low and construction traffic is unlikely to impact on the road network surrounding the Castletreasure Study area. The proposed solar farm is located south-west of the proposed site and it is expected that any construction traffic would use the Ballinrea Road when accessing the solar farm site.

The potential cumulative projects in the environs are a Lidl Discount shop and 5 apartments (ref. 18/6245) and 48 residential units at Clarendon Brook, planning reference 18/6245.

To account for the proposed school, residential developments, discount shop and solar farm if/when they occur, a medium growth rate has been used when factoring up the background traffic to assess the capacity of the road network in future years, in accordance with TII - Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections.

5A.4 Description of Proposed Development

The development comprises a total of 472 residential units including crèche facilities. It should be noted that the number of proposed units was reduced to 472 following the completion of the traffic analysis. As such, the traffic analysis uses a figure of 475 units which is a conservative assessment of the 472 units. The construction of the development will take place on a phased basis with an output estimated to be 118 units/year. It is anticipated the development will be completed and fully operational by the year 2024.

When complete, the proposed Castletreasure development will have three accesses (see Fig.5A.6); 'Access 2' and 'Access 3', will be situated directly off the Carrigaline Road (R609) on the eastern boundary of the site and 'Access 1' will link with the existing residential road connecting with the R609 to the north of the site.

'Access 2' will take the form of a signalized priority T-junction; 'Access 3' will be a priority T-junction serving a cul-de-sac of 98 residential units and 'Access 1' will tie in with the road currently serving the rear of the Templegrove apartment blocks. All junctions will access the Carrigaline Road (R609) and an internal arterial road will connect 'Access 1' and 'Access 2'. Appendix A.5A.2 illustrate the proposed accesses in more detail.

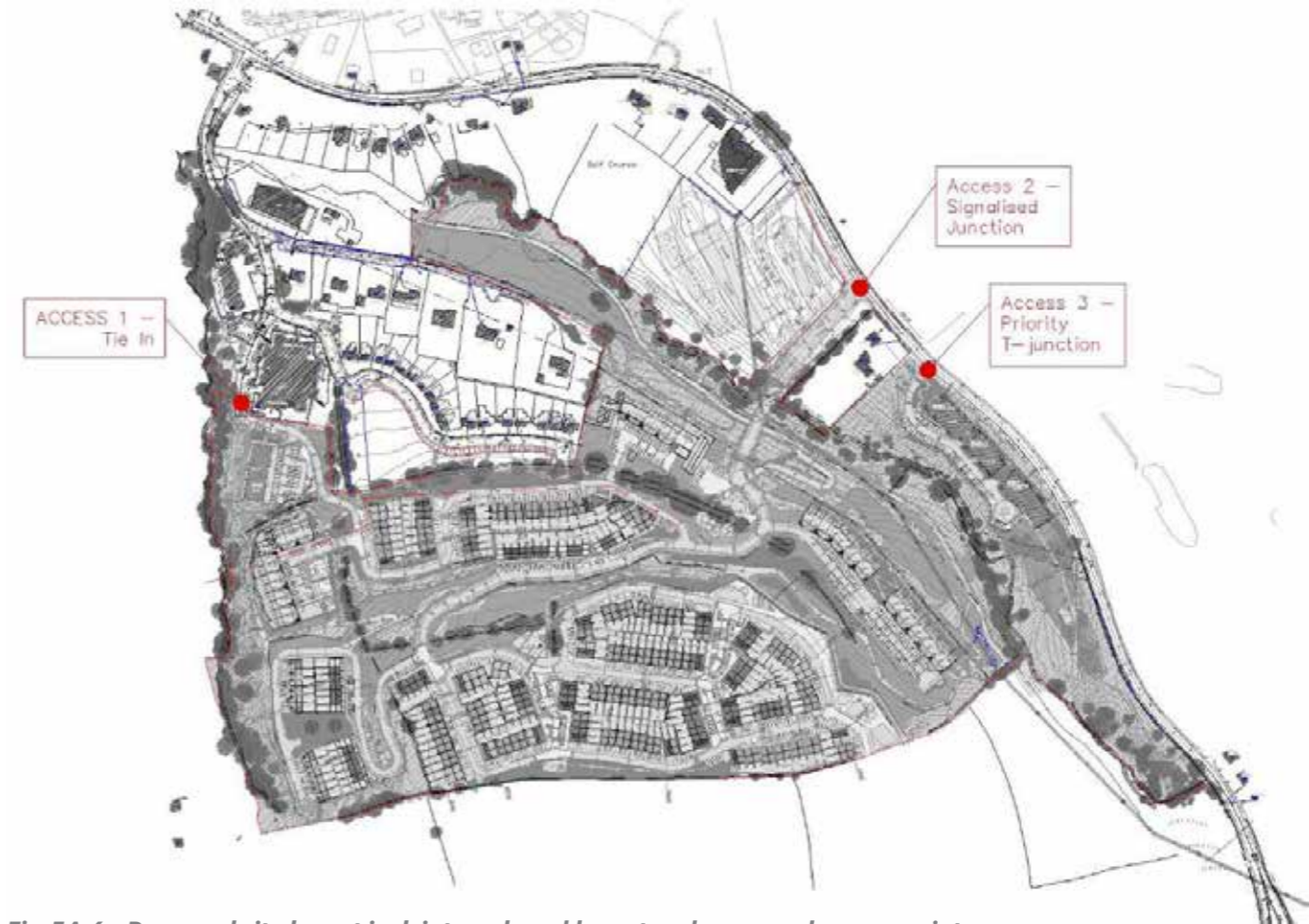


Fig.5A.6 - Proposed site layout incl. internal road layout and proposed access points

The proposed site, including internal road layout and local access points are shown in Figure 5A.6. As detailed in Fig. 5A.3, the proposals include the development of a Greenway traversing the site linking the existing Ballybrack Greenway (to Douglas Village) and the future interurban greenway to be developed as part of the M28 works.

5A.4.5.1 Description of separately proposed public road network upgrades

Two public road infrastructure upgrade projects are planned near the proposed site. As part of the traffic analysis, a scenario which includes the proposed upgrades has been analysed to identify the capacity of the road network when/if these are completed. The two proposed upgrades include:

- The M28 (Cork to Ringaskiddy) Improvement Scheme; and
- A possible signalized junction (including bridge structure) between the R609 and Grange Road (as detailed in DLUTS). The future junction would be situated north of the proposed Castletreasure development site on the R609.

The proposed M28 Interchange at Carr's Hill comprises a full motorway junction to allow full access to and from the M28 from all directions; Douglas, Rochestown, Cork and Ringaskiddy. It will also include a new two-way link road, adjacent to Douglas Golf Club, connecting the new interchange with Maryborough Hill. Appendix A.5A.1 outlines the General Arrangement Road Layout for the proposed M28 junctions relevant to the development site.

The proposed upgrades to the M28 have been analysed separately to the existing road network as part of this TTA. Additionally, a possible future proposed signalised junction which has been analysed by SYSTRA as part of their TTA is included within this report.

5A.4.5.2 Proposed Public Transport

The Douglas Land Use and Transport Strategy (DLUTS) outlines specific measures to promote and increase the use of public transport in the Douglas area. These measures include improved pedestrian/cycle facilities to provide easy access to bus stops for multi-modal trips. As such, the proposed residential development takes cognisance of these measures by providing pedestrian and cycle facilities which link the site to the public transport services operating in the area, encouraging multi-modal trips. Section 5A.4.3 provides further detail of the pedestrian/cycle facilities to be provided as part of the development.

5A.4.5.3 Proposed Pedestrian/Cycle Infrastructure

As part of the Cork Cycle Network Plan 2017, for the Douglas area, the plan envisages a network of primary, secondary and greenway cycle routes. The cycling proposals for the site environs are illustrated in Figure 5A.7. There is a proposed greenway route linking the existing Ballybrack Greenway and the future inter-urban ‘CSE-GW4’ route on the M28. The greenway is proposed to enter the development site from the Ballybrack Greenway via an Irish Water Compound (section of greenway provided by Cork County Council) and will travel through the site. The interconnecting sections which run through the development site will be included and constructed within the proposed development.

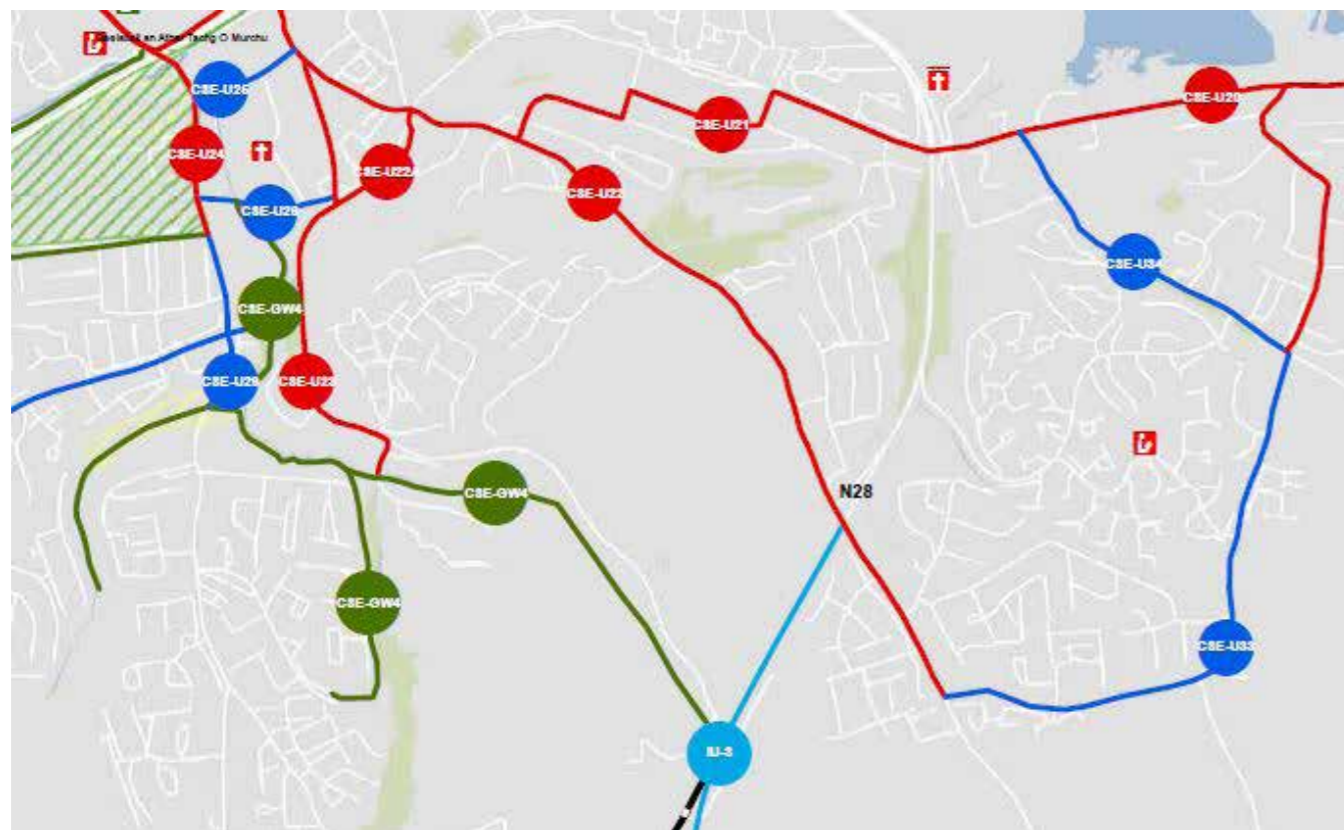


Figure 5A.7: Cork Cycle Network Plan - Douglas

5A.5 Impacts Assessment

It is anticipated that the proposed residential development will have an impact on the local road network during the construction and operational phases. The transport assessment, therefore, assess both the construction and operational stages of the proposed development. However, the focus of detailed analysis will mainly be on the operational stage of the project, as this will have the longer-term impact on the prevailing environment, while the construction impacts will be for a shorter period and the volume of traffic during the construction period will be lower than the operational phase. As such, the traffic modelling on the operational phase provides a worst-case scenario.

5A.5.1 Construction Phase Traffic Impacts

Following an anticipated successful planning application, the residential units will be delivered on a phased basis and it is estimated that on average, 118 residential units will be built per annum in 4 phases. (See Phasing Construction Summary - Chapter 2, Table 2.2). With an estimated start date of Q4 2019, the projected opening year for the completed development is 2024. Due to the calculated number of vehicles during the construction phases, capacity impacts are negligible on the road network. The traffic impacts comprise potential noise and air quality impacts resulting from construction activities, from traffic moving in and out of the site.

Construction traffic will be generated from several sources, primarily attributable to:

- Removal of excavated material/spoil;
- Equipment delivery;
- Materials delivery; and
- Commuting construction staff and site visitors

The following sections summarize details of the Outline Construction Traffic Management Plan. (Detailed in Chapter 2 section 2.6)

5A.5.1.1 Construction Site Access Arrangements

The site entrances will be formed immediately on commencement of the works on the site. The initial entrance will be located to the south of the Templegrove Apartments (Site Access No1. As detailed in Figure 5A.8.) The initial works will be to construct the site compound, access road and car park area inside this entrance.

A second site entrance will be located directly onto the Carrigaline Road (Site Access No2 - See Figure 5A.8). On commencement of the project this access point will facilitate construction of the proposed bridge (e.g. delivery of abnormal loads etc.). It is proposed that a secondary compound is developed on the Carrigaline Road side of the scheme to facilitate construction of Phase 4.

The Phase 1 site earthworks, infrastructure and housing will be constructed from the Site access No. 1 to the south of the Templegrove Apartments and the bridge over the Moneygurney Stream will be constructed using both Site access No. 1 and Site access No. 2 (directly from the R609 Carrigaline Road).

Phase 1 surplus acceptable excavated material required for export will be stockpiled on site until such time as the Moneygurney Stream Bridge is open and operational. The above approach will minimise construction traffic during Phase 1 and provide vehicles with direct access to the R609 (via the proposed Moneygurney Stream Bridge) during Phase 2. This will minimise traffic movements through the residential areas.

A designated parking area will be provided in the site car park at Site Access No.1. It is proposed to cater for up to 75 cars /vans which will minimise the disruption to local amenities, any congestion on the R609 Carrigaline Road and residential estates. This proposed parking area has taken account of the needs of construction staff but is not of a quantum that will discourage the use of sustainable modes of transport or car-pooling, and these alternative transport measures will be encouraged where possible/feasible.

Phase 2 and 3 earthworks, infrastructure and housing will be constructed using Site Access No. 2 only. Phase 4 will require the construction of a third construction access (No.3) also on the Carrigaline Road (approximately 240m south of access point No. 2).

5A.5.1.2 Anticipated Construction Traffic

As detailed above both site access points 1 and 2 will be utilised during Phase 1.

It is envisaged that working hours will be from 07:00 to 18:00, Monday to Friday (08:00 to 14:00 Saturday) and the works will engage a peak maximum of 100 construction personnel.

Construction workers will travel to site before the peak hour of 08:00 - 09:00 to be on site for a 07:00 start-time. A very limited number of construction employees are likely to travel to the site during peak hours. However, in order to provide a robust assessment, it is considered that 75% of the workers are car drivers and 50% of these will arrive during the peak hour (0800 - 09:00), i.e. a total of 38 one-way trips are likely to take place during the morning peak hour. In addition, another 2-3 one-way trips for supervisors are envisaged during each phase of the construction period. It is expected that the estimated construction traffic will have a greater impact on the AM peak, compared to the PM peak as a review of traffic volumes outside the proposed development indicate a higher volume of traffic on the route during the AM peak period, compared to the PM for both the existing road network and the future road network. (See tables 5A.7 and 5A.8)

Table 5A.1: Estimated daily no. of return HGV trips

HGV Trips	Phase 1	Phase 2	Phase 3	Phase 4
Trips calculated based on a concentrated 30 week period (150 Days) to reflect daily Worst Case Scenario	150 Days	150 Days	150 Days	150 Days
Daily No. of Return HGV Trips: Construction Access No. 1	8	10	5	2
Daily No. of Return HGV Trips: Construction Access No. 2	4	50	33	3
Daily No. of Return HGV Trips: Construction Access No. 3	0	0	0	7
*Daily assessment of Truck Trips assumes 'worst case scenario' whereby all works overlap and works are undertaken over 150 days (of the 262 working days available per annum)				

Table 5A.1 below estimates the number of trips made by HGVs daily during each phase and identifies the construction access to be used (base on Table 2.3 Earthworks Cut/Fill balance included in Chapter 2). These trips will be carried out using HGVs. The number of HGV's prepared to be utilized will range from 2no. in Phase 1, rising to 16no. in Phase 2 (to account for the movement of stockpiled Phase 1 excavated material).

It is anticipated, HGV's will be restricted to movements on the local road network during the peak periods, however, for the purposes of this assessment, we have assumed 20% of HGV's may arrive/depart with deliveries of material/equipment during the peak hour.

As can be seen from table 5A.2, the highest construction trips relating to commuting workers, deliveries and supervisor trips during peak hour is estimated during Phase 2 of the development. These are considerably lower than the calculated trip generation from the completed proposed development (See table 5A.6 - Operational Traffic, Trips Generated)

Table 5A.2: Construction Traffic trips anticipated during AM Peak Hour

Construction Phasing	Construction Workers	Estimated Peak Daily Construction Vehicles			Trip anticipated during AM Peak hour			Total Construction Trips
		HGV	Vans	Cars	Goods/Material Trips (HGV)	Workers (Van/Cars)	Supervisor (Car)	
Phase 1	100	2	15	60	0	38	3	41
Phase 2	100	16	15	60	3	38	3	44
Phase 3	100	8	15	60	2	38	3	42
Phase 4	80	2	12	48	0	30	3	33

5A.5.1.3 Details of abnormal loads and deliveries to site

It may be necessary to work outside the normal hours of work at night or on weekends during certain activities and stages of the development (e.g. bridge construction, watermain diversion) which will be subject to agreement with the Local Authority and Irish Water. For such activities, abnormal loads and/or deliveries may be required.

Deliveries of materials to site will be planned to avoid high traffic volume periods where possible, particularly the AM peak hour. There may be occasions, however, when it is necessary to have deliveries within these periods. The Contractor will develop, agree and submit a detailed Traffic Management Plan to the Local Authority for approval prior to commencement of construction works.

Any variations or changes to the working hours will be included in the site-specific developed Construction Stage Traffic Management Plan which will be prepared before the Phase 1 works commences.

Approx. 12 No. abnormal loads will be delivered to site for the construction of the Moneygurney Bridge during Phase 1. These loads will access the site via Construction Access Point No. 2 on the Carrigaline Road R609. Abnormal loads include for the beam placement and bridge deck construction works. These deliveries subject to a permit will be undertaken between the hours of 19:00 and 07:00 to minimise disruption. Section 2.6 of Chapter 2 provides further detail of the traffic management during construction.

5A.5.2 Operational Phase Traffic Assessment

5A.5.2.1 Introduction

The impact of the proposed development on the local road network has been assessed by comparing the projected future traffic volumes for the AM and PM peak hours with and without the proposed development. All existing junctions have been assessed along with the proposed access junctions off the Carrigaline Road (R609).

Although the development will be built on a phased basis, for the purposes of this assessment, an opening year has been assumed as the year in which all of the proposed units associated with the scheme are likely to be fully constructed and occupied; giving the worst-case scenario for generated trips.

It has therefore been assumed that the proposed development will be fully complete and operational in 2024 and as such the assessment has assumed this to be the opening year. It should be noted; the proposed primary school is also assumed to be fully operational at this stage. As such, the proposed primary school development has been included in both 'do something' and 'do nothing' scenarios.

Transport Infrastructure Irelands (TII) Traffic and Transport Assessment Guidelines (2014) required the following modelling scenarios to be included in the assessment:

- Opening Year (assumed 2024) (with/without development) (AM & PM)
- Opening Year + 5 Years (2029) (with/without development) (AM & PM)
- Opening Year + 15 Years (2039) (with/without development) (AM & PM)

The morning peak period (08:00-09:00) and evening peak (17:00-18:00), determined as part of the traffic surveys undertaken, have been examined to assess the busiest case in terms of local traffic on the road network and traffic generated by the proposed development and the proposed primary school.

The proposed infrastructural developments on the surrounding road network are accounted for and table 5A.3 sets out the various assessment scenarios completed as part of this assessment.

Four different scenarios were assessed; specifically (1) the 'Base' (Do Nothing) traffic characteristics and (2) the 'Post Development' (Do Something) traffic characteristics. As such, there are two baselines scenarios (Do Nothing) and two corresponding design scenarios (Do Something) which will enable us to assess all possible impacts of our development. These include:

- Scenario A: **No** public road improvements; with Castletreasure Primary School (incl. signalized junction); **no** Cairn Homes development; **(Base) 'Do Nothing'**
- Scenario B: **With** public road improvements (i.e. M28 and signalized junction); with Castletreasure Primary School, **no** Cairn Homes development; **(Base) 'Do Nothing'**
- Scenario C: **No** public road improvements; with Castletreasure Primary School (incl. signalized junction); **with** Cairn Homes development; **(Post Development) 'Do Something'**
- Scenario D: **With** public road improvements (i.e. M28 and signalized junction); with Castletreasure Primary School, **with** Cairn Homes development; **(Post Development) 'Do Something'**

Table 5A.3: Various Scenarios Assessed

Development Assessment Scenarios	2018 Baseline Traffic (+ growth)	No Public Road Improvements		With Road Road Improvements	
		Scenario A	Scenario C	Scenario B	Scenario D
		School Dev. Only 2,200m2 Primary School	School Dev. + Proposed Dev. 475 Res. Units + Creche + School	School Dev. Only 2,200m2 Primary School	School Dev. + Proposed Dev. 475 Res. Units + Creche + School
2024 Opening Year	✓	✓	✓	✓	✓
2029 Interim Year	✓	✓	✓	✓	✓
2039 Design Year	✓	✓	✓	✓	✓

5A.5.2.2 Traffic Forecasting

The TII Guidelines have been followed when forecasting growth rates for the area. As part of the background review, existing notable sites with live planning permission within the surrounding area have been examined and are accounted for in the growth rate assumptions.

Background traffic has been increased using the TII Project Appraisal Guidelines (PAG) for link-based traffic growth forecasting. Table 5A.4 outlines the growth rate factors for the Cork County area. For the purposes of this assessment and noting the surrounding potential developments, a 'medium' growth rate has been assumed.

Table 5A.4: TII Annual Growth Rate Factors

Region	Vehicle Category	Medium Growth	
		2013-2030	2030-2050
County Cork	Light Vehicle (LV)	1.0102	1.0012
	Heavy Vehicle (HV)	1.0237	1.0176

Reference: TII PAG Unit 5A.3 - Travel Demand Projections, Table 5.3.2 - Link-Based Traffic Growth Rates, October 2016

Proposals to upgrade the N28 to motorway status and the addition of a future bridge structure with signals connecting Carrigaline Road and Grange Road have been included in this report. To account for these potential infrastructure projects, it was necessary to obtain detail on the previous assessment carried out. RPS are the consultants involved in the M28 project, and SYSTRA completed a recent TTA for the proposed school and signalised junction on the R609.

As such, it was necessary to account for these projects and obtain the traffic data for both. RPS Consultants provided J.B. Barry and Partners (JBB) with traffic figures from the model used to assess the proposed M28. These figures have been incorporated into the analysis of the surrounding junctions for Scenarios B and D (as detailed in Table 5A.3 above).

SYSTRA have carried out analysis for the proposed bridge and signalised junction on the R609 Carrigaline Road and a copy of the capacity outputs have been provided to JBB.

5A.5.2.3 Modal Shift

In predicting the level of traffic that will be generated from the proposed development, the mode of transport and quantity of traffic generated must be considered.

It is assumed that the traffic generated from the residential development will have its greatest impact during the morning and evening peak hours, 08:00-09:00 and 17:00-18:00, when traffic reaches its highest flow and the network is most saturated (confirmed by traffic count data). The additional trips are therefore added during these peak periods. The South West Regional Authority's 'Regional Planning Guidelines', the Cork County Development Plan and national policy (including the Smarter Travel: A sustainable Transport Future) anticipate a substantial modal shift to sustainable travel modes in the coming years.

'Theme 11-Commuting' of Census 2016 was interrogated using the online 'Sapmap' tool on the CSO website, to gain an understanding of the existing travel patterns in the Douglas area. The 'Sapmap Area: Electoral Division Douglas' data was used to calculate the existing percentage of people who walk/cycle or use public transport to commute. Table 5A.5 outlines 13% (On foot/Bicycle/Bus,minibus or coach) of those who commute around Douglas, at the time of the census, did not use a vehicle (driver or passenger) as their main mode of transport to work or education.

Table 5A.5: Existing Travel Mode Patterns in Douglas

Means of Travel	Work	School or College	Total	%
On foot	310	457	767	5%
Bicycle	154	27	181	1%
Bus, minibus or coach	461	569	1,030	7%
Train, DART or LUAS	22	11	33	0%
Motorcycle or scooter	49	10	59	0%
Car driver	7,815	417	8,232	55%
Car passenger	389	3,346	3,735	25%
Van	367	13	380	3%
Other (incl. lorry)	33	2	35	0%
Work mainly at or from home	285	10	295	2%
Not stated	179	100	279	2%
Total	10,064	4,962	15,026	100%

As part of this Traffic and Transport Assessment (TTA), it has been assumed, based on the CSO data, and due to the close proximity to the centre of Douglas and local schools, that a modal split of 20% is reasonable and will be applied to the trip generation figures from the proposed development for the design years.

A modal shift of 10% from the existing figure will be used as an estimate for the background traffic for the future years due to the proposed improvements for active travel and public transport in the area.

These figures have been assumed based on the anticipated modal shift figures outlined in the regional reports and are conservative in comparison..

Trip Generation

The predicted trips to/from the completed residential development have been calculated by examining the TRICS (Trip Rate Information Computer System) online database. The TRICS database contains trips for various land uses and rates were established based on the residential nature of the site. The calculation of the number of trips generated by this development is an important component of determining accurately the impact of the development on the local road network. To back-up the accuracy of the TRICS trip rates, the traffic arriving and leaving from the Templegrove/Vicarage Residential Estate was analysed to validate the trip rates identified in TRICS. This analysis gave similar rates to those provided by TRICS.

School trips to/from the proposed Castletreasure primary school, were based on a previous study carried out by Waterman Moylan as part of their planning application. The expected volume of traffic generated by the proposed residential development, school and creche can be seen in Table 5A.6.

Table 5A.6 Proposed Trip Rates and Generation

School Trip Generation - Waterman Moylan Report					
	In	Out			
AM Peak	168	149			
*The PM peak does not coincide with school leaving hours, therefore the AM peak was established as the critical time					
Residential Trip Generation					
Peak Hour	Units	Arriving		Departing	
		TRICS Rate	Trips	TRICS Rate	Trips
08:00-09:00	376	0.152	57	0.526	198
	99	0.152	15	0.526	52
17:00-18:00	376	0.458	172	0.286	108
	99	0.458	45	0.286	28
Creche Trip Generation					
Peak Times	Pupils	Arriving		Departing	
		Rate	Trips	Rate	Trips
08:00-09:00	70	0.383	27	0.243	17
17:00-18:00	70	0.248	17	0.311	22

The traffic analysis is based on assumption of 70 childcare places in the creche. The final creche design has capacity for up to 75 childcare places, however, this minor change has an imperceptible impact on the surrounding junctions.

5A.5.2.4 Trip Distribution

There are three proposed accesses to the residential developments (illustrated in Fig. 5A.9). The development is split into two separate areas with individual accesses; one area has 376 units proposed and the second has 99 units. The means of entry to the main development (376 units) is via Access 1 and Access 2 and a separate, 99 units via Access 3.

Of the 376 units, it was necessary to estimate the directional split between access 1 and 2. Based on the number of houses, proximity to both accesses and the internal road layout, it is estimated that 80% of residents will use Access 2 and 20% will use Access 1.

The AM and PM trip distribution from the proposed development to the existing road network is based on figures outlined in the Waterman Moylan report and the current distribution of surrounding residential estates (identified using the Junction Turn Count figures). This results in a calculated 80/20 split, 80% towards Douglas and 20% towards Carrigaline (based on traffic count figures). Figure 5A.9 illustrates the directional split based on the existing surrounding road network. Appendix A.5A.3 illustrate the trip distribution and generation for all scenarios.

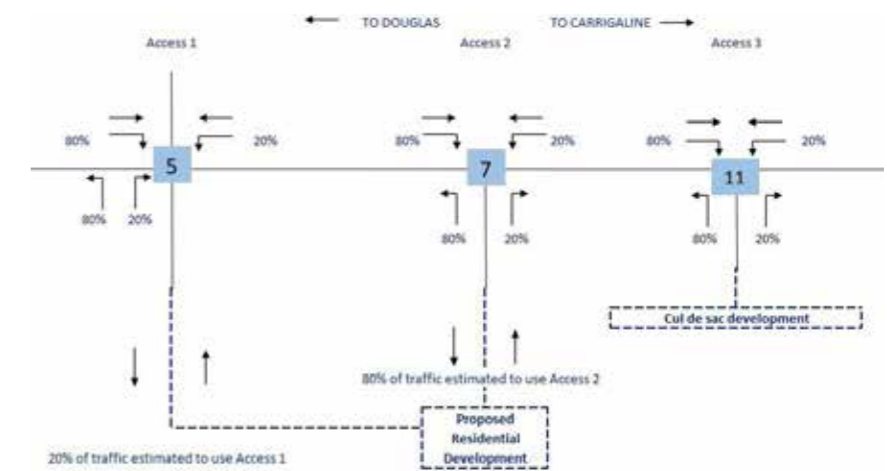


Figure 5A.9: Estimated trip distribution to Existing Road Network

If/when the future upgrades on the road network occur, the trip distribution onto the public road network is expected to change, with more traffic expected to travel to the M28 interchange immediately to the south of the site.

The trip distribution for the future road network (Scenarios B and D) has been based on the figures provided by RPS Consultants, taken from their M28 traffic model. The traffic count data (2018) was used to calculate the trip distribution for scenarios A and C.

As such, it has been assumed that 45% will travel towards the M28 and 55% will travel towards Douglas on the R609. This assumption is based on provision of an access northbound to the M28 towards Cork (currently not in place).

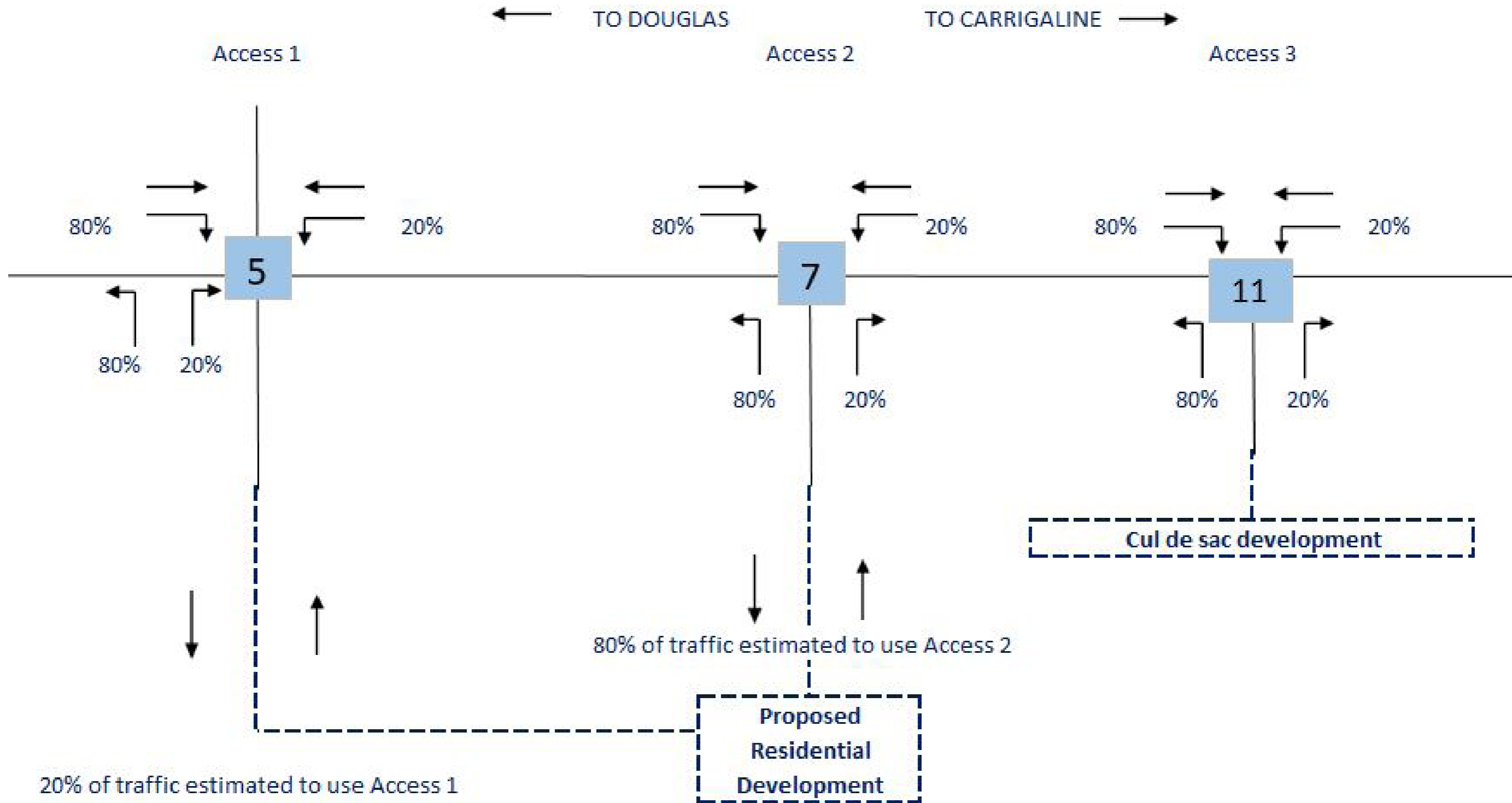


Figure 5A.9: Estimated trip distribution to Existing Road Network

To access Cork City, current traffic travels through Douglas Village via the Fingerpost roundabout of to the M28 Sliproad on Maryborough Hill. Some commuters use Maryborough Woods as a rat-run. When/if the M28 is in place, it has been assumed that trips generated from the proposed development will not use Maryborough Hill as a route to travel to the city. This split has been used at each of the three accesses from the development. (See Figure 5A.10)

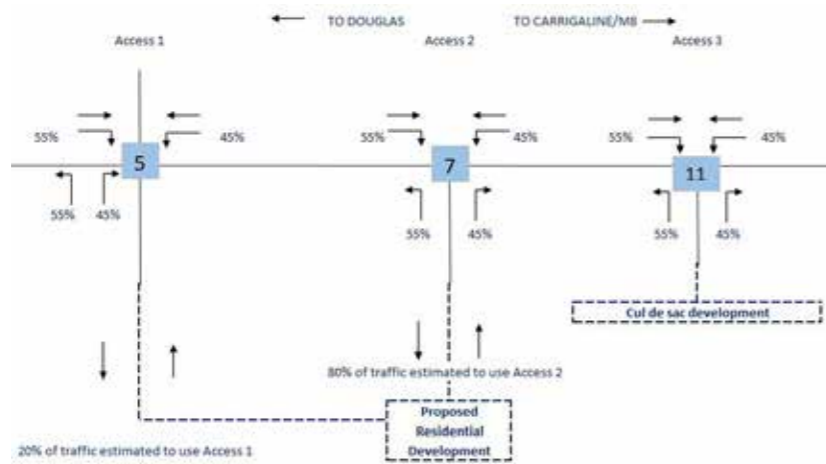


Figure 5A.10: Estimated Trip Distribution to Future Road Network

5A.5.2.5 Link Assessment

The impact assessment was carried out by comparing the two-way traffic volumes for the 'Base' and 'Base plus Development' conditions for both the existing road layout and the future road layout in the Opening Year (2024) and the Design Year (2039). Tables 5A.7 and 5A.8 outline all scenarios in the AM and PM peaks. The table also shows the percentage increase associated with the developments traffic on the surrounding road network. The Annual Average Daily Traffic was also calculated for each link and is available in Appendix A.5A.4.

TA 79/99 of the Design Manual for Roads and Bridges (DMRB) was used to estimate the 'Traffic Capacity of Urban Roads'. The link roads analysed as part of this assessment are categorised as 'Urban All-Purpose Road (UAP)'. The capacity of the link roads surrounding the development have been analysed using the DMRB guidance and tables 5A.7 and 5A.8 provide detail on the estimated flows and capacity of each link road. The analysis indicates that all link roads operate within capacity.

Table 5A.7: Link Assessment for Existing Road Network

Existing Road Network								
2024 (Opening Year)								
Link Section (See Diagrammatic Layout)	Base 2-way (veh/hr) Traffic (AM) Scenario A	Base + Development 2-way (veh/hr) Traffic (AM) Scenario C	% Change	Base 2-way (veh/hr) Traffic (PM) Scenario A	Base + Development 2-way (veh/hr) Traffic (PM) Scenario C	% Change	Road Type as per TA 79/99	Total Capacity of Link (veh/hr)
1. Entrance: R609 between Jct 4 and 5	643	752	17%	487	608	25%	UAP2	1764.00
2. R609 between Jct 1 and 6	989	1189	20%	872	1054	21%	UAP2	1764.00
3. R610 Douglas Relief Road	1333	1421	7%	1429	1533	7%	UAP2	2310.00
4. Maryborough Hill between Jct 1 and 2	770	874	14%	923	969	5%	UAP2	2058.00
5. Maryborough Hill between Jct 2 and 3	871	906	4%	882	1010	15%	UAP2	2058.00
6. R610 Rochestown Road	1037	1107	7%	1278	1351	6%	UAP2	1764.00
7. Maryborough Woods	239	282	18%	199	208	5%	UAP2	2058.00

2039 (Design Year)								
Link Section (See Diagrammatic Layout)	Base 2-way (veh/hr) Traffic (AM) Scenario A	Base + Development 2-way (veh/hr) Traffic (AM) Scenario C	% Change	Base 2-way (veh/hr) Traffic (PM) Scenario A	Base + Development 2-way Traffic (veh/hr) (PM) Scenario C	% Change	Road Type as per TA 79/99	Total Capacity of Link (veh/hr)
1. Entrance: R609 between Jct 4 and 5	675	783	16%	514	631	23%	UAP2	1764.00
2. R609 between Jct 1 and 6	1066	1237	16%	921	1100	19%	UAP2	1764.00
3. R610 Douglas Relief Road	1463	1537	5%	1569	1609	3%	UAP2	2310.00
4. Maryborough Hill between Jct 1 and 2	795	872	10%	982	1005	2%	UAP2	2058.00
5. Maryborough Hill between Jct 2 and 3	922	958	4%	940	965	3%	UAP2	2058.00
6. R610 Rochestown Road	1100	1169	6%	1361	1418	4%	UAP2	1764.00
7. Maryborough Woods	282	292	4%	209	218	4%	UAP2	2058.00

Table 5A.8: Link Assessment for Future Road Network

Future Road Network								
2024 (Opening Year)								
Link Section (See Diagrammatic Layout)	Base 2-way (veh/hr) Traffic (AM) Scenario B	Base + Development 2-way (veh/hr) Traffic (AM) Scenario D	% Change	Base 2-way (veh/hr) Traffic (PM) Scenario B	Base + Development 2-way (veh/hr) Traffic (PM) Scenario D	% Change	Road Type as per TA 79/99	Total Capacity of Link (veh/hr)
1. Entrance: R609 between Jct 8 and 6	962	1120	16%	723	882	22%	UAP2	1764.00
2. R609 between Jct 1 and 6	1117	1254	12%	1031	1190	15%	UAP2	1764.00
3. R610 Douglas Relief Road	1654	1719	4%	1444	1490	3%	UAP2	2310.00
4. Maryborough Hill between Jct 1 and 2	1015	1015	0%	1080	1098	2%	UAP2	2058.00
5. Maryborough Hill between Jct 2 and 10	1066	1066	0%	955	956	0%	UAP2	2058.00
6. R610 Rochestown Road	1378	1449	5%	1723	1798	4%	UAP2	1764.00
7. Maryborough Woods	245	260	6%	165	178	8%	UAP2	2058.00
8. Carrs Hill Underbridge	1023	1128	10%	729	786	8%	UAP1	2226.00
9. Maryborough to Carrs Hill Link Road	1102	1107	0%	604	613	1%	UAP1	2226.00

2039 (Design Year)								
Link Section (See Diagrammatic Layout)	Base 2-way (veh/hr) Traffic (AM) Scenario B	Base + Development 2-way (veh/hr) Traffic (AM) Scenario D	% Change	Base 2-way (veh/hr) Traffic (PM) Scenario B	Base + Development 2-way (veh/hr) Traffic (PM) Scenario D	% Change	Road Type as per TA 79/99	Total Capacity of Link (veh/hr)
1. Entrance: R609 between Jct 8 and 6	1190	1349	13%	875	1036	18%	UAP2	1764.00
2. R609 between Jct 1 and 6	1276	1413	11%	1261	1420	13%	UAP2	1764.00
3. R610 Douglas Relief Road	1916	1982	3%	1649	1694	3%	UAP2	2310.00
4. Maryborough Hill between Jct 1 and 2	1067	1067	0%	1135	1153	2%	UAP2	2058.00
5. Maryborough Hill between Jct 2 and 10	1232	1232	0%	1080	1080	0%	UAP2	2058.00
6. R610 Rochestown Road	1549	1620	5%	1916	1991	4%	UAP2	1764.00
7. Maryborough Woods	355	369	4%	191	205	7%	UAP2	2058.00
8. Carrs Hill Underbridge	1123	1228	9%	913	1001	10%	UAP1	2226.00
9. Maryborough to Carrs Hill Link Road	1111	1113	0%	709	712	0%	UAP1	2226.00

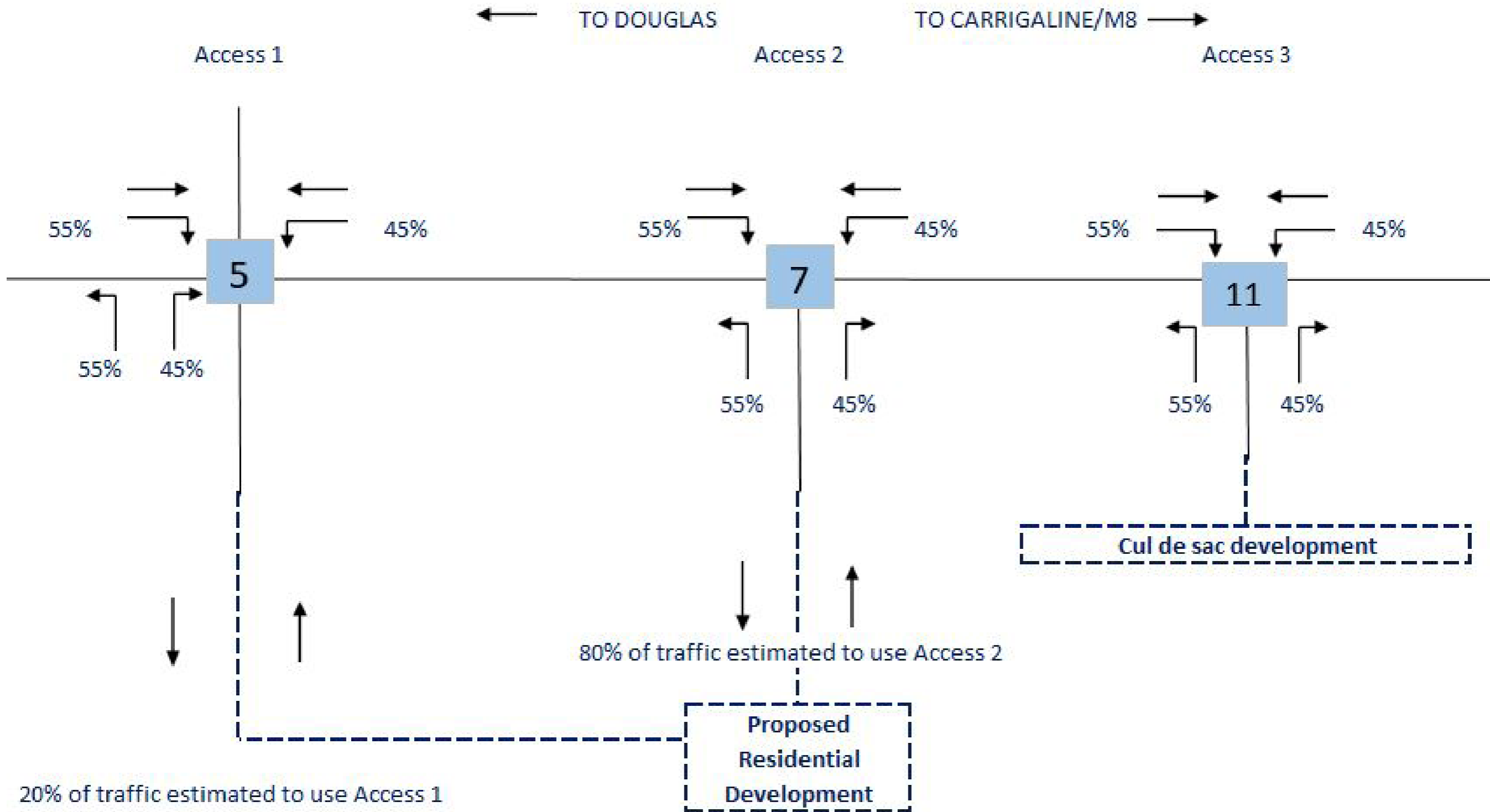


Figure 5A.10: Estimated Trip Distribution to Future Road Network

Both tables show an increase in traffic flow primarily at the location outside the entrance to the development and on the R609 towards Douglas in both the morning and evening peaks.

The Douglas Relief Road (R610) has the highest 2-way flows for both the existing and future road networks. Other areas with notable increases for the existing road layout include:

- Maryborough Hill between Jct 1 and Jct 2 in the AM peak (14%);
- Maryborough Woods in the AM peak (18%); and
- Maryborough Hill between Jct 2 and Jct 3 in the PM peak (15%)

For the future road layout including the upgrades to the N28 (apart from impacts of 6% or less) Maryborough Hill between Jct 1 and Jct 2 increases by 10% in the AM peak.

The increase in two-way traffic on the link sections does have an impact on the capacity of the junctions connecting these road links. The following sections outlines the capacity impact assessment of these junctions.

5A.5.3 Junction Assessment

Junctions, connecting road links, normally determine the network capacity in urban areas. Impact assessments therefore focus on the influence of traffic generated by the development on junctions in the surrounding road network. The following junctions were assessed for both 'base' and 'base plus development' for the existing and future road layouts:

- Junction 1 - Fingerpost Roundabout;
- Junction 2 - Maryborough Woods Road/Maryborough Hill (incl. Maryborough House Hotel access);
- Junction 3 - Maryborough Hill/ N28 Slip Road (on-ramp T-junction);
- Junction 4 - Carrigaline Road/N28 Slip Road (off-ramp T-junction);
- Junction 5 - Carrigaline Road/Berkley; The Vicarage; Templegrove (**Access 1**); and
- Junction 6 - Carrigaline Road/Maryborough Hill.
- Junction 7 - The proposed signalized junction (**Access 2** - shared with Primary School);
- Junction 8 - Proposed M28 - Proposed Carr's Hill West Roundabout
- Junction 9 - Proposed M28 - Proposed Carr's Hill East Roundabout
- Junction 10 - Proposed M28 - Proposed MaryboroughHill/Carrs Hill Link Road
- Junction 11 - The proposed priority junction to the proposed cul-de-sac (**Access 3**); and
- Junction 12 - Possible future signalized junction linking the R609 and Grange Road.

Figures 5A.11 and 5A.12 outlines a diagrammatic illustration of the existing and proposed junctions including the proposed residential development.

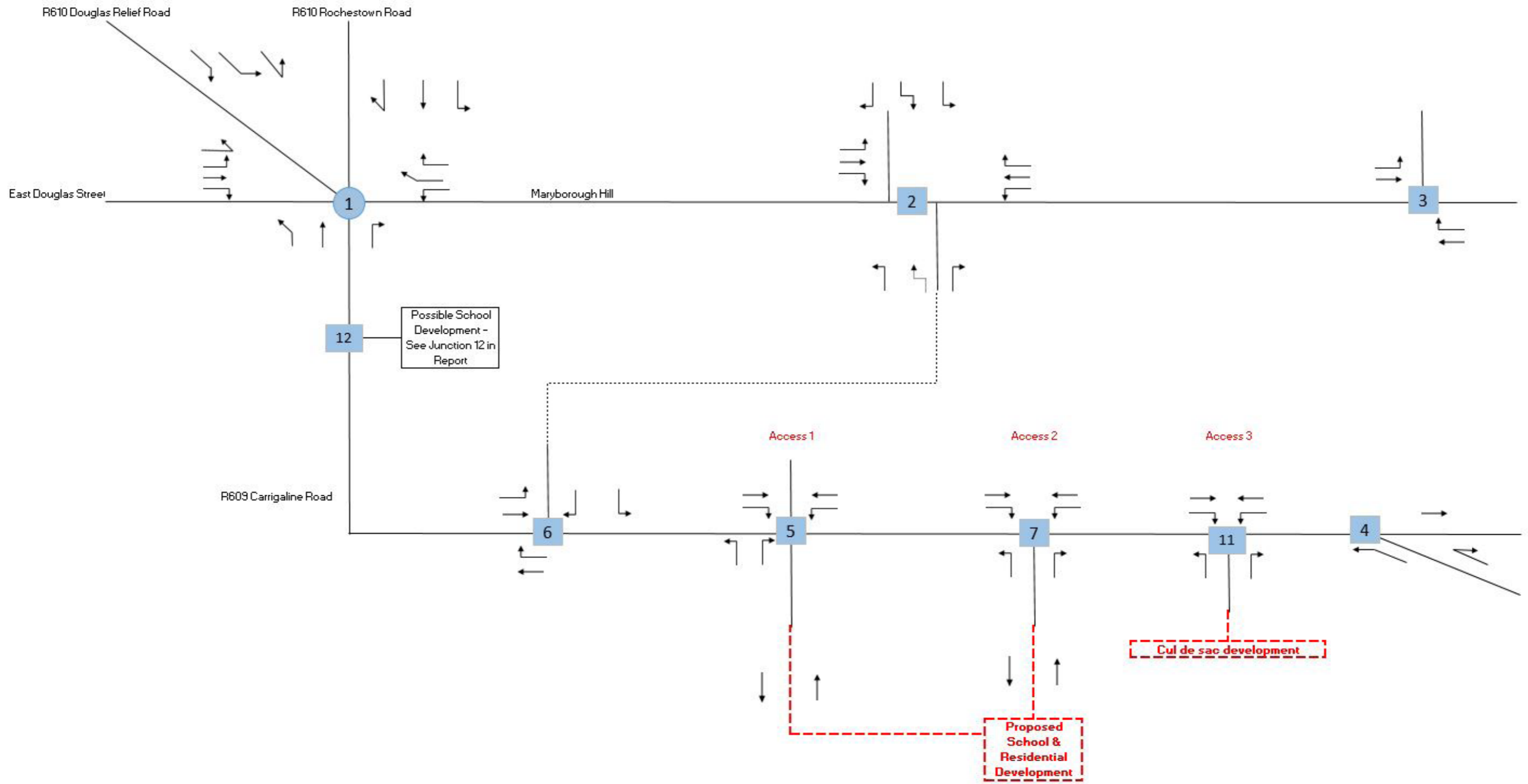


Figure 5A.11: Junctions in Existing Road Layout (Scenario A & C)

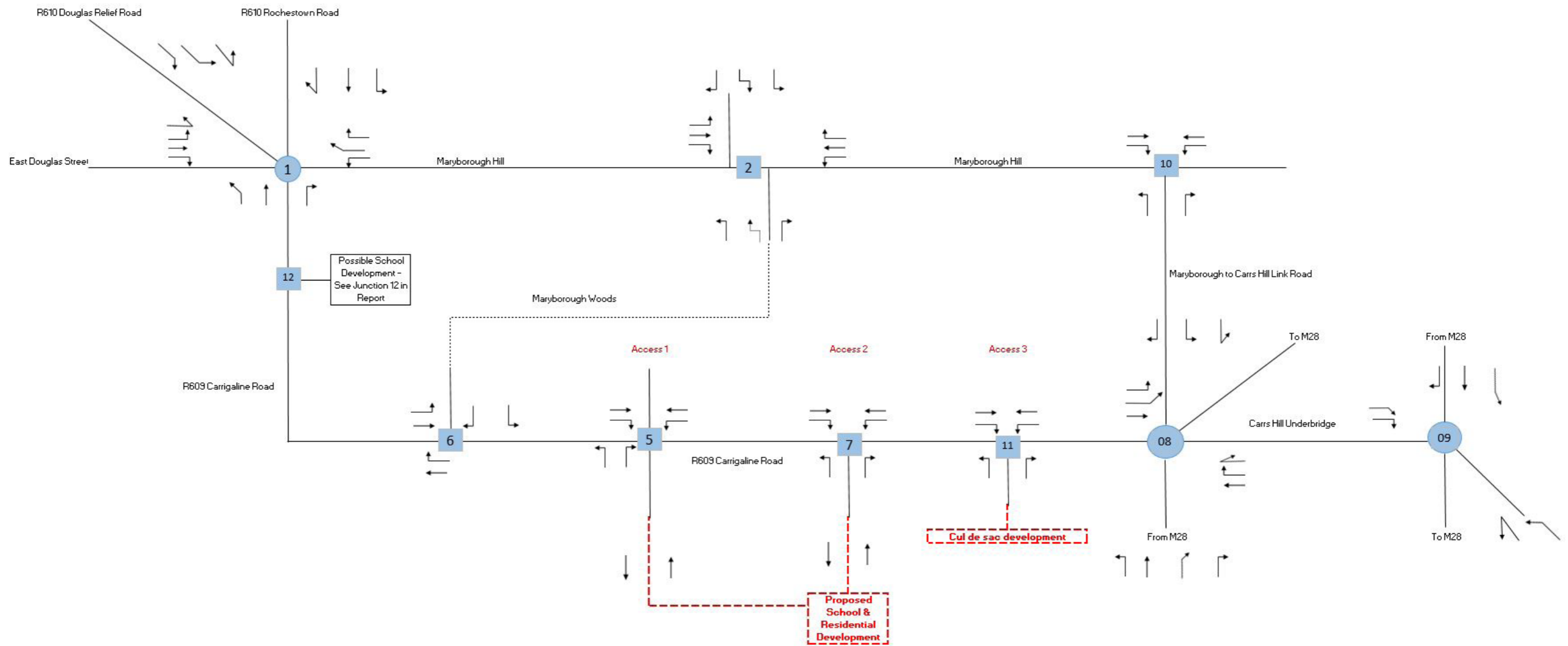


Figure 5A.12: Junctions in Future Road Layout (Scenario B & D)

The analysis carried out for all of the assessment years (2024; 2029; 2039) are based on the traffic count figures (for existing junction), the RPS figures (for future junctions relating to M28) and the SYSTRA figures (for Junction 12), for the time periods 08:00-09:00 and 17:00-18:00.

The Junction capacity is the key determinant of the transport network operation in urban areas. Traffic assessments therefore focus on the influence of traffic generated by the development on junctions in the surrounding road network. The analysis was carried out using PICADY for priority-controlled junctions, ARCADY for roundabouts and OSCADY for signalized junctions. These were used to determine the capacity of the junction arms based on the variety of geometric parameters. The software assesses the extent to which traffic-flow through the junction approaches capacity.

The outputs of the assessment are the Ratio to Flow Capacity (RFC), and a queue value for each arm. The RFC value indicates the extent to which traffic flows on a junction arm approach capacity (a junction arm operating at capacity would have an RFC value of 1).

A priority and roundabout type junction is generally said to be operating satisfactorily if all arms of the junction operate with an RFC value below 0.85. For signalised junctions, the threshold increases slightly to 0.9. The queue value relates to the average of maximum queues on the junction arm.

The analysis of the traffic count data (2018), Opening Year (2024) and the Design Year (2039) are included in the report, however 2039 is the critical year and represents the worst case scenario, therefore, this has been focused on. A full copy of the report on the software outputs for all scenarios in the Existing (2018), Opening (2024) and Design (2039) accompanies the planning application.

Traffic varies from day to day; therefore, it should be noted that the traffic analysis is based on 12-hour count data from a mid-week school day. Any holiday periods are avoided when carrying out traffic counts to ensure data is provided for a 'normal working/school day'.

The tables in the following sections outline the RFC for each arm on each assessed junction. The table highlights the arms operating within capacity using green text; any arm exceeding the RFC design threshold of 0.85 for priority control junctions or 0.9 for signal control junctions or includes a 'warning' from the software output, is highlighted through red text. One warning type occurred when analysing the junctions. The Fingerpost roundabout contains pedestrian crossings on a few arms. The warning relates to traffic stopping on the roundabout, to give priority to crossing pedestrians.

In the following tables summarizing the analysis the '% Diff' refers to the percentage difference between the RFCs in each scenario.

The impact on the RFC has been determined using the following methodology. According to the TFL Traffic modelling guidelines 2010, delay begins to increase exponentially above approximately 0.85 (RFC) or 0.90 for signalised junctions. At junctions operating close to the design thresholds, small reductions in capacity can result in a significant increase in delay. Based on the above, the following impact scale to rate impact of the development on the junctions is outlined in table 5A.9.

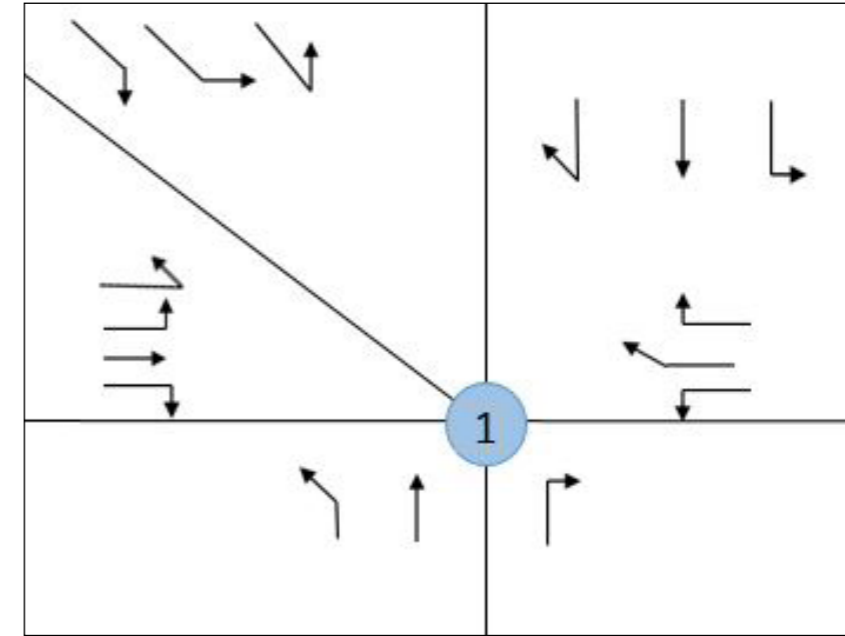


Figure 5A.13: Junction 1 Map and Movements

Table 5A.9: Impact on Ratio to Flow Capacity at Junctions

Do Nothing RFC	Do Something RFC			
	<80%	80-85%	85-90%	>90%
<80%	Slight	Moderate	Significant	Significant
80-85%	Positive	Slight	Significant	Significant
85-90%	Positive	Positive	Slight	Significant
>90%	Positive	Positive	Positive	Slight

As can be seen from Table 5.A.9, the impact of the development is represented by the difference in junction performance between the base conditions (Without Dev) and the development phase condition (With Dev).

5A.5.3.1 Junction 1 - Fingerpost Roundabout

This is a five-arm priority roundabout serving the R609 (Carrigaline Road); the R610 (Douglas Relief Road); the R610 (Rochestown Road); Maryborough Hill and East Douglas Street. All approaches have two-lane entries with single lane exits. East Douglas Street is a one-way street with no access from the roundabout and Maryborough Hill has a continuous bus corridor to the R609 travelling southbound. The R609, Maryborough Hill and the R610 (Rochestown Road), provides pedestrian facilities in the form of a zebra crossings set back from the junction. The R610 (Douglas Relief Road) provides an uncontrolled crossing point at the junction with a splitter island. Similarly, the one-way East Douglas Street provides an uncontrolled crossing at the junction (See figure 5A.13).

Existing Road Layout

The following tables show the results carried out for the Fingerpost Roundabout for the traffic count data (2018), opening year (2024) and design year (2039) for the existing road layout.

Table 5A.10: Junction 1 2024 Junction Performance Results - Existing Road Layout

Junction 1 - Fingerpost Roundabout					
2018 Traffic Count Figures					
Assessment Period	Arm	Approach	Movement	RFC	Queue
AM Peak (08:00-09:00)	A	Maryborough Hill (WB)	L/St/R	0.4	1
	B	R609 Carrigaline Road (NB)	L/St/R	0.281	1
	C	East Douglas Street (EB)	L/L/St/R	0.119	1
	D	R610 Douglas Relief Road (SB)	L/St/R	0.268	1
	E	R610 Rochestown Road (SB)	L/St/R	0.429	1
PM Peak (17:00-18:00)	A	Maryborough Hill (WB)	L/St/R	0.364	1
	B	R609 Carrigaline Road (NB)	L/St/R	0.26	1
	C	East Douglas Street (EB)	L/L/St/R	0.368	1
	D	R610 Douglas Relief Road (SB)	L/St/R	0.537	2
	E	R610 Rochestown Road (SB)	L/St/R	0.512	1

Table 5A.11: Junction 1 2024 Junction Performance Results - Existing Road Layout

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (WB)	L/St/R	0.438	1	0.457	1	4%
	B	R609 Carrigaline Road (NB)	L/St/R	0.325	1	0.401	1	23%
	C	East Douglas Street (EB)	L/L/St/R	0.123	1	0.134	1	9%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.274	1	0.287	1	5%
	E	R610 Rochestown Road (SB)	L/St/R	0.451	1	0.466	1	3%
PM Peak (17:00-18:00)	A	Maryborough Hill (WB)	L/St/R	0.34	1	0.388	1	14%
	B	R609 Carrigaline Road (NB)	L/St/R	0.25	1	0.289	1	16%
	C	East Douglas Street (EB)	L/L/St/R	0.35	1	0.375	1	7%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.504	2	0.543	2	8%
	E	R610 Rochestown Road (SB)	L/St/R	0.486	1	0.54	2	11%

Table 5A.12: Junction 1 2039 Junction Performance Results - Existing Road Layout

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (WB)	L/St/R	0.478	1	0.496	1	4%
	B	R609 Carrigaline Road (NB)	L/St/R	0.348	1	0.424	1	22%
	C	East Douglas Street (EB)	L/L/St/R	0.135	1	0.147	1	9%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.295	1	0.307	1	4%
	E	R610 Rochestown Road (SB)	L/St/R	0.484	1	0.499	1	3%
PM Peak (17:00-18:00)	A	Maryborough Hill (WB)	L/St/R	0.377	1	0.429	1	14%
	B	R609 Carrigaline Road (NB)	L/St/R	0.269	1	0.309	1	15%
	C	East Douglas Street (EB)	L/L/St/R	0.384	1	0.412	1	7%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.555	4	0.597	2	8%
	E	R610 Rochestown Road (SB)	L/St/R	0.533	2	0.592	2	11%

Future Road Layout

The following tables show the results carried out for the Fingerpost Roundabout for the opening year (2024) and design year (2039) for the proposed road layout.

Table 5A.13: 2024 Junction Performance Results - Future Road Layout

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (WB)	L/St/R	0.655	2	0.669	2	2%
	B	R609 Carrigaline Road (NB)	L/St/R	0.339	1	0.403	1	19%
	C	East Douglas Street (EB)	L/L/St/R	0.146	1	0.161	1	10%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.285	1	0.299	1	5%
	E	R610 Rochestown Road (SB)	L/St/R	0.544	2	0.561	2	3%
PM Peak (17:00-18:00)	A	Maryborough Hill (WB)	L/St/R	0.445	1	0.494	1	11%
	B	R609 Carrigaline Road (NB)	L/St/R	0.323	1	0.36	1	11%
	C	East Douglas Street (EB)	L/L/St/R	0.335	1	0.351	1	5%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.595	2	0.642	2	8%
	E	R610 Rochestown Road (SB)	L/St/R	0.449	1	0.495	1	10%

Table 5A.14: 2039 Junction Performance Results - Future Road Layout.

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (WB)	L/St/R	0.631	2	0.644	2	2%
	B	R609 Carrigaline Road (NB)	L/St/R	0.38	1	0.446	1	17%
	C	East Douglas Street (EB)	L/L/St/R	0.147	1	0.159	1	8%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.401	1	0.42	1	5%
	E	R610 Rochestown Road (SB)	L/St/R	0.639	2	0.656	2	3%
PM Peak (17:00-18:00)	A	Maryborough Hill (WB)	L/St/R	0.532	2	0.593	2	11%
	B	R609 Carrigaline Road (NB)	L/St/R	0.386	1	0.423	1	10%
	C	East Douglas Street (EB)	L/L/St/R	0.372	1	0.39	1	5%
	D	R610 Douglas Relief Road (SB)	L/St/R	0.7	1	0.767	4	10%
	E	R610 Rochestown Road (SB)	L/St/R	0.549	2	0.598	2	9%

* Warning indicates restriction may occur due to traffic queuing to leave the junction on an adjacent arm

The results of the analysis indicate that all arms of the junction operate within capacity for both the existing and future road layouts, however, there is a slight negative impact on the capacity of the junction in the long term.

The highest increase (22/23%) is evident on the Carrigaline Road (R609) approaching the Fingerpost Roundabout on the existing road layout. This is to be expected, particularly as 80% of traffic leaving the proposed development has been assumed to head towards Douglas on the existing road network.

The software output for Design Year (2039) includes a warning confirming that restrictions may occur due to traffic queuing to leave the junction on an adjacent arm. The Fingerpost roundabout contains pedestrian crossings on a number of arms. The warning relates to traffic stopping on the roundabout, to give priority to crossing pedestrians. As it is predicted the number of vehicles will grow to 2039, the volume of vehicles at the junction, combined with crossing pedestrians, may lead to some restrictions. Restrictions may occur if there is a high volume of pedestrians using the crossings at the junction. This would cause traffic circulating the roundabout and leaving to stop, giving priority to pedestrians. This may block the through path and force vehicles on adjacent arms to wait, leaving them unable to navigate the junction until the pedestrians and circulating traffic have cleared. This could cause additional queuing traffic and increased waiting times to navigate the junction.

5A.5.3.2 Junction 2 - Maryborough Woods Road/Maryborough Hill (incl. Maryborough House Hotel access)

This is a four-arm staggered signalized junction with pedestrian crossings on all arms; one arm provides access to the Maryborough Hotel and Spa. Advance stopping lines are provided on all arms of the junctions except on the Maryborough Hotel arm. (See figure 5A.14)



Figure 5A.15: Junction 2 Map and Movements

Existing Road Layout

The following tables show the results of the analysis carried out for the Maryborough Hill Signalised Junction for the current year (2018), opening year (2024) and design year (2039) for the existing road layout.

Table 5A.15: Junction 2 2018 Junction Performance Results - Existing Road Layout

Junction 2 - Maryborough Hill Signalised Junction					
2018 Traffic Count Figures					
Assessment Period	Arm	Approach	Movement	RFC	Queue
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	0.862	9
	B	Maryborough Woods (EB)	L/St/R	0.822	6
	C	Maryborough Hill (SB)	L/St/R	0.614	6
	D	Maryborough Hotel (WB)	L/St/R	0.203	1
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.692	6
	B	Maryborough Woods (EB)	L/St/R	0.664	3
	C	Maryborough Hill (SB)	L/St/R	0.913	12
	D	Maryborough Hotel (WB)	L/St/R	0.532	2

Table 5A.16: Junction 2 2024 Junction Performance Results - Existing Road Network

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	0.894	8	0.921	12	3%
	B	Maryborough Woods (EB)	L/St/R	0.88	4	0.921	8	5%
	C	Maryborough Hill (SB)	L/St/R	0.651	5	0.676	6	4%
	D	Maryborough Hotel (WB)	L/St/R	0.202	1	0.202	1	0%
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.66	6	0.692	6	5%
	B	Maryborough Woods (EB)	L/St/R	0.636	3	0.677	3	6%
	C	Maryborough Hill (SB)	L/St/R	0.86	10	0.89	11	3%
	D	Maryborough Hotel (WB)	L/St/R	0.508	2	0.515	2	1%

Table 5A.17: Junction 2 2039 Junction Performance Results - Existing Road Network

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	0.942	13	0.975	16	4%
	B	Maryborough Woods (EB)	L/St/R	0.942	9	0.975	11	4%
	C	Maryborough Hill (SB)	L/St/R	0.707	6	0.751	7	6%
	D	Maryborough Hotel (WB)	L/St/R	0.211	1	0.211	1	0%
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.703	6	0.726	7	3%
	B	Maryborough Woods (EB)	L/St/R	0.671	3	0.705	3	5%
	C	Maryborough Hill (SB)	L/St/R	0.935	14	0.958	16	2%
	D	Maryborough Hotel (WB)	L/St/R	0.54	2	0.547	2	1%

It should also be noted that one arm of the junction is currently exceeding the capacity threshold. The results indicate that two arms exceed the threshold in the Opening Year with the development, therefore there is a moderate short-term negative impact.

In the Design year, three arms exceed the design threshold, although it's important to recognise that these exceed the design threshold with and without the proposed development. There is only a marginal increase in both RFCs and queues due to the development therefore, the impact is classed as slight at this junction due the increase in the RFC. It should be noted that whilst the normal design threshold is exceeded, the theoretical capacity of the junction is not exceeded.

Future Road Layout

The following tables show the results carried out for the Maryborough Hill signalised junction for the opening year (2024) and design year (2039) for the proposed road layout.

Table 5A.18: Junction 2 2024 Junction Performance Results - Proposed Road Layout

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	1.031	27	1.031	27	0%
	B	Maryborough Woods (EB)	L/St/R	0.101	1	0.101	1	0%
	C	Maryborough Hill (SB)	L/St/R	0.582	4	0.582	4	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.588	5	0.588	5	0%
	B	Maryborough Woods (EB)	L/St/R	0.208	1	0.208	1	0%
	C	Maryborough Hill (SB)	L/St/R	0.847	9	0.847	9	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%

Table 5A.19: Junction 2 2039 Junction Performance Results - Proposed Road Layout

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	1.061	34	1.061	34	0%
	B	Maryborough Woods (EB)	L/St/R	0.341	2	0.341	2	0%
	C	Maryborough Hill (SB)	L/St/R	0.729	6	0.729	6	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.706	7	0.706	7	0%
	B	Maryborough Woods (EB)	L/St/R	0.29	1	0.29	1	0%
	C	Maryborough Hill (SB)	L/St/R	0.936	13	0.936	13	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%

The results for Scenarios B and D are the same as it is assumed traffic from the school and residential development will not travel via Junction 2 due to the new road layout; this would be a longer convoluted route for traffic to take to access either Douglas or the new M28. It should also be noted that the figures provided by RPS for this junction did not include traffic flow to and from the Maryborough Hotel. The minor arm entering/exiting the Maryborough Hotel is less significant given the small volume of traffic using the hotel at peak times. Tables 5A.18 and 5A.19 indicate the proposed development will have a neutral impact at this junction when/if the future road layout becomes operational.

5A.5.3.3 Junction 3 - Maryborough Hill/ N28 Slip Road (on-ramp T-junction)

This is a three-arm priority junction just north of the N28 overbridge. Maryborough Hill forms the major arm of the junction. The single lane slip road provides northbound access to the N28. There is a footpath on the eastern side of the major arm with a southbound cycle lane on approach to the junction. There are no pedestrian/cycle facilities on the minor arm (N28 slip road).

Existing Road Layout

Junction 3 is a priority T-junction with Maryborough Hill forming the major arm and the one-way N28 slip road forming the minor arm. (See figure 5A.15) If/when the proposed upgrade occurs to the N28, this junction will be altered. The slip road to the M28 will be removed and a link road between Maryborough Hill and Carr's Hill will be introduced. (See Junction 10). The following tables show the results of the analysis carried out for the Maryborough Hill/N28 Slip Road Junction. It is assessed for the current year (2018), opening year (2024) and design year (2039) with the existing road layout.

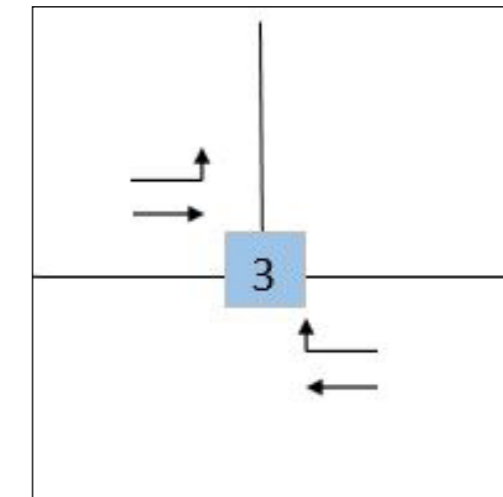


Figure 5A.15: Junction 3 Map and Movements

Table 5A.20: Junction 3 2018 Junction Performance Results - Existing Road Layout

Junction 3 - Maryborough Hill/N28 Slip Road					
2018 Traffic Count Figures					
Assessment Period	Arm	Approach	Movement	RFC	Queue
AM Peak (08:00-09:00)	A	Maryborough Hill (SB)	L/St	-	-
	B	N28 Slip Road (NB)	St	0	0
	C	Maryborough Hill (NB)	St/R	0.949	13
PM Peak (17:00-18:00)	A	Maryborough Hill (SB)	L/St/R	-	-
	B	N28 Slip Road (NB)	L/St/R	0	0
	C	Maryborough Hill (NB)	L/St/R	0.837	7

Table 5A.21: Junction 3 2024 Junction Performance Results - Existing Road Layout

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	1.031	27	1.031	27	0%
	B	Maryborough Woods (EB)	L/St/R	0.101	1	0.101	1	0%
	C	Maryborough Hill (SB)	L/St/R	0.582	4	0.582	4	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.588	5	0.588	5	0%
	B	Maryborough Woods (EB)	L/St/R	0.208	1	0.208	1	0%
	C	Maryborough Hill (SB)	L/St/R	0.847	9	0.847	9	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%

Table 5A.22: Junction 3 2039 Junction Performance Results - Existing Road Layout

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Maryborough Hill (NB)	L/St/R	1.061	34	1.061	34	0%
	B	Maryborough Woods (EB)	L/St/R	0.341	2	0.341	2	0%
	C	Maryborough Hill (SB)	L/St/R	0.729	6	0.729	6	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%
PM Peak (17:00-18:00)	A	Maryborough Hill (NB)	L/St/R	0.706	7	0.706	7	0%
	B	Maryborough Woods (EB)	L/St/R	0.29	1	0.29	1	0%
	C	Maryborough Hill (SB)	L/St/R	0.936	13	0.936	13	0%
	D	Maryborough Hotel (WB)	L/St/R	0	0	0	0	0%

The results of the analysis indicate that the junction is currently operating above the normal design threshold for a priority T-junction on Maryborough Hill (North of the Junction). This continues to occur into the Opening and Design Year with or without the development. The impact of the proposed development on this junction is slight in the short and long-term.

5A.5.3.4 Junction 4 - Carrigaline Road/N28 Slip Road (off-ramp T-junction)

This is a grade-separated junction with free-flowing slip roads onto and off the N28. The R609 southbound travels underneath the N28 prior to accessing the slip road. Southbound access only is available at this junction. (See figure 5A.16)

No analysis was carried out for this junction as it is largely free flowing. Traffic count figures indicate very small numbers of vehicles utilise the right turn which allows traffic which has come off the N28 from Carrigaline to re-join towards Carrigaline. The proposed development is expected to have a neutral/not significant impact on this junction in the short/medium/long term.



Figure 5A.16: Junction 4 Map and Movements

5A.5.3.5 Junction 5 - Carrigaline Road/Berkely; The Vicarage and Templegrove

This is a priority T-junction with the Carrigaline Road (R609) forming the major arm of the junction. These roads are single lane on all approaches with footpaths on all arms of the junctions. The minor arm provides access to the residential housing estates of Temple Grove and the Vicarage. (See figure 5A.17)

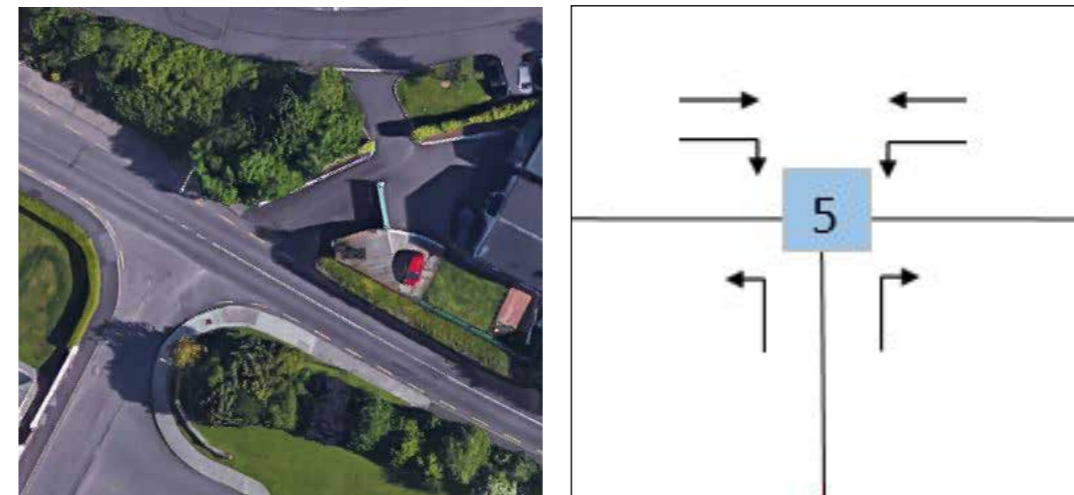


Figure 5A.17: Junction 5 Map and Movements

Existing Road Layout

The following tables show the results of the analysis carried out for the priority T- Junction of the Carrigaline Road and the Vicarage. It is assessed for the current year (2018), opening year (2024) and design year (2039) with the existing road layout.

Table 5A.23: Junction 5 2018 Junction Performance Results - Existing Road Network

Junction 5 - Carrigaline Rd/Berkely					
2018 Traffic Count Figures					
Assessment Period	Arm	Approach	Movement	RFC	Queue
AM Peak (08:00-09:00)	A	Carrigaline Road (WB)	L/St	-	-
	B	Berkely (NB)	L/St/R	0.093	1
	C	Carrigaline Road (EB)	St/R	0.013	1
PM Peak (17:00-18:00)	A	Carrigaline Road (WB)	L/St	-	-
	B	Berkely (NB)	L/St/R	0.055	1
	C	Carrigaline Road (EB)	St/R	0.049	1

Table 5A.24: Junction 5 2024 Junction Performance Results - Existing Road Network

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.097	1	0.182	1	88%
	C	Carrigaline Road (EB)	St/R	0.014	0	0.032	0	129%
PM Peak (17:00-18:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.053	0	0.092	1	74%
	C	Carrigaline Road (EB)	St/R	0.047	0	0.097	1	106%

Table 5A.25: Junction 5 2039 Junction Performance Results - Existing Road Network

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.104	1	0.191	1	84%
	C	Carrigaline Road (EB)	St/R	0.014	1	0.033	0	136%
PM Peak (17:00-18:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.056	1	0.096	1	71%
	C	Carrigaline Road (EB)	St/R	0.051	1	0.103	1	102%

This junction will form an access to/from the north western area of the proposed site, therefore the level of traffic using this junction increases. Although there is a large percentage increase, it should be noted that this junction has ample spare capacity to take the increased volume of traffic; therefore, the impact is categorised as slight with all arms well within the design capacity threshold even in the 2039 Design year including the development.

Future Road Layout

The following tables show the results of the analysis carried out for the Carrigaline/The Vicarage priority T-junction during the opening year (2024) and design year (2039).

Table 5A.26: Junction 5 2024 Junction Performance Results - Future Road Network

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.021	0	0.114	1	443%
	C	Carrigaline Road (EB)	St/R	0.056	1	0.077	1	38%
PM Peak (17:00-18:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.098	1	0.178	1	82%
	C	Carrigaline Road (EB)	St/R	0.104	1	0.152	1	46%

Table 5A.27: Junction 5 2039 Junction Performance Results - Future Road Network

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.101	1	0.209	1	107%
	C	Carrigaline Road (EB)	St/R	0.075	1	0.096	1	28%
PM Peak (17:00-18:00)	A	Carrigaline Road (WB)	L/St	-	-	-	-	
	B	Berkely (NB)	L/St/R	0.125	1	0.216	1	73%
	C	Carrigaline Road (EB)	St/R	0.257	1	0.315	1	23%

Similar to the results for the existing road network, although there are large percentage increases in the RFC, it should be noted that this junction has ample spare capacity to take the increased volume of traffic. The impact is slight and all arms are well within the capacity threshold even in the 2039 Design year including the development.

5A.5.3.6 Junction 6 - Carrigaline Road/Maryborough Woods

Like junction 5, this junction is a priority T-junction with the major arm on the R609. The minor arm of Maryborough Woods Road provides a through road to Maryborough Hill serving the Maryborough Woods residential area. There are no pedestrian crossings at this junction, however, there are footpaths on each arm. (See figure 5A.18)

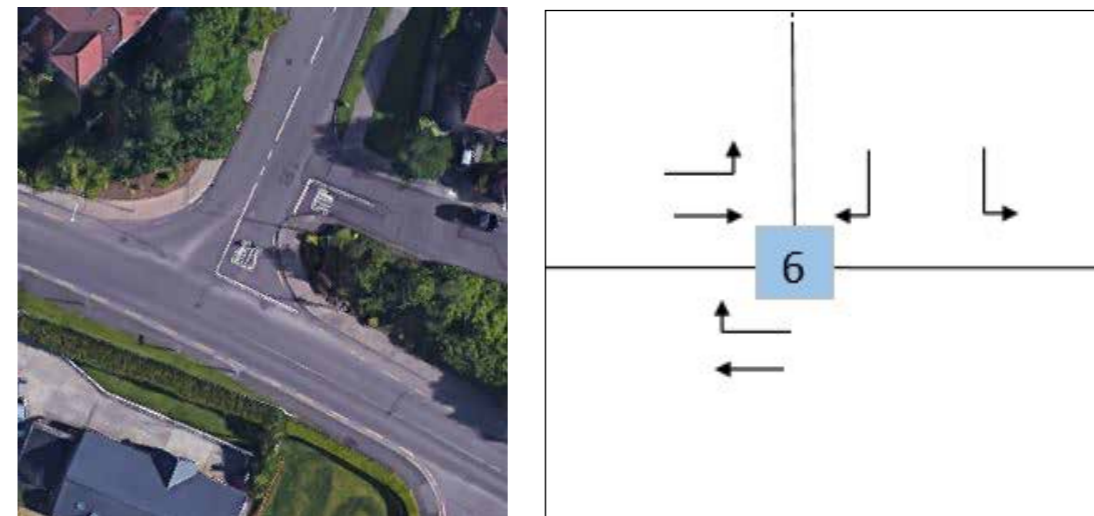


Figure 5A.18: Junction 6 Map and Movements

Existing Road Network

The following tables show the results of the analysis carried out for the priority T- Junction of the Carrigaline Road and Maryborough Woods. It is assessed for the current year (2018), opening year (2024) and design year (2039) with the existing road layout.

Table 5A.28: Junction 6 2018 Junction Performance Results - Existing Road Network

2018 Traffic Count Figures					
Assessment Period	Arm	Approach	Movement	RFC	Queue
AM Peak (08:00-09:00)	A	Carrigaline Road (EB)	L/St	-	-
	B	Maryborough Woods (SB)	L/R	0.391	1
	C	Carrigaline Road (WB)	St/R	0.056	1
PM Peak (17:00-18:00)	A	Carrigaline Road (EB)	L/St	-	-
	B	Maryborough Woods (SB)	L/R	0.119	1
	C	Carrigaline Road (WB)	St/R	0.05	1

Table 5A.29: Junction 6 2024 Junction Performance Results - Existing Road Network

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.453	1	0.508	2	12%
	C	Carrigaline Road (WB)	St/R	0.073	1	0.097	1	33%
PM Peak (17:00-18:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.113	1	0.131	1	16%
	C	Carrigaline Road (WB)	St/R	0.048	1	0.064	1	33%

Table 5A.30: Junction 6 2039 Junction Performance Results - Existing Road Network

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario A)		Design (Scenario C)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.483	1	0.537	2	11%
	C	Carrigaline Road (WB)	St/R	0.079	1	0.101	1	28%
PM Peak (17:00-18:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.144	1	0.161	1	12%
	C	Carrigaline Road (WB)	St/R	0.052	1	0.068	1	31%

The results indicate a slight impact due to the increase in the RFCs and minimum effect on queuing traffic resulting from the proposed development. The highest RFC (0.537) occurs on Arm B (Maryborough Hill) during the AM peak for Design Year 2039, however, the impact is not significant as the junction operates within capacity.

Future Road Network

The following tables show the results of the analysis carried out for the Carrigaline Road/Maryborough Woods priority T-junction during the opening year (2024) and design year (2039).

Table 5A.31: Junction 6 2024 Junction Performance Results - Future Road Network

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.614	2	0.674	2	10%
	C	Carrigaline Road (WB)	St/R	0.105	1	0.145	1	38%
PM Peak (17:00-18:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.107	1	0.156	1	46%
	C	Carrigaline Road (WB)	St/R	0.092	1	0.1	1	9%

Table 5A.32: Junction 6 2039 Junction Performance Results - Future Road Network

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.862	6	0.954	10	11%
	C	Carrigaline Road (WB)	St/R	0.185	1	0.226	1	22%
PM Peak (17:00-18:00)	A	Carrigaline Road (EB)	L/St	-	-	-	-	-
	B	Maryborough Woods (SB)	L/R	0.143	1	0.196	1	37%
	C	Carrigaline Road (WB)	St/R	0.025	0	0.03	0	20%

The results indicate an increase in the RFCs for all arms of this junction. Maryborough Woods (SB) approaching the junction has the highest RFC (0.954) with the development, however, from the above table, it is evident that this arm exceeds the normal design threshold in the year 2039 with or without the development. The long-term impact can be described as significant however, it should be noted that whilst the normal design threshold is exceeded, the theoretical capacity of the junction is not exceeded.

5A.5.3.7 Junction 7 - The proposed signalized junction (Access 2 - shared with the Castletreasure School)

This is a proposed signalised junction which will serve both the proposed primary school and residential development. The major arm comprises the Carrigaline Road (R609) with the minor arm forming the entrance/exit to the developments. The minor arm splits to a two-lane approach when approaching the junction, creating a dedicated left and right turn lane. On the major arm, a dedicated right turn lane has been included to prevent right turning traffic block through traffic. (See figure 5A.19)

The peak PM period for the school is anticipated to be between 15:00 and 16:00; as such, the AM scenario is considered the worst-case scenario for the junction analysis. To confirm this, a review of traffic volumes for Junction 5 and Junction 6 indicate a higher volume of traffic on the route during the AM peak period, compared to the PM for both the existing road network and the future road network. (See tables 5A.7 and 5A.8)

Table 5A.33 indicates the results of the junction analysis for Access 2 in the 2039 Design Year.

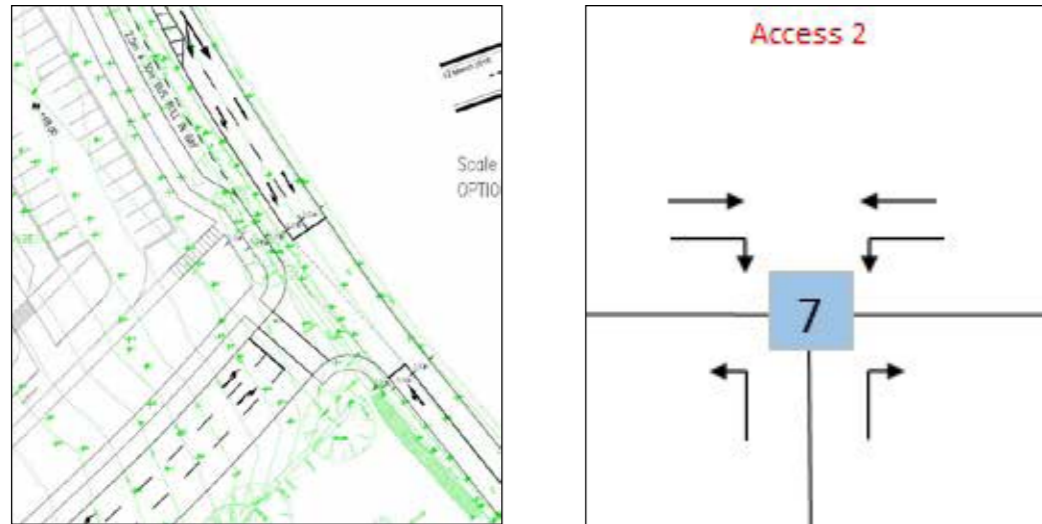


Figure 5A.19: Junction 7 Map and Movements

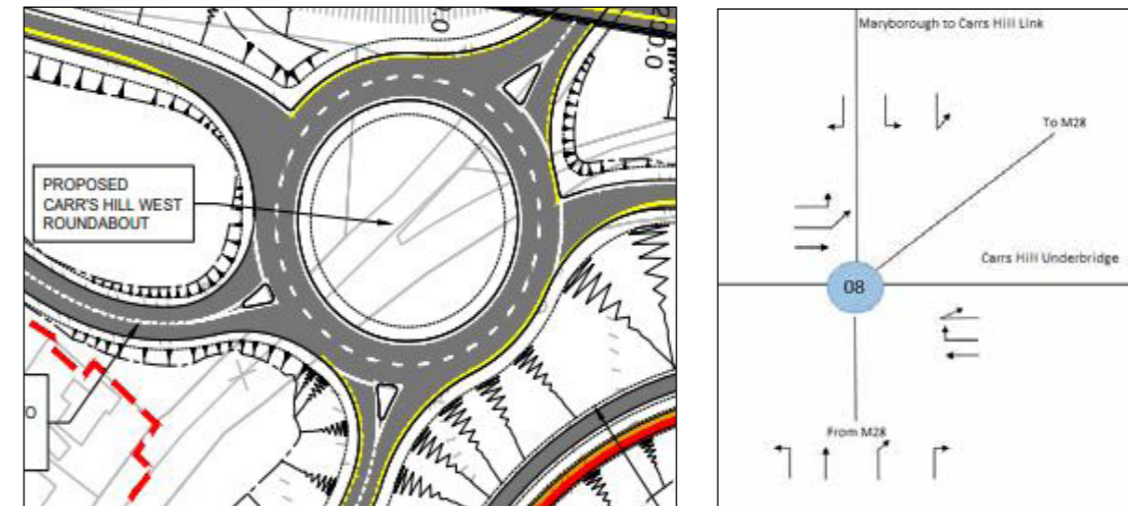


Figure 5A.20: Junction 8 Map and Movements

Table 5A.33: Access 2 2039 Junction Performance Results (Scenario A, B, C & D)

2039 AM Peak - Proposed Access 2 - Signalised Junction												
Arm	Approach	Movement	Scenario A		Scenario C		% Diff	Scenario B		Scenario D		% Diff
			RFC	Max Queue	RFC	Max Queue		RFC	Max Queue	RFC	Max Queue	
Arm A	R609(SB)	LT/St	0.57	6	0.659	8	16%	0.652	8	0.769	10	18%
		LT (1)	0.259	2	0.448	4	73%	0.252	2	0.417	5	65%
Arm B	Access 2	RT (2)	0.189	1	0.343	2	81%	0.532	2	0.685	4	29%
		St (1)	0.113	1	0.117	1	4%	0.487	5	0.532	6	9%
Arm C	R609(NB)	RT (2)	0.497	3	0.543	4	9%	0.539	3	0.632	4	17%

The results indicate that all arms of the junction operate within capacity for the 2039 AM peak. There is an increase in the RFC for all arms with a slight impact on the junction.

5A.5.3.8 Junction 8 - Proposed M28 - Proposed Carr's Hill West Roundabout

Junctions 8, 9 and 10 form part of the proposed upgrade to the N28. Due to the close proximity of the development site, it is anticipated there will be an impact on the new junctions from the proposed development.

Junction 8 is a five-arm priority roundabout serving the R609 (Carrigaline Road); the Maryborough to Carrs Hill Link Road; the M28 Off-ramp; the M28 On-ramp and the Carrs Hill underbridge. Figure 5A.20 illustrates a preliminary design of the junction. All approaches have single lane approaches with single lane exits.

The following sections outline the results of the analysis for all three junctions. These junctions have been assessed for the 2024 and 2039 years for both Scenarios B and D.

Table 5A.34: Junction 8 2024 Junction Performance Results

Junction 8 - Proposed Carrs Hill West Roundabout									
2024 Opening Year									
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff	
				RFC	Queue	RFC	Queue		
AM Peak (08:00-09:00)	A	R609 Carrigaline Road	L/St/R	0.396	1	0.488	1	23%	
	B	Maryborough/Carrs Hill Link	L/St/R	0.89	8	0.937	11	5%	
	C	M28 On-Ramp	L/L/St/R	-	-	-	-	-	
	D	Carr's Hill Underbridge	L/St/R	0.376	1	0.387	1	3%	
	E	M28 Off-Ramp	L/St/R	0.231	1	0.247	1	7%	
PM Peak (17:00-18:00)	A	R609 Carrigaline Road	L/St/R	0.184	1	0.237	1	29%	
	B	Maryborough/Carrs Hill Link	L/St/R	0.189	1	0.195	1	3%	
	C	M28 On-Ramp	L/L/St/R	-	-	-	-	-	
	D	Carr's Hill Underbridge	L/St/R	0.254	1	0.278	1	9%	
	E	M28 Off-Ramp	L/St/R	0.307	1	0.348	1	13%	

Table 5A.35: Junction 8 2039 Junction Performance Results

2039 Design Year									
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff	
				RFC	Queue	RFC	Queue		
AM Peak (08:00-09:00)	A	R609 Carrigaline Road	L/St/R	0.549	1	0.643	1	17%	
	B	Maryborough/Carrs Hill Link	L/St/R	0.927	5	0.976	6	5%	
	C	M28 On-Ramp	L/L/St/R	-	-	-	-	-	
	D	Carr's Hill Underbridge	L/St/R	0.443	1	0.454	1	2%	
	E	M28 Off-Ramp	L/St/R	0.302	1	0.317	1	5%	
PM Peak (17:00-18:00)	A	R609 Carrigaline Road	L/St/R	0.187	1	0.239	1	28%	
	B	Maryborough/Carrs Hill Link	L/St/R	0.239	1	0.246	1	3%	
	C	M28 On-Ramp	L/L/St/R	-	-	-	-	-	
	D	Carr's Hill Underbridge	L/St/R	0.378	1	0.401	1	6%	
	E	M28 Off-Ramp	L/St/R	0.326	1	0.37	1	13%	

The results of the analysis for Junction 8 indicates that one junction arm exceeds the normal design threshold in the opening and design years. Arm B (Maryborough/Carrs Hill Link) exceeds the normal design threshold, however; this occurs with or without the proposed development. There is a slight medium and long-term impact on this junction resulting from the proposed development, however, the junction is still within the theoretical capacity threshold and the arm (Maryborough/Carrs Hill Link) exceeds the design threshold with or without the development.

5A.5.3.9 Junction 9 - Proposed M28 - Proposed Carr's Hill East Roundabout

Junction 9 is a four-arm priority roundabout serving the Carrs Hill South Link Road; the; the M28 Off-ramp; the M28 On-ramp and the Carrs Hill underbridge. Figure 5A.21 below illustrates a preliminary design of the junction. All approaches have single lane approaches with single lane exits.

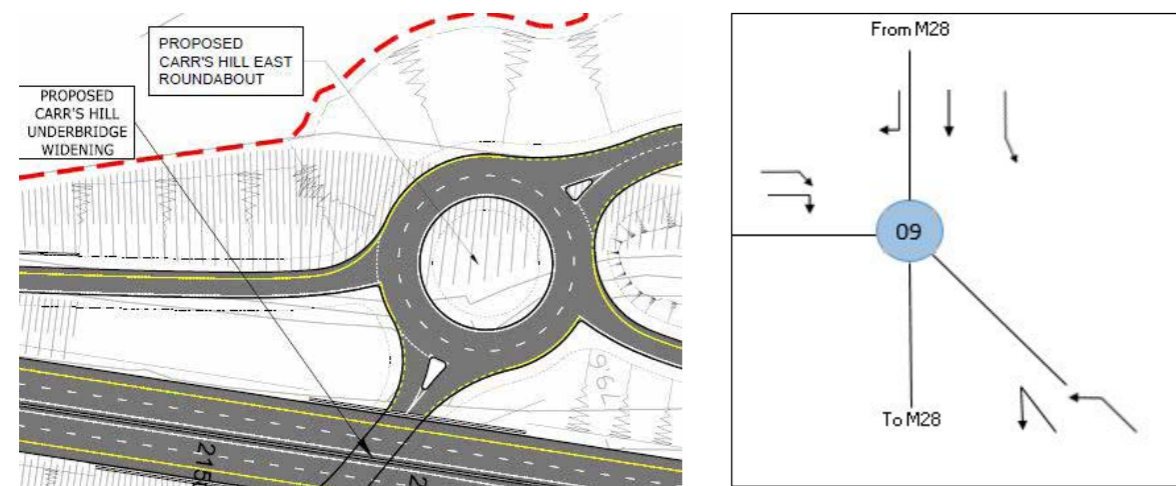


Figure 5A.21: Junction 9 Map and Movements

Table 5A.36: Junction 9 2024 Junction Performance Results

2024 Opening Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrs Hill Underbridge	St/R	0.295	1	0.361	1	22%
	B	M28 Off-Ramp	L/St/R	0.256	1	0.275	1	7%
	C	Carrs Hill South Link	St/R	0.394	1	0.422	1	7%
	D	M28 On-Ramp Link	L/R	-	-	-	-	-
PM Peak (17:00-18:00)	A	Carrs Hill Underbridge	St/R	0.191	1	0.236	1	24%
	B	M28 Off-Ramp	L/St/R	0.282	1	0.308	1	9%
	C	Carrs Hill South Link	St/R	0.165	1	0.184	1	12%
	D	M28 On-Ramp Link	L/R	-	-	-	-	-

Table 5A.37: Junction 9 2039 Junction Performance Results

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrs Hill Underbridge	St/R	0.398	1	0.464	1	17%
	B	M28 Off-Ramp	L/St/R	0.33	1	0.357	1	8%
	C	Carrs Hill South Link	St/R	0.519	2	0.557	2	7%
	D	M28 On-Ramp Link	L/R	-	-	-	-	-
PM Peak (17:00-18:00)	A	Carrs Hill Underbridge	St/R	0.217	1	0.252	1	16%
	B	M28 Off-Ramp	L/St/R	0.364	1	0.39	1	7%
	C	Carrs Hill South Link	St/R	0.271	1	0.29	1	7%
	D	M28 On-Ramp Link	L/R	-	-	-	-	-

The highest RFC (0.557) for this junction occurs in the 2039 Design Year on Arm C (Carrs Hill South Link). The impact of the development on the junction is slight with the junction operating well within capacity for the 'with' and 'without' scenarios.

Junction 10: Maryborough Hill/Carrs Hill Link Road

Junction 10 is a three-arm priority T-junction with Maryborough Hill forming the major arm and the Maryborough to Carrs Hill link road forming the minor arm. The minor arm flares to provide dedicated left and right turn lanes. The major arm includes a right turn lane to provide capacity for right turning vehicles accessing the M28 northbound. This measure prevents through traffic being blocked at the junction. A proposed cycle track runs north south on the major arm. (See figure 5A.22)

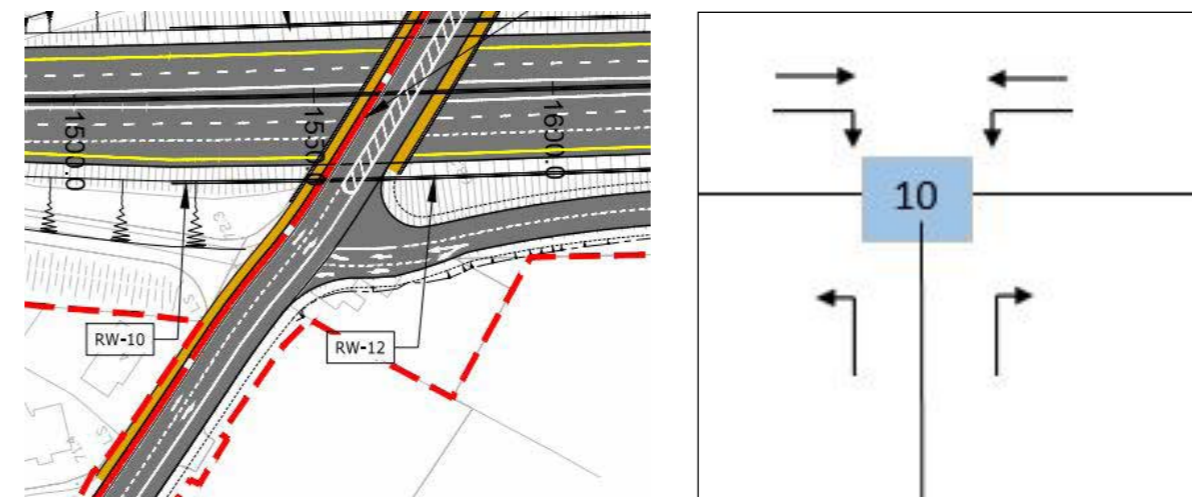


Figure 5A.22: Junction 10 Map and Movements

2024 Opening Year									
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff	
				RFC	Queue	RFC	Queue		
AM Peak (08:00-09:00)	A	Maryborough Hill (N)	St/L	0.042	0	0.042	0	0%	
	B	Carrs Hill Link Road	L/R	0.205	1	0.208	1	1%	
	C	Maryborough Hill (S)	St/R	0.874	6	0.874	6	0%	
PM Peak (17:00-18:00)	A	Maryborough Hill (N)	St/L	0.243	1	0.242	1	0%	
	B	Carrs Hill Link Road	L/R	0.46	1	0.458	1	0%	
	C	Maryborough Hill (S)	St/R	0.217	1	0.219	1	1%	

2039 Design Year									
Assessment Period	Arm	Approach	Movement	Base (Scenario B)		Design (Scenario D)		% Diff	
				RFC	Queue	RFC	Queue		
AM Peak (08:00-09:00)	A	Maryborough Hill (N)	St/L	0.063	0	0.064	0	2%	
	B	Carrs Hill Link Road	L/R	0.359	1	0.363	1	1%	
	C	Maryborough Hill (S)	St/R	0.931	9	0.931	9	0%	
PM Peak (17:00-18:00)	A	Maryborough Hill (N)	St/L	0.285	1	0.287	1	1%	
	B	Carrs Hill Link Road	L/R	0.548	1	0.551	2	1%	
	C	Maryborough Hill (S)	St/R	0.285	1	0.287	1	1%	

Table 5A.38 and 5A.39 indicate that Arm C (Maryborough Hill) of the proposed junction exceeds the normal design threshold marginally in the opening and design years. The right turning traffic accessing the Carrs Hill Link Road is delayed due to the high volume of Westbound traffic on Maryborough Hill. The westbound traffic has right of way when

travelling straight on or turning left at the junction, creating a delay for right turning traffic. It should be noted that the impact of the development on this junction is imperceptible.

5A.5.3.10 Junction 11: Proposed Access 2

Junction 11 is a priority T-junction serving 99 residential units directly off the Carrigaline Road (R609). The R609 form the major arm with Access 3 forming the minor arm. As this junction is a standalone junction, which will only be provided as part of the proposed development, it is only assessed for scenarios C and D (with development). The junction was only analysed in the 2039 Design Year to illustrate the worst-case scenario.

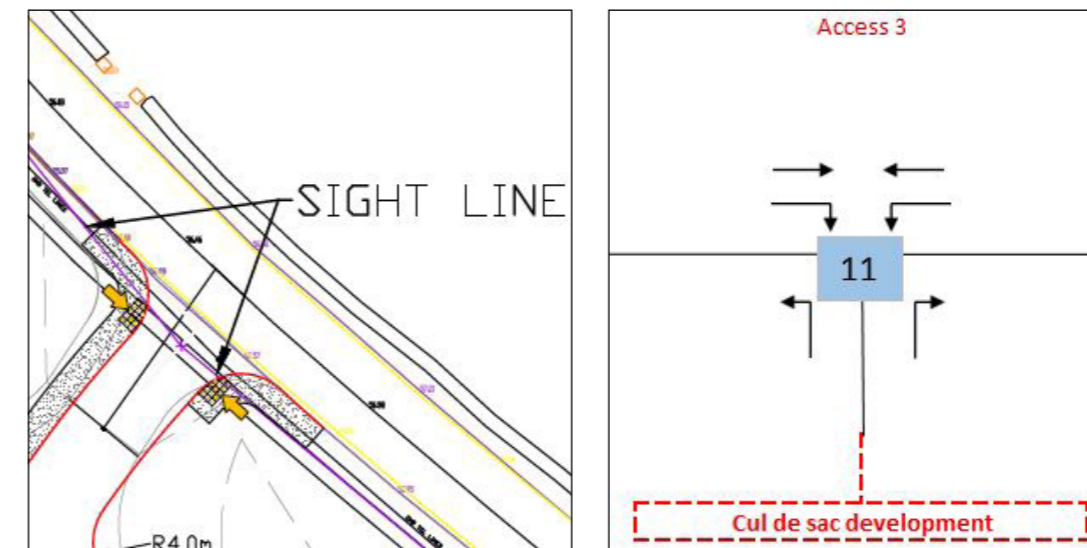


Figure 5A.23: Junction 11 Map and Movements

Table 5A.40: Junction 11 2039 Junction Performance Results

2039 Design Year								
Assessment Period	Arm	Approach	Movement	Base (Scenario C)		Design (Scenario D)		
				RFC	Queue	RFC	Queue	
AM Peak (08:00-09:00)	A	Carrigaline Road (NB)	St/L	-	-	-	-	
	B	Access 3	L/R	0.087	1	0.135	1	
	C	Carrigaline Road (SB)	St/R	0.022	0	0.017	0	
PM Peak (17:00-18:00)	A	Carrigaline Road (NB)	St/L	-	-	-	-	
	B	Access 3	L/R	0.048	1	0.064	1	
	C	Carrigaline Road (SB)	St/R	0.061	1	0.05	1	

The results of the analysis indicate that the junction will operate well within capacity.

5A.5.3.11 Junction 12: Proposed Signalised School Junction

Junction 12 is a signalised junction on the R609 (Carrigaline Road) to the north of the development site. Two forms of this junction were analysed, one without the proposed bridge structure linking the Grange Road to the R609 and one with. (See Figure 5A.24).



Figure 5A.24: Junction 12 Map and Movements

To assess the traffic impact of the possible development on the surrounding highway network, the DLUTS model was used by SYSTRA to obtain the distribution of the developments traffic. The model was developed to include for an east-west link bridge from Douglas Terrace to the west of the site location to the Carrigaline Road. The proposed development access has been assessed with and without the proposed East-West link (See figure 5A.24). Similar to the primary school adjacent to the Castletreasure site, assessments included the AM peak analysis only.

The operational assessment of the proposed access junction has been considered for the opening year and future design year with and without the East-West link completed. Tables 5A.41 and 5A.42 from SYSTRAs TTA Report illustrate the key results from the analysis including the Degree of Saturation (DoS), practical reserve capacity and the mean max queue. The results of SYSTRAs assessment indicate that the overall junction operates within capacity.

Table 5A.41: Results of Design Year Analysis without East-West Link

LINK	ROAD MOVEMENT	DEG OF SAT (%)	TOTAL DELAY (PCUHR)	MEAN MAX QUEUE (PCU)
1/1	Carrigaline Road SB Left/Ahead	47.1%	2.5	7.1
2/1	Site Access Right/Left	79.3%	4.4	8.1
3/1+3/2	Carrigaline Road NB Ahead/Right	80.5%	6.8	19.7
PRC Over All Lanes 11.8%				
Total Delay Over All Lanes 13.76 pcuHr				

Table 5A.42: Results of Design Year Analysis with East-West Link

LINK	ROAD MOVEMENT	DEGREE OF SATURATION	TOTAL DELAY (PCUHR)	MEAN MAX QUEUE
1/1+1/2	Carrigaline Road SB Ahead Right Left	19.8%	1.0	2.9
2/1+2/2	Carrigaline Road NB Ahead Left Right	81.7%	7.2	27.0
3/1	Bridge Eastbound Left Ahead	79.3%	3.7	6.5
3/2	Bridge Eastbound Right	35.2%	1.1	2.3
7/1	Site Access Right Left Ahead	80.2%	5.3	11.2
PRC Over All Lanes 10.1%				
Total Delay Over All Lanes 18.44 pcuHr				

5A.6 Mitigation Measures

5A.6.1 Construction Phase

To minimise disruption to the local area, construction traffic volumes will be managed through the following measures:

5A.6.1.1 Arrivals

During peak hours, ancillary, maintenance and other site vehicle movements on the local road network will be discouraged. Daily construction programmes will be planned to minimise the number of disruptions to surrounding streets by staggering HGV movements to avoid any site queues. Only the minimum essential site parking has been provided. Construction staff will be prohibited from parking on adjacent public roads or residential neighbourhoods.

The Applicant will promote travel by sustainable modes of transport through the Construction Traffic Management Plan.

5A.6.1.2 Hours of Work

Construction operations on site will generally be between the hours of 07:00 and 18:00, Monday to Friday and 08:00 to 14:00 on Saturdays. The construction times will ensure construction traffic will have limited impact on the peak periods of 08:00-09:00 in the morning and 17:00-18:00 in the evening as it is envisaged that staff will generally arrive to work before 08:00 in the morning and either leave before 17:00 or after 18:00 in the evening, to reduce any impact on the PM peak traffic.

5A.6.1.3 Construction Traffic Management Plan

As part of the construction works, an Outline Traffic Management Plan has been prepared (Section 2.6 – Chapter 2) which outlines the approach to the project and details potential impacts for the residential areas and public road system. It also includes measures to mitigate any potential noise, air quality and dust/mud resulting from construction activities, namely from traffic movements in and out of the site. Wheel wash facilities will be provided on-site to ensure that construction debris will not have an impact on the quality of roads in the surrounding areas.

A detailed Construction Traffic Management Plan will be prepared by the contractor and agreed with Cork County Council, prior to the commencement of works.

5A.6.1.4 Construction staff travel plan/onsite parking arrangements

To reduce the impact of vehicles on the existing properties in the area, the Applicant will provide management of all site traffic movements and parking throughout the duration of the works. The access points will be secured for the duration of the development and safety signage erected on all fences and gates.

75 No. designated parking areas will be within the site boundary and will remove the risk of vehicles causing disruption to the local area and the local amenities.

The location of the designated parking area will be within the site boundary within the designated site compound No. 1 (As detailed in Figure 5A.8). The parking areas will take account of the needs of construction staff but will not be of a quantum that will discourage the use of sustainable modes of transport or car-pooling when possible.

5A.6.2 Operational Phase

5A.6.2.1 Pedestrian/Cycle Facilities

The proposed development provides an integrated network of footpaths accessing all parts of the site. This network links with the recently opened Ballybrack greenway which runs directly to Douglas village centre.

The high-level proposals within the Cork Cycle Network Plan 2017 are accommodated within the development. The proposed development takes cognisance of these plans; as part of this project, a 4m cycle path is to be provided running along the northern boundary of the site linking the Ballybrack Valley greenway to the future inter-urban route on the N28/M28. This will provide cyclists travelling to, from and through the proposed development with a safe and comfortable facility in both directions.

5A.6.2.2 Public Transport

In the future years, it is expected that the wider transport network, including Douglas, will see significant improvements due to additional bus lanes and local junction enhancements including additional traffic capacity, upgraded junction controls as well as significant enhanced public transport, walking and cycling facilities. The DLUTS report provides detailed proposals of improvements to the local road network and public transport/active travel facilities. This will provide residents of the proposed site with different travel choices and encourage active travel and public transport use. This will offset the negative impact of single vehicle trips on the surrounding road network.

5A.6.2.3 Provision of Local Schools/Services

The site is strategically located on the outskirts of Douglas Village and enjoys excellent walking, cycling and public transport links. The local shops and Douglas Village shopping centres are all easily accessible by foot/bike from the proposed site. The development proposals for the Castletreasure site include for the provisions of a creche facility and direct pedestrian routes to the proposed primary school adjacent to the site.

The provision of these facilities within walking distance of the development will act to encourage greater access by foot and bicycle and will reduce the overall volume of traffic generated by the proposed development.

A large part of AM peak traffic is generated by school trips; during school breaks, the improvement of morning traffic is evident on the road network. It is important to highlight the location of the proposed development in relation to the proposed and existing schools, as it is expected this will significantly reduce the number of school trips made from the proposed development using the car.

A proposed primary school will be located adjacent to the development; it is probable that a large proportion of pupils from the proposed development will walk/cycle to the school. Even if pupils are taken by car, this will not impact on the external road network. Therefore, it can be concluded that although the primary school will generate trips to/from the school from other areas, school traffic from the proposed development to this school will not impact the surrounding road network.

Beyond the primary school on the adjacent site, there are a number of primary and secondary schools located in and around Douglas Village. These are all within a walkable/cyclable distance from the development via the Ballybrack Greenway. This greenway runs from the proposed development site into the heart of Douglas village, connecting directly across from the entrance to the shopping centres. This route provides safe access directly to the village from the proposed development. A list of the schools accessible by walking/cycling include:

- Primary - St. Luke’s National School (1km, approx. 10min walk/5 min cycle)
- Primary - St. Columba’s Boys and Girls Primary Schools (< 1.5km, approx.15min walk/7min cycle)
- Secondary - Gaelscoil na Duglaise (<2km, approx..20min walk/10min cycle)
- Secondary - Douglas Community School (<2km, approx..20min walk/10min cycle)

Figure 5.A.25 illustrates the walking distances from the proposed development to the other schools in the area. From the above, it is predicted that specific schools’ trips in the AM peak from the development will be low due to proximity of schools (existing and proposed) and the excellent greenway facilities providing safe access to the village centre and nearby schools. These factors will minimize the impact of school trips to/from the development during the AM peak period.

Table 5A.43 outlines the positive and negative residual impacts of the proposed development.

The positive impacts include the network of pedestrian and cycle facilities included as part of the development. The proposed development takes cognizance of the Cork Cycle Network Plan (2017) by developing a section of the ‘CSE-GW4’ greenway through the site. This links the development directly to the Ballybrack greenway and provides a tie in for the proposed inter-urban cycle route to Carrigaline.

The development also provides a significant and direct network of footpaths throughout the development linking the residential units with the proposed primary school and directly to Douglas village via the Ballybrack Greenway. The pedestrian and cycle links also act as an easy means to access public transport facilities in the area, giving commuters the choice of active travel or multi-modal journeys.

Negative impacts include an increase in traffic during the construction and operational stages which will have a slight/moderate impact on the link roads and junction capacities in the vicinity of the site.

All of the link roads analysed have sufficient capacity to accept the additional vehicles to be generated by the proposed development in the construction and operational stages, up to the 2039 Design Year.

Section 5A.5.3.1 to 5A.5.3.12 detail the junction capacities and the impact of the development during the operational stage. It is evident from the analysis that a number of junction arms exceed the normal RFC design threshold in the 2039 Design Year, however, still operate within theoretical capacity. It should be noted that the junctions which indicate capacity issues in the various design years will have these capacity issues (with or without the traffic generated by the proposed development) arising from the estimated growth in background traffic. The impact of the proposed development on these junctions is generally slight/moderate.

Table 5A.43: Residual Positive and Negative Impacts

Mode	Effects	Impact	Mitigation	Residual Impact	Impact Rating	Duration of Impact
Construction Phase						
Traffic	Construction Traffic Flows	Moderate	Construction Traffic Management Plan	Slight	Negative	Temporary
Operational Phase						
Traffic	Traffic Flows on links and to junctions	Moderate	Improved Access to Public Transport through new pedestrian facilities; New Greenway connecting existing Ballybrack Greenway to future Inter-urban Greenway; Improved public transport services/facilities as part of DLUTS to encourage public transport use in Douglas area	Slight	Negative	Medium/Long-term
Walking	Increased Pedestrian connectivity to local schools and Douglas Village	Slight	N/A	Slight	Positive	Medium/Long-term
Cycling	Increased cycling activity on the Ballybrack greenway, to local schools and Douglas Village	Slight	N/A	Slight	Positive	Medium/Long-term



Figure 5.A.25: Approx. Walking Times to nearby Schools/Services 5A.7 Residual Impacts

5A.7 Conclusion

This report details the Traffic and Transportation Assessment (TTA) associated with the planning application for the proposed development of lands at Castletreasure, Douglas, Co. Cork.

This TTA indicates that the proposed development is well located in term of Douglas Village Centre, with proposed pedestrian and cycle facilities tying in with the existing Ballybrack Valley greenway, with direct access to Douglas Village.

There are good public transport options available to commuters from Douglas Village to Cork City and beyond with multiple services available during morning and evening peak periods.

The level of traffic generated by construction activities during the construction of the development will be less than that generated by the development once operational.

The transport assessment of the operational activities of the proposed development indicates that there is a slight to moderate impact experienced by the local link roads as a result of the traffic generated by the proposed development. The highest increase in traffic is on the R609 Carrigaline Road which runs along the northern boundary of the site. Tables 5A.7 and 5A.8 in Section 5A.5.2.6 indicate an increase in two-way traffic outside the proposed entrance and on the R609 of approx 20% for the existing and future road network. The increase is moderate and is not deemed significant as the link roads operate well within capacity.

All other routes will only experience a slight impact of between 2% and 4% for Design Year (2039) on the existing road network. As detailed in tables 5A.7 and 5A.8 all link roads operate within capacity.

If/when the proposed M28 project occurs, the only other significant increase in traffic on the link road network is 10% on the Carrs Hill Underbridge. Overall, for the existing and future road network, there is a slight to moderate negative impact increasing in significance on the links closest to the site. The impacts are categorized as medium/long-term.

Similar to the link assessments, the most significant impact of the generated traffic is at the proposed access junctions, the Fingerpost Roundabout and the proposed Carrs Hill West junction. These are the closest junctions to the development with the traffic dissipating to the other junctions on the network.

A large part of AM peak traffic is generated by school trips; during school breaks, the improvement of morning traffic is evident on the road network. It is important to highlight the location of the proposed development in relation to the proposed and existing schools, as it is expected this will significantly reduce the number of school trips made from the proposed development using the car.

A proposed primary school will be located adjacent to the development; it is probable that a large proportion of pupils from the proposed development will walk/cycle to the school. Even if pupils are taken by car, this will not impact on the external road network. Therefore, it can be concluded that although the primary school will generate trips to/from the school from other areas, school traffic from the proposed development will not impact the surrounding road network.

The following provides a brief summary of the capacity of each junction in the Design Year:

Existing Road Network:

- Junction 1: Operates within capacity
- Junction 2: Current, traffic count data (2018), one arm exceeding design capacity threshold but within theoretical capacity; (2039), three arms exceeding design capacity threshold but within theoretical capacity, with and without development.
- Junction 3: Currently (2018), one arm exceeding capacity threshold, (2039), one arm exceeding design capacity threshold and one exceeding theoretical threshold,
- Junction 4: Free-flowing traffic at junction. No capacity issues.
- Junction 5: Operates within capacity
- Junction 6: Operates within capacity
- Junction 7: Operates within capacity

Proposed Road Network:

- Junction 1: Operates within capacity but warning regarding potential restrictions on two arms.
- Junction 2: One arm exceeds design threshold and one exceeds theoretical threshold, with and without development.
- Junction 3: Junction will be removed in proposed road layout.
- Junction 4: Junction will be removed in proposed road layout.
- Junction 5: Operates within capacity.
- Junction 6: One arm exceeds normal design capacity threshold but operates within theoretical capacity threshold with and without the development.
- Junction 7: Operates within capacity
- Junction 8: One arm exceeds normal design capacity threshold but is within theoretical capacity, with and without the development.
- Junction 9: Operates within capacity
- Junction 10: One arm exceeds normal design capacity threshold but is within theoretical capacity, with and without development.
- Junction 11: Operates within capacity
- Junction 12: Operates within capacity

As such, the assessment of all future scenarios demonstrates that the traffic generation associated with the proposed development will have a slight to moderate impact on the surrounding junctions. Of the junctions on the existing and future road networks, it is evident that Junctions 2, 3, 6, 8 and 10 exceed the normal design capacity threshold on some arms of the junction, while the theoretical capacity is exceeded on one arm of Junction 2 and 3. Although these junction arms exceed the capacity thresholds in the 2039 Design Year, it is important to note that this occurs with and without the development at all of these junctions.

The following paragraphs describe in more detail the direct operational impact that the development has on junctions with arms operating over the RFC design and theoretical thresholds of 0.85 or 0.9 or those which include a warning in the software output.

Junction 1

The software output for the **future road network** in the Design Year (2039) includes a warning confirming that restrictions may occur due to traffic queuing to leave the junction on an adjacent arm. The Fingerpost roundabout contains pedestrian crossings on a number of arms. The warning relates to traffic stopping on the roundabout, to give priority to crossing pedestrians.

As it is predicted the number of vehicles will grow up to 2039, the volume of vehicles at the junction, combined with crossing pedestrians, may lead to some restrictions. Restrictions (queuing vehicles) may occur if there is a high volume of pedestrians using the crossings at the junction. This could cause additional queuing traffic and increased waiting times to navigate the junction. From the analysis results, the development will have a slight-moderate impact on the Fingerpost Roundabout as a whole, however, the junction will operate within capacity (with some warnings) for the Design Year (2039).

Junction 2

On the existing public road network, one arm of the junction is currently exceeding the normal design capacity threshold but within theoretical capacity. The results of the analysis indicate that an additional arm exceeds the design threshold (but within theoretical capacity) in the Opening Year (2024) with the development, therefore there is a slight short-term negative impact with two arms exceeding the threshold.

In the Design year (2039), three arms exceed the design threshold, but are still within theoretical capacity. It is important to recognise that these exceed the threshold with and without the proposed development. There is only a marginal increase ($\leq 4\%$) in the RFCs due to the development, therefore, the impact is a slight negative long-term impact at this junction resulting from the proposed development.

For the future road network, the results from the analysis are the same as the existing road network, as it is assumed traffic from the school and residential development will not travel via Junction 2 due to the new road layout; this would be a longer convoluted route for traffic to take to access either Douglas or the new M28. As such, the results of the analysis indicate the proposed development will have a neutral impact at this junction when/if the future road layout becomes operational.

Junction 3

One arm of Junction 3 on the **existing public road network** is currently exceeding the design threshold. In the Opening (2024) and Design Year (2039), one arm operates outside the design threshold and one outside the theoretical threshold with or without the proposed development. The results of the analysis indicate that the impact of the proposed development on this junction is imperceptible ($\leq 1\%$).

Junction 3 will not exist on the **future road network** if/when the proposed upgrades occur on the N28. A new slip road to access the M28 northbound will be provided at the proposed Carr's Hill Interchange. (See Appendix A.5A.1)

Junction 6

On the **existing public road network**, all junction arms operate well within capacity. The results indicate a moderate increase in the RFCs (11%) with minimal effect on queuing traffic due to the proposed development.

For the **future road network**, the results indicate a moderate increase in the RFCs (11%-37%) with queuing vehicles on the Maryborough Hill (SB) arm increasing from 6 to 10, however, this is the only arm on the junction which exceeds the design threshold of 0.85.

Although, the Maryborough Woods (SB) arm operates over the normal design threshold, but within theoretical capacity, it is evident from the analysis that the design threshold is exceeded in the design year (2039) with or without the proposed development. The long-term impact can be described as negative however, the significance of the development is only slight as the Maryborough Woods (SB) arm on the junction fails with or without the development.

Junction 8 (Future Road Network Only)

The results of the analysis for Junction 8 indicates that one arm exceeds the design threshold, but within theoretical capacity in the opening and design years. Arm B (Maryborough/Carrs Hill Link) fails marginally, however, this occurs with or without the proposed development.

There is only a slight medium and long-term impact on this junction as a whole with all arms, except one, well within capacity. On the arm that exceeds the RFC threshold, there is only a slight impact (5%) as a result of the proposed development. It is also important to note that the (Maryborough/Carrs Hill Link) arm of the junction exceeds the threshold with or without the development.

Junction 10 (Proposed Road Network Only)

As with Junction 8, one arm of this junction exceeds the RFC design threshold marginally in the 2039 Design Year. The proposed development has an imperceptible impact on this junction as a whole and there is a neutral impact (0%) on the arm of the junction which exceeds the threshold.

As such, this arm, (Maryborough Hill (S)) exceeds the threshold with and without the development.

Further to the synopsis of each of the above junctions, it is evident that the only junction with a moderate negative impact is Junction 6. Although arms on other junctions fail, this is mainly due to the projected growth in background traffic and less to do with the direct impact from the trips generated from the proposed development.

Chapter 5B

Material Assets

Service Infrastructure / Utilities

5B

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

**CHAPTER 5B
MATERIAL ASSETS - SERVICE
INFRASTRUCTURE / UTILITIES**

5B.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) document has been prepared by Tim Finn of JB Barry & Partners, Consulting Engineers and Luke O’Mahony of O’Connor Sutton Cronin Consulting Engineers.

Tim is a Chartered Civil Engineer and an Associate Director with J.B. Barry and Partners with over 30 years’ experience in the industry, working with the Local Authority and as a consulting engineer. Tim’s experience includes construction and design work and his recent experience includes project planning and project management for a wide range of public and private infrastructure projects. Luke BSc (Hons), is a Mechanical Engineer, with over 8 years’ experience in the private sector as a consulting mechanical engineer.

This chapter addresses the material assets serving the subject lands relating to foul sewerage, water supply, gas, electricity, and broadband.

5B.2 Methodology

The assessment of the potential impact of the proposed development on the water bodies was carried out according to methodology specified by the following:

- EIA Directive 2014/52/EU;
- ‘Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)’ (EPA, 2017);
- ‘Guidelines on the information to be contained in EIS’ (EPA 2002); and
- ‘Advice Notes on Current Practice in the preparation of EIS’ (EPA 2003);

The scope of the work for the assessment involved undertaking a Desk Study, a Site Walkover, site surveys and investigations.

During the Desk Study, information on the relevant existing material assets associated with the development was derived from the following sources:

- Irish Water records;
- Cork County Council records;
- ESB Networks records;
- Gas Networks Ireland records;
- EIR records;
- Consultations with Irish Water and Cork County Council;
- Topographical survey;
- Site Investigations data;
- Site walkover;

Projections of Built Services use, and potential interference will be made, for both construction and operational phases of the development, and the impacts are assessed.

The methodology used to determine likely significant effects on Material Assets and the referenced impact criteria have been developed by the specialist in consideration of the EPA guidelines. Using established best practice and professional judgement, the significance of impact on Material Assets: Built Services is based on the criteria developed in Table 5B.1.

Table 5B.1 Material Assets - Built Services Impact Significance Criteria

Significance	Criteria
Profound	Profound impact occurs where there is a permanent disruption to a utility service or where there is significant surcharging of an existing system
Major	Major impact occurs where there is a long term disruption to a utility service or where there is minor surcharging of an existing system
Moderate	Moderate impact occurs where there is a medium term disruption to a utility service or where there is significant increase of flow within an existing system
Slight	Slight impact occurs where there is a short term disruption to a utility service or where there is a minor increase of flow within an existing system
Imperceptible	Imperceptible impact occurs where there is a temporary disruption to a utility service or where there is a no quantifiable increase of flow within an existing system

Existing Receiving Environment

5B.2.1 Surface Water Drainage

There are no records or evidence indicating the presence of any constructed surface water drainage infrastructure within the site in terms of pipework or field drains.

It is evident that existing rainwater drainage from the site is by means of percolation into the existing ground and overland flows primarily to the Moneygurney Stream and Douglas Stream. It is also likely that part of the site drains northward and is intercepted by the existing road drainage system in the adjacent Vicarage development, which discharges to the Douglas Stream.

There is no proposal to utilise any stormwater drainage infrastructure to facilitate the disposal of surface water from the proposed development. All discharges of stormwater will be via the Moneygurney Stream and Douglas Stream. Please refer to Chapter 7 - Water for the assessment of Water including surface water drainage and storm water.

5B.2.2 Foul Water Drainage

There are no records or evidence indicating the presence of any constructed foul water drainage infrastructure within the site.

The closest foul water drainage system to the site is located within the adjacent Vicarage development.

5B.2.3 Potable Water

Existing watermains within and in the vicinity of the site are depicted in Figure 5B.1.

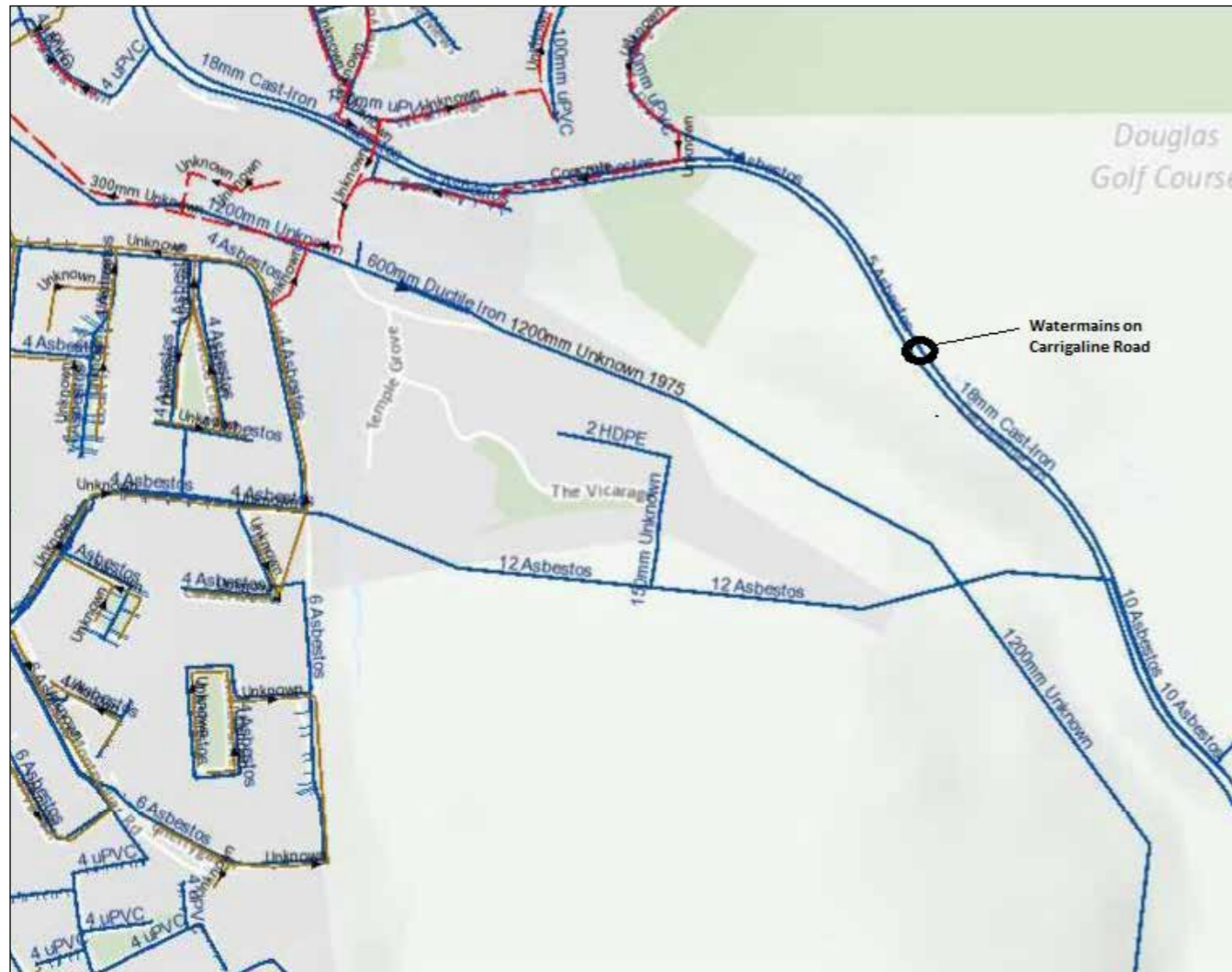


Figure 5B.1 Existing Water Supply Network

From available water main records, liaison with Irish Water, topographical and Ground Penetrating Radar (GPR) surveys and site investigations, the following existing watermains have been identified within the site:

- 1 No. 1,200mm diameter trunk watermain;
- 1 No. 300mm diameter distribution watermain; and
- 1 No. 150mm diameter watermain.

The 1,200mm diameter trunk watermain is a strategically-important item of infrastructure. It delivers treated water originating at Inniscarra Water Treatment Plant to Carrigaline and adjacent areas of Cork's Lower Harbour via a pumping station to the north of the site and a reservoir on Carr's Hill to the south.

The 300mm diameter distribution watermain connects to a watermain on the Carrigaline Road R609 and supplies potable water to the residential areas to the west of the site.

Within the site, a 150mm diameter watermain connects to the 300mm diameter distribution watermain and supplies a number of properties to the north of the nearby Vicarage development.

5B.2.4 Power

Within the site there are 2 No. sets of 3-Phase overhead ESB power lines routed through the site - one located in the western part of the site and the other located in the eastern part of the site.

From utility maps received from ESB Networks, the areas adjacent to the proposed development are served by extensive networks of Low Voltage and Medium Voltage power supplies, routed both overhead and underground.

5B.2.5 Gas

From utility maps received from Gas Networks Ireland, there are no gas mains routed through the site, but there is a 125mm diameter, 4-bar medium pressure gas main located in the Vicarage to the north of the site. This gas main extends beyond the Vicarage boundary and terminates at a point within the site of the proposed development, see figure 5B.2.



Figure 5B.2 Existing Gas Mains

5B.2.6 Telecommunications

From utility maps received from EIR, there are telecommunications networks in the vicinity of the proposed development.

Also, from the Department of Communications, Climate Action and Environment maps, the area surrounding the proposed development is serviced by High Speed Broadband, with EIR Fibre available in the Vicarage immediately adjacent to the site.

5B.3 Characteristics of the proposed development

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

5B.3.1 Foul Water Drainage

Within that area of the development west of the Moneygurney Stream, 225mm and 150mm diameter sewers will collect discharges from houses and apartments and flow by gravity to the north-western corner of the site. It is proposed to connect the foul drainage system to the existing foul sewer network at two locations - in the Vicarage and in the Templegrove development (as detailed in Figure 5B.3).

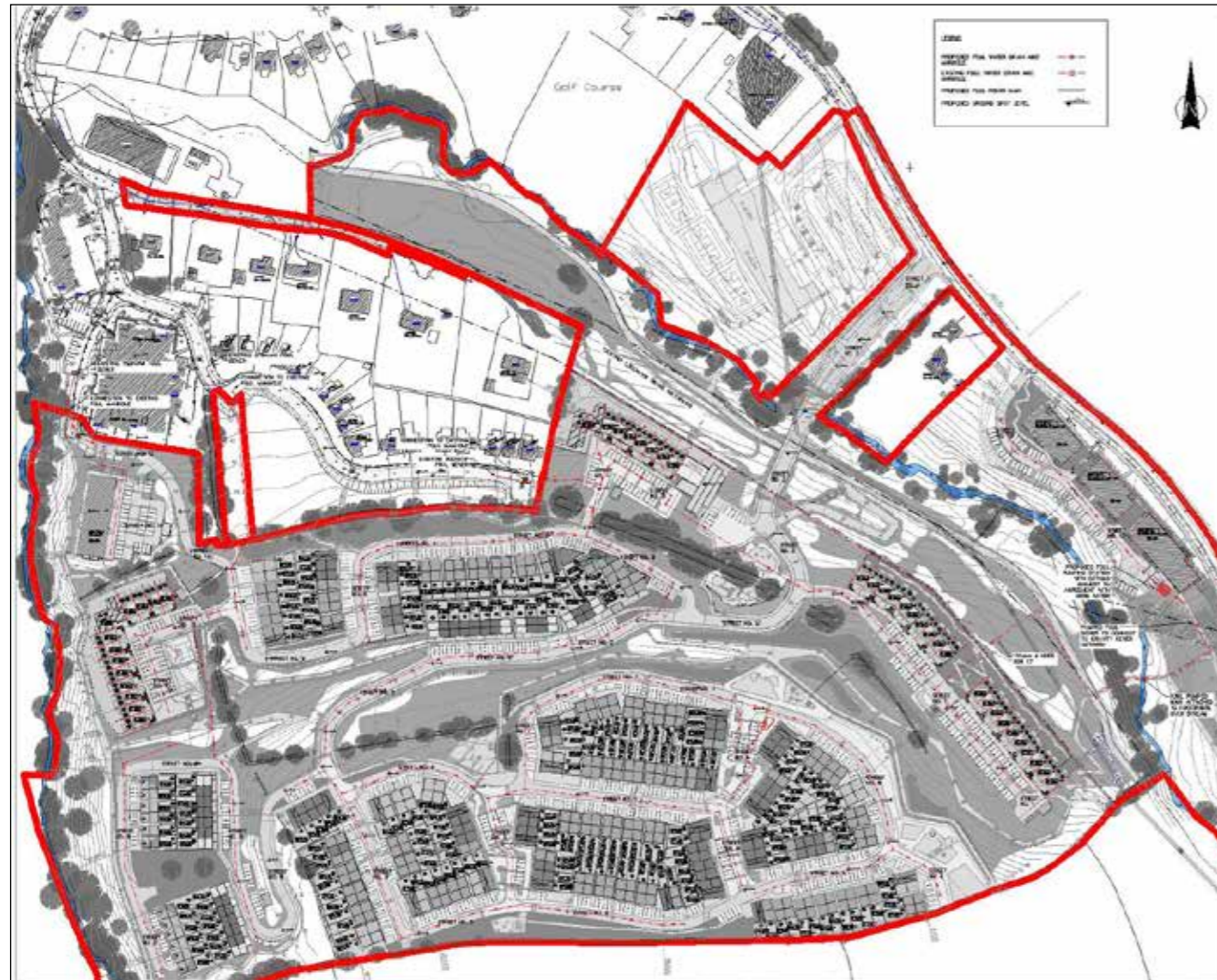


Figure 5B.3 Proposed Foul Water layout

Within that area east of the Moneygurney Stream, foul water will be collected by gravity sewers for discharge to a pumping station. Pumping of foul water from the three apartment blocks will be required due to the levels of the development in relation to the surrounding topography. To facilitate operation and maintenance, the pumping station will be located alongside the paved area to the rear of the apartment blocks. The pumping station will be designed in accordance with Irish Water requirements and its details will be agreed with Irish Water. The pumped foul sewer will connect to the gravity foul sewer system within the development on the western side of the Moneygurney, and this necessitates a crossing of the stream. To facilitate this crossing, the pumped foul sewer will be attached to the pedestrian footbridge which will span over the stream. Installation of this pumped foul sewer will not require works within the stream.

Foul Water from the proposed development will enter the collection network and ultimately discharge to Carrigrennan WWTP for treatment and disposal. This discharge will incrementally increase over a four to five-year period as the housing development is completed and occupied in phases as follows:

- Phase 1 277.52 m³/day
- Phase 2 208.81 m³/day
- Phase 3 380.62 m³/day
- Phase 4 377.82 m³/day
- Overall development 1,244.77 m³/day

The above demand assessments are based on Irish Water’s design parameters as follows:

- Average occupancy = 2.7 persons/dwelling
- Per-capita consumption = 150 litres/person/day
- Peaking factor = 6
- Infiltration = 10% of unit consumption

A Pre-Connection Enquiry application was submitted to Irish Water, the response to which confirmed that the proposed development can be serviced by the existing foul sewer network in the area albeit with upgrades where necessary. In this respect, Cairn PLC have entered into a Project Works Service Agreement (PWSA) with Irish Water whereby surveys of the existing foul sewer network in the area will be undertaken by Irish Water to confirm if local upgrades to its network are required.

Gravity sewers are designed using Micro-Drainage WINDES design software to ensure self-cleansing velocities will be achieved on all pipe runs.

The proposed foul water drainage system has been designed and will be constructed in accordance with the requirements of Irish Water and will comply with the following:

- ‘Code of Practice for Wastewater Infrastructure’ (Irish Water);
- ‘Wastewater Infrastructure Standard Details’ (Irish Water);
- Building Regulations, Technical Guidance Document Part H ‘Drainage and Waste Water Disposal’; and
- IS EN752, “Drain and Sewer Systems Outside Buildings”;

Odours will be generated within the foul drainage system and will require venting in accordance with Irish Water standard details which will ensure the odour issue has imperceptible impact at the connection point to the existing foul sewer network, or at the location of the proposed pumping station.

5B.3.2 Potable Water

Irish Water have a number of watermains running through the site. A 1200mm diameter trunk main runs along the eastern side of the site over which there is a 30m wayleave which prevents development along this corridor. It is not proposed to connect to or interfere with this strategically-important trunk main.

There is a 300mm diameter watermain running east to west through the middle section of the site over which there is a 10m wide wayleave. It will be necessary to re-locate this main to suit the proposed arrangement of roads and houses on the site. The route for this re-aligned main will generally be along new road corridors with connection to the existing main at the eastern and western boundaries of the site. The proposed route for this diverted 300mm diameter main is

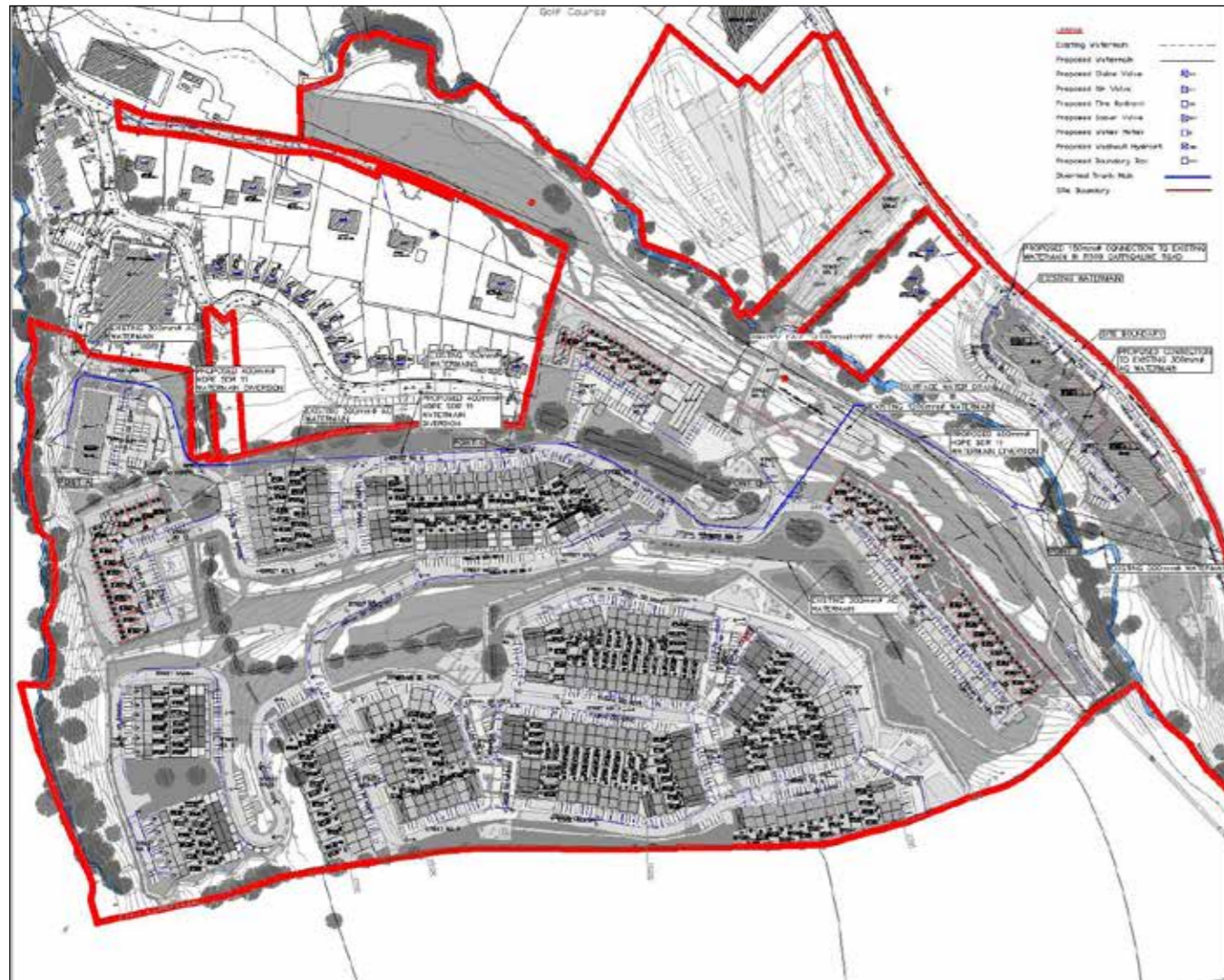


Figure 5B.4 Proposed Water Supply layout.

shown in Figure 5B.4 (and also accompanying this planning application in Drawing ref. 18203-JBB-1A-XX-DR-C-0510) and discussions are ongoing with Irish Water to agree this revised route.

The existing Vicarage development is served by a 150 mm diameter watermain which is connected to the 300mm main referred to above. This 150mm diameter main will be re-connected to the re-routed 300mm diameter watermain.

Within that area of the development west of the Moneygurney Stream, the development will be served by a network of 200mm, 150mm, 100mm and 80mm diameter watermains laid out as shown on the attached drawings and connected to the re-routed 300mm diameter main.

Within that area of the development east of the Moneygurney Stream, the development will be served by a network of 150mm, 100mm and 80mm diameter watermains laid out as shown on the attached drawings and connected to the existing 400mm diameter main in the adjacent Carrigaline Road.

Following a Pre-Connection Enquiry, Irish Water issued a Confirmation of Feasibility for connection to its water network infrastructure, a copy of which is included in Appendix 5B.1.

The proposed water supply system has been designed and will be constructed in accordance with the requirements of Irish Water and will comply with the following:

- 'Code of Practice for Water Infrastructure' (Irish Water);
- 'Water Infrastructure Standard Details' (Irish Water); and
- Building Regulations, Technical Guidance Document Part B 'Fire Safety';

This increase in water supply demand will happen incrementally over a four to five-year period as the housing development is completed and occupied in phases as follows:

• Phase 1	56.54 m ³ /day
• Phase 2	42.63 m ³ /day
• Phase 3	77.41 m ³ /day
• Phase 4	77.23 m ³ /day
• Overall development	253.80 m ³ /day

The above demand assessments are based on Irish Water's design parameters as follows:

• Average occupancy	= 2.7 persons/dwelling
• Per-capita consumption	= 150 litres/person/day
• Average day / peak week demand factor	= 1.25

The demand assessments are rather conservative as the above parameters are applied to all residential units i.e. houses and apartments.

The new site watermain network has been designed to adequately serve the firefighting requirements of the development.

Fire hydrants will be provided such that each house will be within 45m of a hydrant and these hydrants will be provided so as to be fully accessible to the fire service.

Sluce valves will be installed on all principal watermain connections to ensure that sections of the development can be isolated for maintenance and repair as required.

A water-meter will be installed on the main connections, subject to detailed agreement with Irish Water/Cork County Council.

5B.3.3 Power

Power supply, and the requirement for any alterations to the existing power supply network for the development of the subject site, will be agreed with ESB Networks in advance of construction. All power supply related works will be carried out in accordance with ESB Networks relevant guidelines. An Electrical Diversified Load of approximately 1.7MW is required which will be split over one main double substation located centrally beside the creche in the residential scheme.

5B.3.4 Gas

Gas supply, and the requirement for any alterations to the existing gas supply network for the development of the subject site, will be agreed in advance of construction with Gas Networks Ireland. All gas supply related works will be carried out in accordance with Gas Networks Ireland relevant guidelines. A Gas diversified load of 15MW is required to accommodate the site. To the north of the site, there is an existing 125mm diameter, 4 bar medium pressure pipe that could be extended to supply the development. This will need to be co-ordinated and confirmed by Gas Networks.

5B.3.5 Telecommunications

Telecommunications supply, and the requirement for any alterations to the existing telecommunications network for the proposed development, will be agreed in advance of construction with the relevant telecommunications providers. All telecommunications related works will be carried out in accordance with relevant guidelines.

5B.4 Potential Impacts

5B.4.1 Construction Impacts

5A.4.1.1 Foul Water

Foul sewers for the development will be connected to the existing foul drainage network outside the site, as detailed in Figure 5B.3 (and also accompanying this planning application in Drawing ref. 18203-JBB-1A-XX-RR-C-0019). The potential adverse impact on the local foul drainage network would be short term and imperceptible, and confined to the works required to construct connections to existing manholes. Details of the connections will be agreed with Irish Water as part of a final Connection Agreement in which the requirements of Irish Water will be set-out and agreed with the Applicant.

The site compound will require a temporary foul connection. This likely adverse impact of this connection will be temporary and imperceptible and will be subject to a Connection Agreement with Irish Water.

5A.4.1.2 Potable Water

Construction of the proposed development will require diversion of the existing 300mm diameter and 150mm diameter distribution watermain within the site as detailed in Figure 5B.4 (and also accompanying this planning application in Drawing ref. 18203-JBB-1B-XX-DR-C-0510). The final details regarding connection and routing of these watermain will be agreed in advance with Irish Water.

With respect to the existing 1,200mm diameter trunk watermain within the site, it is imperative that construction works are managed and undertaken in a manner to mitigate risk to the integrity and operation of this element of infrastructure. In this regard, Irish Water require implementation of protective measures when working within 15m of this watermain.

An existing 300mm watermain runs through the site and will need to be diverted to facilitate the proposed development layout. This will require the installation of a new watermain and two connections at the eastern and western sides of the site to the existing watermain as detailed in Figure 5B.4 (and also accompanying this planning application in Drawing ref. 18203-JBB-1B-XX-DR-C-0510).

Provision of a new water main distribution network would involve construction activities within the subject lands mainly involving trench excavations conducted in parallel with the other services. The potential adverse impact on the local public water supply network would be short term and slight.

There is a risk of a temporary short-term disruption to the quality of local public water supply during the construction and in particular during diversion of the existing 300mm diameter and 150mm diameter distribution watermain within the site. The likely adverse impact of this will be slight short term when new connections are made to existing pipework and temporary shut-downs are required to facilitate such connections. All such temporary shut-downs will be operated under agreement with Irish Water with appropriate procedures put in place to advise local users of the likely short-term impacts (such as temporary discolouration/temporary water-supply interruptions/etc.).

The site compound will require a temporary water connection. This likely adverse impact of this temporary connection will be temporary and imperceptible and will be subject to a Connection Agreement with Irish Water.

5A.4.1.3 Power, Gas and Telecommunications

The installation of the utilities for the development will be conducted in parallel with the other services and will primarily involve construction of ducting and chambers using open excavation.

It will be necessary to divert both sets of existing 3-Phase overhead ESB power lines to facilitate the proposed development (including construction of the access bridge). Relocation or diversions to existing overhead ESB lines may lead to temporary loss of connectivity to and / or interruption of supply from the electrical grid to the surrounding areas. Proposed underground relocation or diversions routes are subject to ESB agreement. This likely adverse impact may be characterised as a temporary, regionally short term, minimal impact.

There may be a potential temporary loss of connection to the Gas Networks Ireland infrastructure while carrying out works to provide connection to the proposed development. This likely adverse impact may be characterised as a temporary, regionally short term, moderate impact.

There may be a potential temporary loss of connection to the telecommunications infrastructure while carrying out works to provide connection to the proposed development. This likely adverse impact may be characterised as a temporary, locally short term, minimal impact.

The site compound will require a temporary power and telecommunications connection. The likely adverse impact of the provision of this supply will be temporary and negligible.

5B.4.2 Operational Impacts

5A.4.2.1 Foul Water

The impact of the proposed development on the foul drainage network will be to increase the quantity of foul water entering the collection network and discharging to Carrigrennan WWTP for treatment and disposal.

The potential impact from the operational phase of the development on the existing wastewater treatment plant at Carrigrennan will be long-term and imperceptible.

Following a Pre-Connection Enquiry, Irish Water issued a Confirmation of Feasibility for the proposed development. The Applicant has entered into a Project Works Services Agreement (PWSA) with Irish Water which facilitates Irish Water in undertaking a detailed assessment of the local network to identify the need, if any, for local upgrades to certain sections of the existing pipe network to accommodate the proposed development.

The Phase 4 development at the northern side of the site requires installation of a pumping station to deliver foul sewage to the existing foul sewer network. This pumping station will be designed and constructed in accordance with Irish Water requirements and will require maintenance on an ongoing basis to ensure its continued efficient operation.

Given that the overall development will take place and become occupied in phases the load on the existing foul sewer network will increase slowly over a period of four to five years, providing the time required for any upgrades, if required.

As such the impact of the proposed development on the existing foul sewer network will be long term and slight.

5A.4.2.2 Potable Water

The impact of the operational phase of the proposed development on the public water supply is likely to be to an increase in the quantity of water to be treated and supplied through the existing network to the site.

The potential adverse impact of the proposed development on the water supply network is likely to be long-term and imperceptible.

5A.4.2.3 Power, Gas and Telecommunications

The impact of the operational phase of the proposed development on the power supply network would be the requirement for an Electrical Diversified Load of 1.7MW which will be split over one main double substation located in centrally beside the creche in the residential scheme. The impact of the operational phase of the proposed development on the gas supply would be the requirement for a Gas diversified load of 15MW to accommodate the development of the lands. The impact of the operational phase of the proposed development on the telecommunications network would be to increase the demand on the existing network.

The potential adverse impact of the proposed development on the Power, Gas and Telecommunications networks is likely to be long-term and minimal.

5B.4.3 'Do-nothing' scenario

There are no predicted impacts on these material assets should the proposed development not proceed.

5B.5 Mitigation Measures

5B.5.1 Construction Mitigation

Mitigation measures proposed in relation to the drainage and water infrastructure include the following:

An outline "Construction Management Plan" is included in Chapter 2 of this EIAR which will be further developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the "Construction Management Plan".

In order to reduce the risk of defective or leaking sewers, all new sewers should be laid in accordance with Irish Water standards, pressure-tested and CCTV surveyed to ascertain any possible defects.

The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be removed off site to a licensed facility until a connection to the public foul drainage network has been established.

The construction compound's potable water supply shall be protected from contamination by any construction activities or materials.

The diversion of the existing 300mm watermain will be carried out in full consultation with Irish Water and connections to the existing watermain at each end of this diversion, and the permanent connection to serve the development, will be carried out under an agreed methodology and with full notification to existing Irish Water customers who will be affected by the short-term

interruptions to water supply which will occur while making these connections.

Where possible backup network supply to any services will be provided should the need for relocation or diversion of existing services be required otherwise relocation or diversion works will be planned to incur minimal impact, with users notified in advance of any works.

Connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

The storm sewer network is designed to flow under public roads and open spaces to insure unimpeded access is available to the pipe network (including hydrocarbon interceptors and silt traps) at all times to allow for monitoring and maintenance.

With mitigation measures in place, no negative impacts on human health are predicted as a consequence of the construction phase of the development.

5B.5.2 Operational Mitigation

Mitigation measures proposed during the operational stage include the following:

All new drainage lines (foul and surface water) will be pressure-tested and will be subject to a CCTV survey to identify any possible defects prior to being made operational.

It is envisaged that the development will take place and be occupied on a phased basis (i.e. 4 No Phases) and therefore the downstream foul sewerage system (foul sewer network and wastewater treatment facility) will be loaded gradually and incrementally which corresponds to the intentions identified in the pre-connection enquiry submitted to Irish Water for the development.

Water conservation methods such as the use of low flush toilets and low flow taps will be incorporated into dwellings to reduce water volumes and related treatment and abstraction costs of the development.

Such water conservation methods will reduce the loading on the foul sewer network and the treatment works at Carrigrennan WWTP.

On completion of the construction phase no further mitigation measures are proposed in relation to the electrical, gas and telecommunications infrastructure.

With mitigation measures in place, no negative impacts on human health are predicted as a consequence of the operational phase of the development.

5B.6 Potential Cumulative Impacts

The cumulative residual construction and operational impacts of the proposed Castletreasure development and the following projects and plans have been assessed:

- M28 Bloomfield to Ringaskiddy - Planning Ref: Ha 0053
- 24 class-room Primary School - Planning Ref: 18/5369
- Greenway improvements - Planning Ref Part 8 Pending
- Lidl Discount shop and 5 apartments. - Planning Ref: 18/5814
- 48 residential units at Clarendon Brook. - Planning Ref: 18/6245
- 600 pupil secondary school. - Planning Ref: 18/6246

Cumulatively these other proposals with regard to Material Assets - Service Infrastructure and Utilities do not affect the material assets criteria ratings used for the Castletreasure Development and will not influence the residual impacts proposed given either their scale and/or distance from the project.

5B.7 Residual Impact

5B.7.1 Foul Water

The development will generate additional foul sewage flows to the existing foul sewage network and municipal wastewater treatment facilities, but the volume of these additional flows is minor in the context of the capacity of the existing network and treatment facilities.

Following mitigation measures proposed the residual impacts on foul water infrastructure during construction are temporary and imperceptible.

Following mitigation measures proposed the residual impacts on foul water infrastructure during operation are long term and imperceptible for the existing Wastewater Treatment Plant and long term and slight for the existing foul sewer network.

5B.7.2 Potable Water

Potable water will be provided by connecting to the public water mains which are fed from the Inniscarra Reservoir. Within the site the water will be distributed via a network of 100mm, 150mm and 200mm diameter water main pipes, the design and construction of the network will be in accordance with the Water Supply Code of Practice published by Irish Water. The development will generate additional water demand on the existing water supply network and municipal water treatment facilities, although the volume of these additional flows is minor in the context of the capacity of the existing network and treatment facilities.

As a consequence of having to divert the existing 300mm watermain through the site and having to make connections to this existing water main there will be short-term impacts on existing water-supply in the area but these will be managed in full consultation with Irish Water with appropriate notifications and mitigation measures employed. It is proposed that the residual impact on Potable Water Infrastructure during the Construction Phase of the development following mitigation will remain to be short term and slight.

The additional demand arising from the development is minor in the context of the capacity of the existing water supply network in the area and therefore there the residual impacts on Potable Water Infrastructure during the Operational Phase of the development will be long term and imperceptible.

5B.7.3 Power, Gas and Telecommunications

No significant impacts from either the Construction or Operational Phase of the development are likely, as a consequence of the connection to the Power, Gas and Telecommunications networks.

5B.7.4 Human Health

With mitigation measures in place, there are no predicted residual impacts on human health associated with the Material Assets (Service Infrastructure / Utilities) discipline.

5B.8 Monitoring

5B.8.1 Foul Water

The proposed foul sewer network includes gravity sewers generally with a small pumping station required to serve the apartment development on the northern side of the site. All foul sewer pipes and rising-mains have been designed to achieve self-cleansing velocities in accordance with The Irish Water Wastewater Code of Practice. Upon handover, all foul sewer components are to be monitored and maintained by Irish Water.

5B.8.2 Potable Water

On-going water usage within the proposed development will be monitored by bulk water meters. Water usage will therefore be monitored by Irish Water to avoid leaks, breakages, etc.

5B.8.3 Power, Gas and Telecommunications

On completion of the construction phase the service providers will initiate their own monitoring measures in relation to the power-supply, gas and telecommunications infrastructure.

5B.9 References

- Environmental Protection Agency. "Advice Notes for Preparing Environmental Impacts Statements", (EPA 2015).
- Environmental Protection Agency. "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports" (EPA 2017).
- Environmental Protection Agency. "Guidelines on the information to be contained in EIS" (EPA 2002).
- Environmental Protection Agency (2003) Advice Notes on Current Practices in the Preparation of Environmental Impact Statements. (EPA 2003).
- ESB Networks. Code of Practice for Avoiding Danger from Overhead Electricity Lines (ESB 2008).
- CIRIA Environmental Good Practice on Site 3rd Edition, (C692), (CIRIA Publications, 2010).
- CIRIA Control of water pollution from construction sites, guidance for consultants and contractors, (C532), (CIRIA Publications, 2001).
- Electronic Sources: www.landregistry.ie



Chapter 6

Land & Soils

6

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

CHAPTER 06 LAND & SOILS: SOILS, GEOLOGY & HYDROGEOLOGY

6.1 Introduction

This Chapter has been prepared by John Fallon, Senior Environmental Engineer with J.B Barry & Partners Consulting Engineers who has over 17 years' experience in the geotechnical / environmental sector. John has an honours Degree in Geology from University College Cork (1998) and a MSc in Civil / Environmental Engineering from Trinity College Dublin (2005). John's experience includes the coordination and preparation of the environmental impact statements for both water and road infrastructure schemes.

This Chapter describes the existing Land and Soils: Soils, Geology & Hydrogeology, it then considers and assesses the potential for likely significant effects on Land and Soils: Soils, Geology & Hydrogeology (including natural soils, bedrock, imported fill, groundwater etc) from the construction and operational phases of the proposed Castletreasure Residential Development, Douglas, Co. Cork.

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

6.2 Methodology

The Land and Soils assessment has been prepared in accordance with the following guidelines;

- Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements by the Institute of Geologists of Ireland (IGI, 2013);
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports by the Environmental Protection Agency (EPA, 2017); and

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, National Road Authority (2008).

The main guidance document used in this chapter is the IGI (2013) guidelines which give a recommended procedure containing 4 elements, it also gives guidance on the classification of impacts from the EPA guidelines and on criteria rating and impact significance from the NRA guidelines.

The scope of work for the assessment involves the completion of a Desk Study and Site Walkover which will involve the collation and review of all available information pertaining to the site including previous environmental reports and studies relevant to the development site including the following:

- Ordnance Survey of Ireland, (OSI) On-line Maps/Historic Maps and Aerial Photographs,
- Geological Survey of Ireland (GSI) On-line Geological Datasets, (www.gsi.ie/mapping.htm),
- EPA and National Parks & Wildlife Service (NPWS) web-based mapping,
- The UCC "Geology of the Cork District", by Ivor AJ MacCarthy, 1988,
- The GSI "Geology of South Cork Sheet 25" 1:100,000 Scale Geology Map & Booklet 1994,
- Priority Geotechnical Limited: Castletreasure Development, Douglas, Ground Investigation Factual Report No. P18081;
- Site walkover;
- Aerial Photography; and
- Site Layout Plans.

The Walkover Survey element of the scope of work enabled the physical examination of the geological, geomorphological and land use characteristics of the site and its setting in the locality.

6.2.1 IGI Guidelines

The potential impact of the proposed project on Land & Soils: Soils & Geology & Hydrogeology has been assessed by classifying the importance of the relevant attributes, quantifying the likely magnitude of any impact on these attributes and determining the significance of the impact.

This impact assessment methodology is in accordance with the guidance outlined in Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements published by the Institute of Geologists of Ireland (IGI) in 2013.

This Chapter outlines a methodology, which has four distinct elements, as follows:

- 1st Element: Initial Assessment;
- 2nd Element: Direct and Indirect Site investigations and Studies;
- 3rd Element: Mitigation Measures, Residual Impacts and Final Impact Assessment; and
- 4th Element: Completion of the Soils, Geological and Hydrogeological Sections of the EIS (now EIAR).

The initial assessment describes the existing land and soil environment and presents a description of the past and present uses of the site and other neighbouring sites.

This section also describes the nature of the site based on both site specific and neighbouring site investigation data from publicly available sources.

Where specific features/attributes are identified, their importance is ranked in line with the IGI Guidelines.

The outcome from examining this available data is the Conceptual Site Model (CSM) where the impacts on specific receptors are considered in terms of the magnitude of the effect/impact of an element of the project on a receptor and the importance of that receptor following guidelines established in the documents above.

The magnitude of the potential impact is ranked in accordance with the IGI Guidelines and this allows the Significance of the Impact to be determined.

Following the assessment of impacts, specific mitigation measures have been developed to avoid, reduce and, if possible, remedy any negative effects on the land and Soils: Soils, Geology & Hydrogeology.

Residual impacts are then described. The magnitude and significance of these residual impacts have also been classified based on the IGI Guidelines.

6.2.2 Study Area

For the purpose of the assessment of the impacts of the proposed project on the surrounding environment, the wider study area includes up to a 2km radius from the site. The extent of the wider study area was based on the IGI Guidelines which recommend a minimum distance of 2km. It is considered that the nature and scale of the proposed project does not necessitate a larger study area.

6.2.3 Proposed Development

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

The topography of the site will require considerable preparatory earthworks. Earthworks for the proposed development will extend into the subsoils (and in places weathered bedrock) in order to facilitate the construction of building foundations and retaining structures which will facilitate housing/apartment/roads construction.

Approximately 700m, 985m, 820m and 290m of retaining wall structures are required for Phases 1 - 4 of the development to facilitate construction of the project, these will range in height from approximately 2 - 9m in height.

Where possible excess soil will be reused on the site for construction of embankments/backfill to retaining structures etc. However, there will be a significant export of acceptable earthworks material surplus to requirements on site as detailed in Table 6.1. It should be noted that Phase 1 export of material shall be stockpiled on site (as detailed in Section 2.4 - Construction Management Plan) until the Moneygurney Stream Bridge crossing is fully operational to allow export of this material via the R609 Carrigaline Road. Table 6.1 outlines the Bulk Fill and Cut required for the project construction, including the importation of aggregate material (e.g. Clause 804, Clause 808 material) which will be used for the construction of internal roads, backfill / surround of site infrastructure, backfill to retaining walls etc.

Table 6.1: Earthworks Cut / Fill Balance

	Phase 1	Phase 2	Phase 3	Phase 4
Bulk FILL (m³) (2+4)	16,027	2,827	8,781	8,910
Bulk CUT (m³) (1+2+3)	46,289	43,423	33,230	11,301
1. <u>Export</u> : Material for Disposal (Unacceptable U2 + Topsoil) (m³)	6,879	6,349	6,594	6,320
2. Acceptable Site Won (including weathered bedrock) Material Fill Material to be re-used on Site	9,679	0	3,819	6,056
3. Export: Cut (including weathered bedrock) Acceptable material surplus to requirement	29,731	37,074	22,816	-1,075*
4. Import: Annex E built fill material requirement	6,348	2,827	4,962	2,854

*Phase 4 General Fill deficit will be sourced from Phase 3 Surplus.

6.3 Initial Assessment: Existing Environment

The Castletreasure site is located approximately 1km south of Douglas Village adjacent to the R609 Carr's Hill as detailed in Chapter 1 - Introduction.

6.3.1 Land use and Topography

The proposed site is currently undulating and green field and contains two hydrological features, the Douglas and Moneygurney Streams, which flow in a northerly direction through the site. The Moneygurney Stream flows in a north westerly direction through the site and forms a portion of the northern boundary of the site.

The lands lie to the immediate east of the Douglas Stream which flows in a northerly direction along the western boundary of the site.

The land was previously used for agriculture but has not been put to agricultural use for a number of years. There is unauthorised, informal use of the land for walking / dog walking and evidence of low-level anti-social behaviour in pockets of the site (litter and small bonfire markings). The land also contains water supply infrastructure comprising a 300mm and a 1200mm diameter water mains. The lands to the west and north are the established residential areas of Donnybrook and Carr's Hill. Areas in the western side and northern side of the site were previously infilled with excavated soil most likely from developments adjacent to the site which have since naturally re-vegetated.

6.3.2 Quaternary Geology

Information on the subsoil geology of the study area has been obtained from the GSI website (See Figure 6.1). The online GSI subsoil data has been based on the mapping undertaken by Teagasc.

The data indicates the following overburden types within the study area -

- TDSs (red areas) - till derived chiefly from Devonian Sandstones;
- Made Ground (green - urban and brown - industrial areas); and
- Rock - bedrock outcrop and subcrop (grey areas);

6.3.3 Regional Bedrock Geology

The surface geology local to Cork City and County is controlled throughout by folds in the rock sequence, with the axis considered to run approximately from east to west. These folds were created during the Variscan Orogeny (a period of mountain-building caused by continental collision) between approximately 390 and 310 million years ago.

The ridges which are evident across southern Cork comprise of Devonian age (roughly 415 to 360 million years ago) sandstones and mudstones. However, the valleys are considered to consist of much softer limestones from the Carboniferous period (roughly 360 to 300 million years ago) which have been eroded into u-shaped valleys by ancient rivers and glaciers.

Geologically recent Quaternary sediments cover many of the rocks, particularly in the valleys and are mostly of glacial origin, ranging from approximately 1.6 million years to the present day. These sediments have been deposited either directly from glacier ice during an Ice Age, or by glacial meltwater flowing from the ice. The sediments may be up to 100m thick in deep-cut valleys and are considered to represent a major resource in the Cork area, through sands and gravels of which they are predominantly composed, of groundwater, and also of geothermal energy. Two buried valleys in the Cork Syncline can be classed as high yield regional aquifers.

6.3.4 Local Bedrock Geology

Information on the solid geology of this area has been obtained from maps and field guides published by the GSI. The Geology of South Cork Sheet 25 covers the site and indicates the site is underlain by Ballytrasna Formation described as Purple Mudstone and Sandstone.

The proposed development area is located north of the "Great Island Anticline" - which can be described as a Sandstone shale cored anticline with two major limestone cored synclines located to the north (the Cork-Middleton Syncline) and to the south (the Cloyne syncline).

The geological map outlined in Figure 6.2 indicates that bedrock is cross cut by a north south trending geological fault at the northern extent of the site.

6.3.5 Aquifer Classification

GSI mapping indicates that the site is underlain by purple mudstone and sandstone, the overall GSI aquifer classification for this formation is LI, a locally important aquifer overlying bedrock which is Moderately productive only in Local Zones. GSI Mapping also indicates the site is underlain by the overall Ballinhassig East groundwater body which is designated as a poorly productive bedrock (Figure 6.3).

6.3.6 Groundwater Vulnerability

Groundwater vulnerability provides an indication of the ease at which potential contaminants can migrate downwards from the surface to the underlying aquifer. Vulnerability is identified in the mapping as predominantly being "Extreme" with "X" (rock near the surface or karst) located at the western and northern extents of the proposed site indicating a shallow depth to bedrock across the proposed site (See Figure 6.4).

6.3.7 Groundwater Body

The central portion of the study area is located within the Ballinhassig Groundwater Body. This groundwater body is composed of the lower permeability sandstones and mudstones and experiences higher run-off from the ridges and higher ground. The bedrock forms a Locally Important Aquifer which is moderately productive only in local zones (LI). Folding and faulting within the bedrock results in zones of enhanced permeability in the mudstones and sandstones.

Permeability decreases rapidly with depth. Groundwater flow paths are expected to be short (30m to 300m) with groundwater discharging to small springs or streams. There may be cross flow from the aquifers in this groundwater body to the adjacent karstic groundwater bodies.

The Ballinhassig Groundwater Body is underlain by non-carbonate rocks and alkalinity ranges from 10-300 mg/l (as CaCO₃) and hardness ranges about 40-220 mg/l (moderately soft to moderately hard). Conductivities in these units are relatively low (125-600 µS/cm) with an average of about 300 µS/cm. In general, high iron and manganese concentrations can occur in groundwater due to the dissolution of FE and Mn from the sandstone and shale where reducing conditions occur. Background chloride concentrations will be high due to proximity to the sea.

6.3.8 Groundwater Source Protection Schemes

Groundwater Source Protection Schemes are county-based projects that are undertaken jointly between the GSI and the respective Local Authority. There are no Groundwater Source Protection Schemes for water supplies within the study area, or within 10km of the site.

6.3.9 Neighbouring Groundwater Abstractions

GSI mapping indicates that there are five no. wells recorded within the 2 km study area as shown on Figure 6.5 and detailed in Table 6.2.

Table 6.2: GSI Mapping - Groundwater Wells

GSI Name	Townland	Well Use	Yield Class General Comment
1705NWW013	Moneygurney	Unknown	Poor
1705NWW012	Castletreasure	Unknown	Goes Dry
1705NWW001	Douglas	Unknown	Good / 130.9m ³ /Day
1705NWW002	Douglas	Unknown	Poor / 9.8m ³ /Day
1705NWW003	Douglas	Unknown	Good / 140m ³ /Day

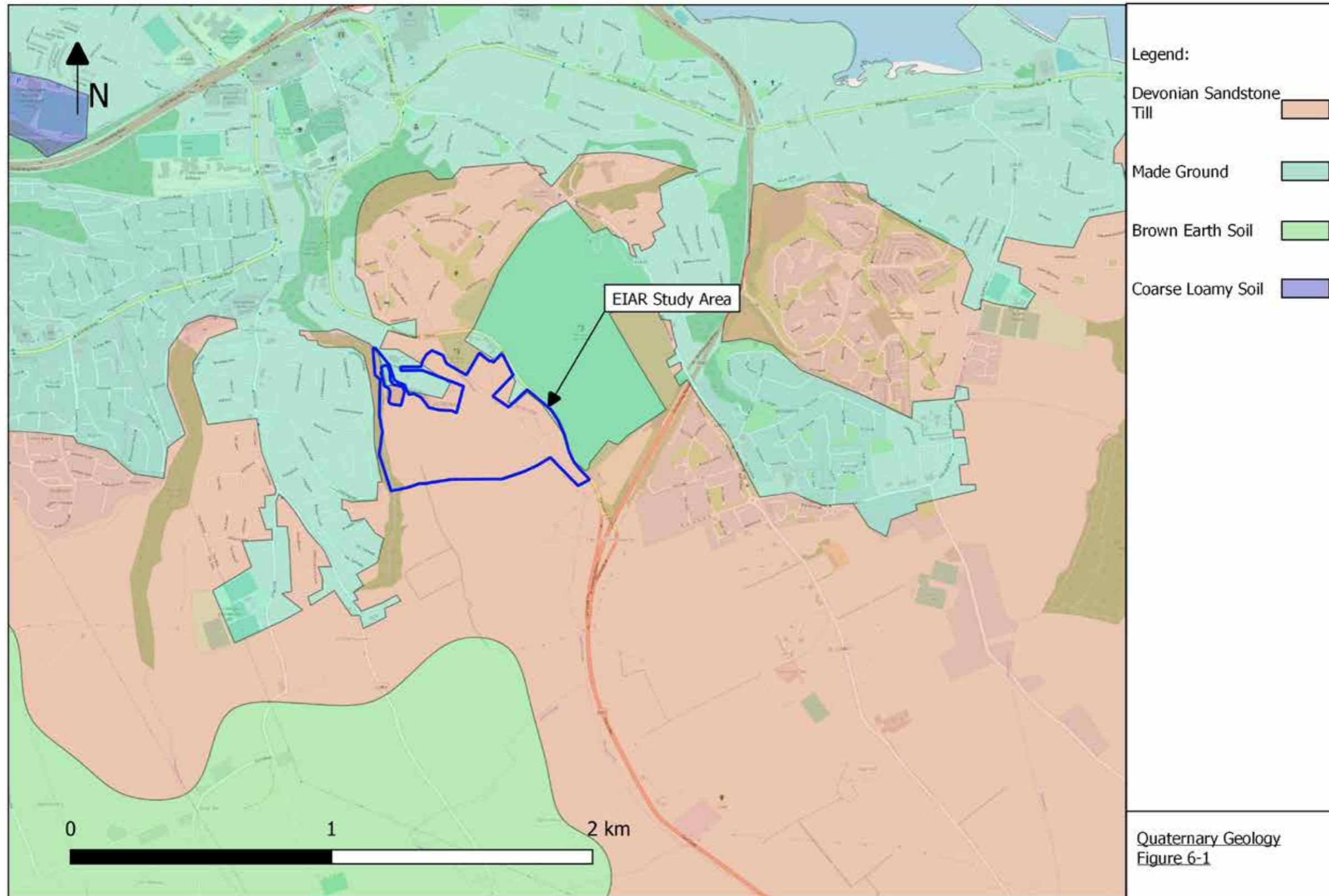


Figure 6.1

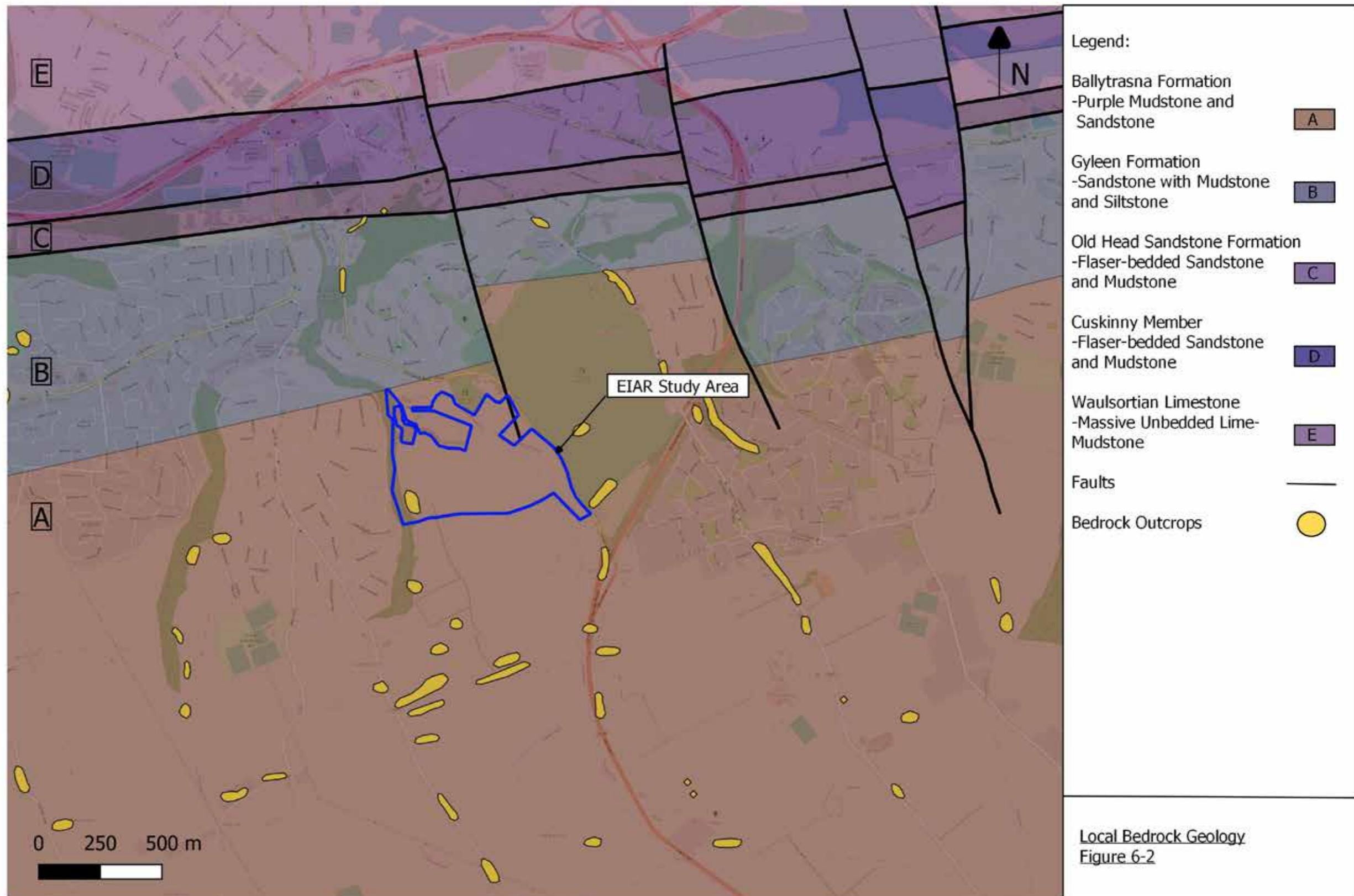


Figure 6.2

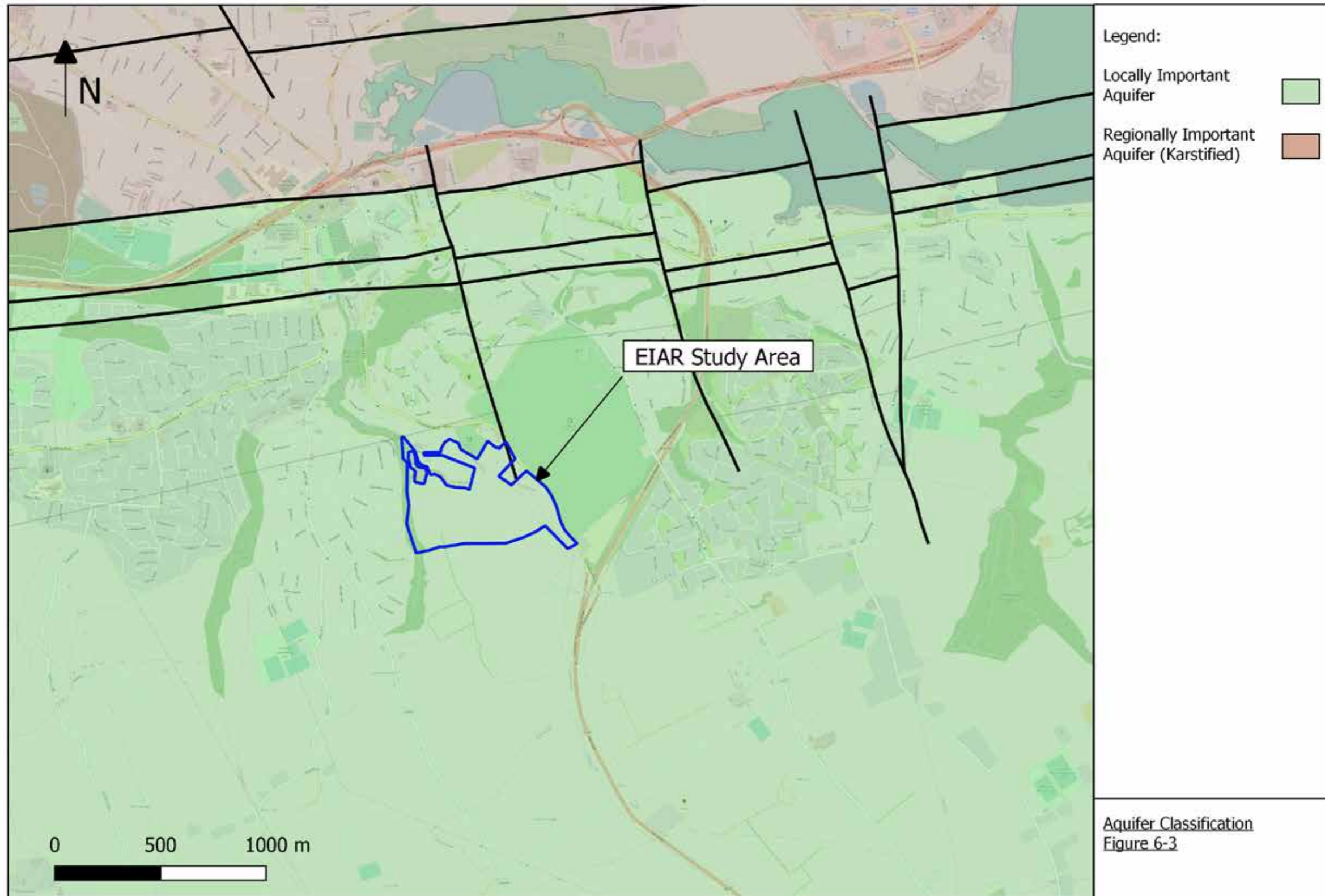


Figure 6.3

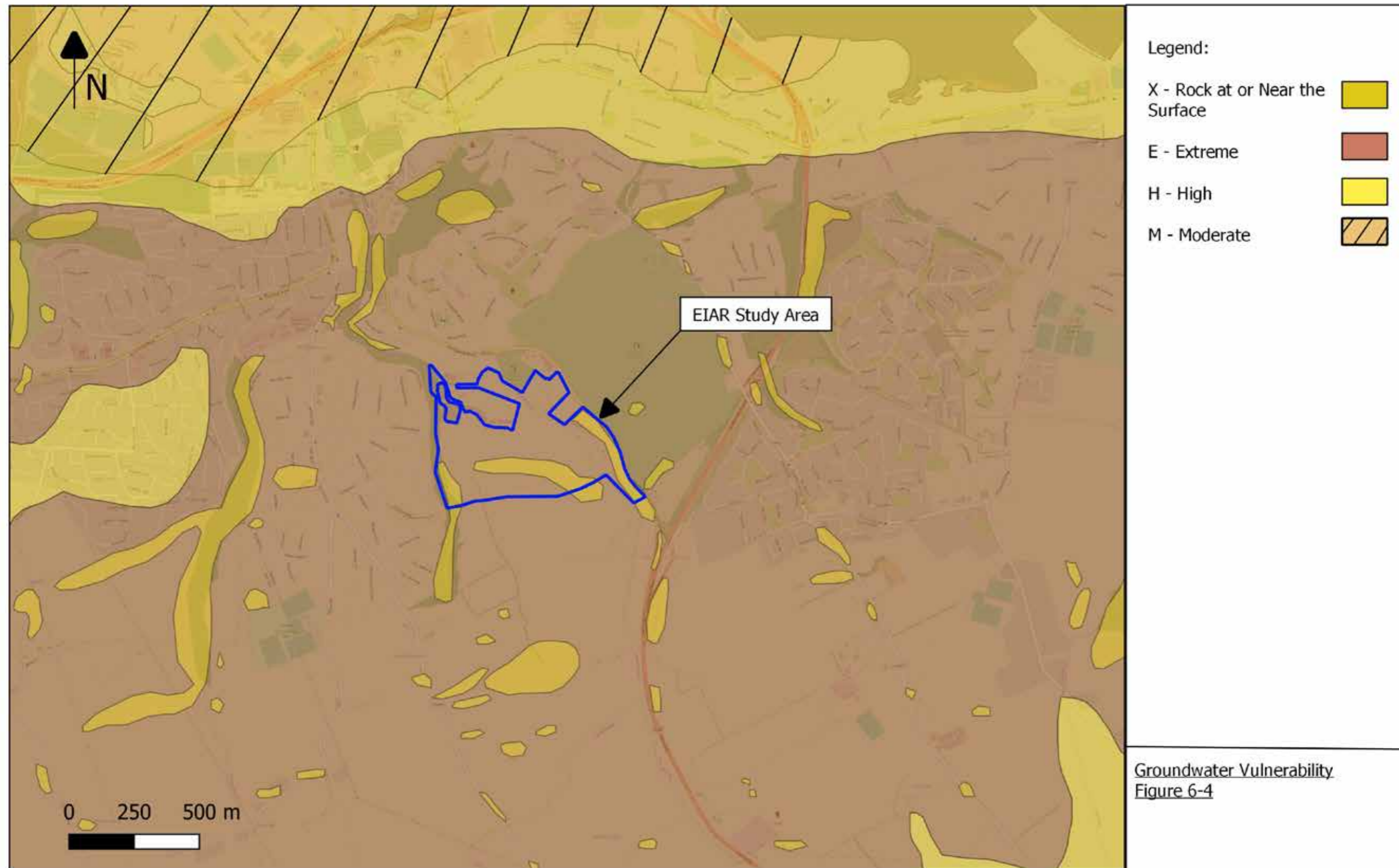


Figure 6.4

6.3.10 Landslide Potential

Past landslides or potential landslide locations are identified on the GSI website. No past landslides were identified, and the area is identified as generally having a low to moderately low landslide susceptibility risk.

6.3.11 Geological Heritage

A review of the GSI’s County Geological Sites of County Cork (Geological Survey of Ireland, 2016), indicated there are no County Geological Sites (CGS) identified within the perimeter of the site or within the study area.

6.3.12 Economic Geology

The Geological Survey of Ireland Quarry Database provides a comprehensive database of active quarries and pits in the Republic of Ireland. No active quarries or Mineral Locations were identified at the location of the proposed development. Materials required from quarries will only be sourced from quarries which are listed on the register maintained by the local authority and which are compliant with relevant legislation.

6.3.13 Contaminated Land

The National Waste Collection Permit Office (NWCPO) issue Waste Collection Permits for all of the Waste management Regions in Ireland. According to the EPA mapviewer, there are no waste licenced facilities, IPC or IE facilities within the site boundary with 1 no., the Kinsale Road landfill, boundary located approximately 1.9km to the northwest of the proposed development.

There is no evidence of contaminated land from baseline data sources, ground investigation surveys or walkover surveys within the study area. There are a number of soil heaps and earthen berms were identified in the lands to the east of the Irish Water pumping station and south of the existing Templegrove apartments where soil and stone from the construction of the adjacent existing apartment developments was stockpiled. Detailed soil laboratory contamination testing was undertaken with the results presented in Appendix 6.1 with individual test data compared to the Landfill Waste Acceptance Criteria for INERT to Hazardous material.

All samples from this site fall into the INERT classification, no evidence of contamination was found.

6.3.14 Ecologically Protected Sites

The National Parks and Wildlife Service online database was consulted to establish whether any ecologically protected sites which are dependent on groundwater exist in the vicinity. A full assessment of the ecological features at the Site is outlined in the Chapter 8, Biodiversity, while this section will deal with those which may be influenced by changes in the groundwater regime.

The following protected ecological sites (Table 6.3) have been identified within a 2 km radius of the Site, as mapped in Chapter 8, Biodiversity:

Table 6.3: Site Importance of Geological/Hydrogeological Features/Attributes

Protected Feature	Site Code	Approximate distance from the Site
Cork Harbour SPA	004030	1.6km
Douglas River Estuary pNHA	001046	1.6km

6.4 Initial Assessment and Impact Determination

The criteria for rating site importance of a geological feature is based on the Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes published by the NRA (2009) which is reproduced in the IGI guidelines. Initial assessment is based on the findings of the information listed above. This rating was used to create Table 6.4.

Table 6.4: Castletreasure Criteria for Rating Site Importance

Feature	Importance	Justification
Locally important bedrock aquifer	Medium	Locally important aquifer overlying bedrock which is Moderately productive only in Local Zones. Attribute has a medium quality or value on a local scale.
Economic Geology	Medium	Sub-economic extractable mineral resource. Attribute has a medium quality or value on a local scale.
Soils	Medium	Moderately drained and/or moderate fertility Soils. Attribute has a low quality, significance or value on a local scale.

A review of the available information both from site works and information review of the site and the region, the site is conservatively classified as Type B geological environment. A Type B environment is identified as “*Naturally dynamic hydrogeological environment*”, this has also been applied to both the geological and hydrogeological environment.

Assessments as required by the Activities/Environment Matrix in the Institute of Geologists of Ireland guidelines corresponding to the Proposed Project conditions (Type B) were undertaken for the following activities:

- Earthworks
- Excavations of materials above and the water table.

Table 6.5 outlines the investigations required by the IGI guidelines for a Type B Geological Environment which should be undertaken based on the environmental type and different activities which will be undertaken.

Table 6.5: Works Requirement for Assessment of a Type B Environment

Works required under the IGI Guidelines for a Type B Environment	Works Completed
Earthworks	
Invasive site works to characterise the nature, thickness, permeability and stratification of soils.	Site Investigations completed as presented in Section 6.5.1 .
Works to determine groundwater level, flow direction and gradient e.g. monitoring in standpipes, piezometers, or boreholes.	As presented in Section 6.5.2.8 .
Works to determine groundwater –surface water interactions.	As presented in Section 6.5.2.8 .
Excavation of materials above the water table	
Site works to characterise nature, thickness, permeability and stratification of soils and subsoils e.g. trial pits, augering.	Site Investigations completed as presented in Section 6.5.1 .
Site works to fully characterise the bedrock geology and in order to define the resource volume/weight according to the PERC Reporting Standard e.g. trenching, drilling, geophysics.	Bedrock geology for the Proposed Development has been characterised by extensive rotary coring and logging as detailed in Section 6.5.2.5.
Works to determine groundwater level, flow direction and gradient	As presented in Section 6.5.2.8 .

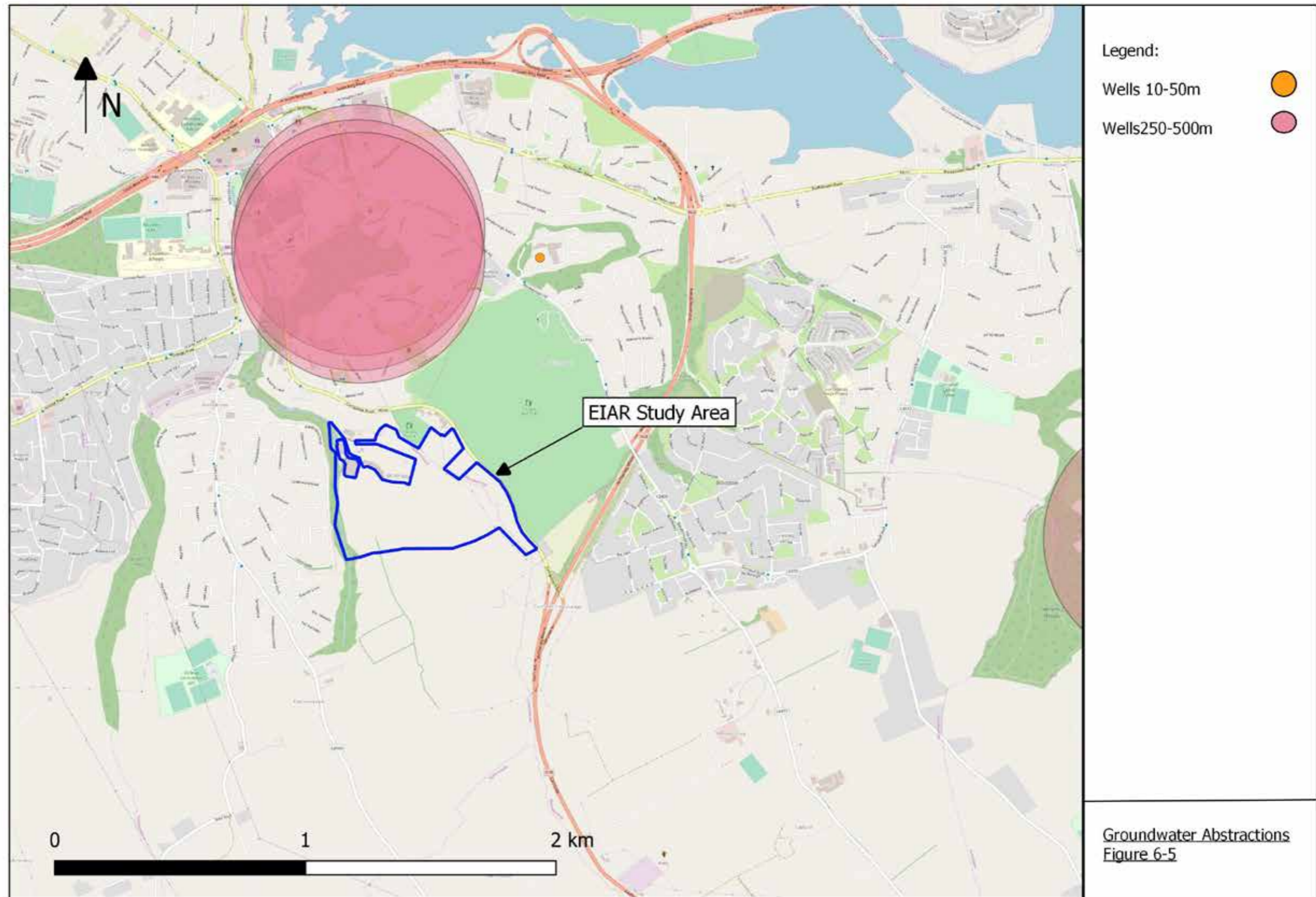


Figure 6.5

6.5 Direct and Indirect Site Investigations and Studies

6.5.1 Ground Investigation

A ground investigation was carried out to establish subsurface conditions at the proposed project by Priority Geotechnical Limited in 2018. A summary of the ground investigation carried out is provided in Table 6.6 .

Table 6.6: Summary of Ground Investigation Works Undertaken

Contractor	Description of Investigation	Details of Investigation
Priority Geotechnical Limited	Castletreasure Development, Douglas, Ground Investigation Factual Report No. P18081	10 Cable Percussion Boreholes 8 Rotary follow-on cored holes 18 trial pits 6 slit trenches 4 Standpipes Insitu Testing including Standard Penetration Testing 3 Standpipe Installations

6.5.2 Encountered Ground Conditions

A ground investigation was carried out to establish subsurface conditions at the proposed project by Priority Geotechnical Limited in 2018. A summary of the ground investigation carried out is provided in Table 6.6 with a summary of encountered ground conditions detailed .

6.5.2.1 Topsoil

Topsoil: Comprising brown slightly sandy to sandy SILT (Sand is fine to coarse) was encountered between 0.1 - 0.6m bgl.

6.5.2.2 Made Ground

Made Ground has been defined as soil which has been altered in some way by human activity (imported and placed in-situ) was encountered in TP11 from 0.35 to 1.35m bgl and in TP14 from 0.0 to 2.5m bgl. It is described as dark brown, slightly sandy to sandy, gravelly SILT/CLAY FILL with cobble and boulder fill (with rootlets, rubbish and timber from 1.7 - 2.5m bgl in TP14). Madeground was also encountered in Boreholes BH7, 8 and 10 ranging in depths of 6m, 2.3 and 2.0m bgl respectively.

6.5.2.3 Cohesive Glacial Till

Cohesive glacial till was generally encountered directly beneath topsoil, interbedded with granular glacial till and/or above rockhead. It is generally described as firm/stiff slightly sandy gravelly SILT with low cobble content. BH2, BH9, TP4, TP12 and TP21 has 3.0m encountered purple slightly sandy to sandy slightly gravelly to gravelly CLAY with cobbles.

6.5.2.4 Granular Glacial Till

The glacial deposits encountered during the ground investigations comprise a highly variable, stratified mixture of cohesive and granular materials. The boundaries between these material types likely varying from sharp to gradational both laterally and vertically. A detailed review of the available ground investigation data for the site indicates that, although glacial deposits occur as either 'cohesive' or 'granular', they comprise a heterogeneous mixture of materials.

Where present, granular glacial till occurs as interbedded layers within cohesive glacial till and/or directly above (presumed) rockhead.

The granular glacial till is generally described as purple/brown, (slightly) silty, (very) sandy GRAVEL and very silty, very gravelly SAND. Sand is described as fine to coarse, gravel is described as fine to coarse, angular to sub-rounded of mixed lithologies.

6.5.2.5 Encountered Bedrock Geology

Weak to medium weak purple / brown Mudstone bedrock was encountered in all rotary boreholes at depths ranging from 1.5 to 8.95m bgl. Weathered Bedrock was also encountered in 11 of the 18 Trial Pits excavated and generally recovered as purple brown clayey sandy GRAVEL encountered at depths ranging from 0.6 to 4m bgl.

6.5.2.6 Contaminated Land

Laboratory test results do not indicate contamination in the samples tested.

6.5.2.7 Organic Matter

There is no organic material identified at the site.

6.5.2.8 Groundwater

Groundwater was encountered in the cable percussion boreholes, rotary coreholes and trial pits at depths ranging from 0.8 to 9.0m ground level as detailed in Table 6.7. Standpipes were installed in three rotary cores, RC02, 06 and 08 with groundwater readings take included in Table 6.8.

Table 6.7: Groundwater Depths encountered during Ground Investigation

Location	Ground Level (m OD)	Groundwater Depth Strike (m bgl)	Reduced Levels (m OD)
BH01	41.94	2.7	39.24
BH02	42.34	2.6	39.74
BH03	47.44	6.4	41.04
RC01	41.94	3.0	38.94
RC02*	42.34	9.0	33.34
RC04	27.44	8.0	19.44
RC10	35.34	4.0	31.34
TP04	61.11	1.9	59.21
TP15	40.34	1.3	39.04
TP21	37.14	3.1	34.04

*Standpipe Installed

Table 6.8: Groundwater Monitoring during Ground Investigation

RC No.	Ground Levels mOD	Response Zone		Material	Groundwater reading 01/02/2019 (below ground level)	Groundwater Levels (Reduced Levels m OD) 01/02/2019
		From	To			
RC002	42.34	1.5	5.0	Overburden	2.4	39.94
RC006	77.75	5.0	9.0	Rock	6.83	70.82
RC008	44.01	1.5	7	Overburden	Dry	-

6.5.2.9 Conceptual Site Model

Using the subsurface information from the ground investigation and published data, a conceptual site model is summarised in Table 6.9. The conceptual model plots the factual ground investigation data within the study area along the existing ground level against the proposed levels, earthworks areas and groundwater levels of the Proposed Development.

Table 6.9: Castletreasure Summary of Conceptual Site Model

Unit	Material	Description	Depth to Top of Unit (m bgl)	Range of Unit Thickness (m) a)
1	Topsoil	Topsoil	0.0	0.1-0.6
2	Made Ground	Dark brown, slightly sandy to sandy, gravelly SILT/CLAY FILL with cobble and boulder fill (with rootlets, rubbish and timber from 1.7 - 2.5m bgl in TP14).	0.0	1.0-6.0
3	Cohesive Glacial Till	Typically comprising brown slightly sandy, gravelly SILT with low cobble content or slightly gravelly sandy CLAY	0.0 to 2.5	1.0 to 4.2
4	Granular Glacial Till	Typically comprising purple/brown, (slightly) silty, (very) sandy GRAVEL and very silty, very gravelly SAND.	0.0 to 2.0	0.2 to >4.5m
5	Bedrock	Typically weak to medium weak purple / brown Mudstone bedrock	0.6 to 8.95	Unproven

Note: a) The depths and unit thicknesses are based on borehole locations and may not represent the maximum or minimum depths and thicknesses across the site.

6.6 Potential Impacts of the Proposed Scheme

6.6.1 Direct Impacts Construction - Land & Soils

Subsoil Removal

The earthworks balance for the Proposed Development has been designed to minimise the requirement for the importation of material and to maximise the reusability of materials within the site. Notwithstanding this, the topography of the site will require considerable preparatory earthworks. Earthworks for the proposed development will extend into the subsoils in order to facilitate the construction of building foundations and retaining structures which will facilitate housing/apartment/roads construction.

Where possible excess soil will be reused on the site for construction of embankments/backfill to retaining structures etc. However, it is envisaged that there will be a significant export of material required to be re-used / disposed off-site as per earthworks quantities detailed in Table 6.1.

All unacceptable material (U2), determined as waste, will be disposed of in accordance with all relevant legislation including the Waste Management Act 1996 (as amended) and associated regulations. The management of excavated waste will be done so in accordance with the CMP as outlined in Chapter 2 - Project Description Section 2 - Waste Management Strategy. Haulage of this material is assessed in Chapter 5a - Traffic & Transportation.

The removal of soil excavation works is a direct and permanent impact on the Soils and Geology of the proposed development. However, the soil is generally granular glacial till and of low commercial value. The magnitude of this potential impact is negligible (NRA 2008) and would be classified under the EPA guidelines as having a neutral effect, of imperceptible significance and permanent duration.

Bedrock Removal

The removal of bedrock during excavation works is a direct and permanent impact on the soils and geology of the Proposed Development. However, the site itself is not a County Geological Site (CGS).

The earthworks balance for the *Proposed Development* has been designed to minimise the requirement for the importation of material and to maximise the reusability of materials within the site. Notwithstanding this, the topography of the site will require considerable preparatory earthworks. Earthworks for the proposed development will extend into the weathered bedrock in order to facilitate the construction of apartment basements (Phase 4) and at retaining structures throughout the scheme which will facilitate housing/apartment/roads construction.

Weathered bedrock will generally be encountered in the excavation of underground parking for the apartment blocks to the east of the Moneygurney Stream (Phase 4) and at localised areas of deep excavations for retaining structures throughout the site. The Ground Investigation undertaken indicates that the upper horizons of this type of stratified bedrock, which is extensively encountered in the Cork area, are very to slightly weathered and very fractured, and are easily diggable and/or rippable by heavy construction machinery. For the purpose of this assessment it is deemed that the volume of rock to be removed will be localised, and rippable by an excavator with rock breaking not likely to be required.

Where possible excess weathered mudstone bedrock will be reused on the site for construction of embankments/backfill to retaining structures etc. However, it is envisaged that there will be a significant export of material required to be re-used / disposed off-site as per earthworks quantities detailed in Table 6.1. Traffic impacts associated with the movement of this material during construction is assessed in Chapter 5A - Traffic and Transport.

The removal of bedrock during excavation works is a direct and permanent impact on the Soils and Geology of the proposed development. The bedrock attribute is of moderate importance. The magnitude of this potential impact is negligible (NRA 2008) and would be classified under the EPA guidelines as having a neutral effect, of imperceptible significance and permanent duration.

Loss of Economic Potential (Geology)

In accordance with the aggregate potential mapping undertaken as part of the National Development Plan 2007-2013, the study area is predominately classified as a high aggregate potential. The construction of the proposed Castletreasure development would result in the loss of the aggregate resource.

The type of bedrock that will be excavated is widely available and deemed an uneconomically extractable mineral resource. The magnitude of this potential impact is a negative effect, of imperceptible significance and of permanent duration.

Erosion, Storage and Stockpiles

Earthworks surfaces will be exposed during the excavation of cuttings. These earthworks surfaces are subject to erosion if left exposed over a long period of time. The impact is classified as having a negative quality, moderate significance and temporary duration.

The removal of topsoil, overburden material and rock and the treatment of those materials shall require its temporary storage (in particular the Phase 1 stockpiling of material), handling and reuse on site. The impact is classified as having a negative quality, slight significance and temporary duration.

Sealing of topsoil / overburden material

During construction, vehicles and plant will track over areas of topsoil and overburden. The vehicle and plant movements have the potential to compact the subsoil (following topsoil removal). The magnitude of this potential impact is a negative effect, of imperceptible significance and of permanent duration.

Soil Pollution

During the construction phase, localised accidental spillages of fuel or chemicals on the site have the potential to contaminate the underlying soils by exposure, dewatering or construction related spillages resulting in a Permanent Negative Impact on Soils.

For example, raw or uncured concrete and grouts, washed down water from exposed aggregate surfaces, cast-in-place concrete from concrete trucks, fuels, lubricants and hydraulic fluids for equipment used on the development site, bitumen and sealants used for waterproofing concrete surfaces can all potentially impact on soils during construction stage.

In the case of soils, the magnitude of this impact is small adverse as it may result in the requirement to excavate/remediate a small proportion of contamination or result in a low risk of pollution to soils. As a result, its significance is Moderate / Slight for soil features.

Earthworks Haulage

During earthworks construction, heavily loaded large earthmoving vehicles will travel through the site, causing ground vibrations, unwanted compaction and disturbance of natural ground of unfinished road surfaces.

See also Chapter 2, Construction Processes, Chapter 10, Air Quality and Climate and Chapter 9, Noise and Vibration. The impact is classified as having a negative quality, slight significance and temporary duration for Soil and Geological features.

6.6.2 Direct Impacts Construction - Hydrogeology

There are several elements associated with the development which have the potential to impact the hydrogeological environment. These can be subdivided into those activities which may impact groundwater quality and those which may impact groundwater flow paths and levels.

Groundwater Quality

No planned construction activities have the potential to impact on groundwater quality. The unplanned activities which may impact the groundwater quality on site during the construction phase are:

- Accidental spillages of polluting materials on site (The amount of fuel on site during the construction will be limited to fuel storage for plant,
- Release of fines into the groundwater, and
- The potential for contaminated runoff to enter the groundwater.

If any of these unplanned activities were to occur during construction, there is potential contamination of groundwater quality underlying the site.

The potential impacts on Land and Soil features as highlighted in Table 6.4 are:

Locally Important Aquifer: The magnitude of this potential impact on the Locally Important Aquifer could potentially be Moderate Adverse resulting in a significance rating of Moderate.

Economic Geology: The magnitude of this potential impact on the economic geology could potentially be Small Adverse resulting in a significance rating of Slight for Economic Geology.

Soils: During the construction phase, localised accidental spillages of fuel or chemicals on the site have the potential to contaminate the underlying soils by exposure, dewatering or construction related spillages resulting in a Permanent Negative Impact on Soils. In the case of soils, the magnitude of this impact is small adverse as it may result in the requirement to excavate/remediate a small proportion of contamination or result in a low risk of pollution to soils. As a result, its significance is Slight for soil features.

6.6.3 Direct Impacts Operation - Land & Soils

None anticipated.

6.6.4 Direct Impacts Operation - Hydrogeology

The development will create additional impermeable areas. There are no direct discharges to the ground during the operation of the development.

Reduction in Recharge Area

The proposed development will result in a reduction of recharge area due the introduction of impermeable surfaces (roofs, roads and carparks). However, this reduction is considered to be insignificant in comparison to the total recharge area of the aquifer.

6.7 Mitigation Measures for the Proposed Scheme

6.7.1 Construction Phase

A project specific Construction Management Plan (PCMP) will be prepared and submitted to the planning authority prior to the commencement of development and will be maintained by the contractor during the construction phase. An outline CMP is included in Section 2.4 of the EIAR. The PCMP will include a range of site specific measures which will include the following mitigation measures:

- Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development. Keeping the surface area of exposed soils in the construction areas to a minimum is the most effective way of preventing the release of dust in dry weather and suspended sediments in wet conditions. Potential impacts are therefore avoided.
- At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas. Limiting activities to work areas and not allowing machinery or construction activity in proposed future green, open space and/or undeveloped areas will ensure that there is no dust or sediment runoff generated and no soil compaction will occur in those areas.
- Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter watercourses.
- Topsoil will be re-used where possible in gardens and park areas.
- Disturbed subsoil layers will be stabilised as soon as practicable. Therefore, backfilling of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping), will all be carried out promptly to minimise the duration that subsoil layers are exposed to the effects of weather.
- Similar to comments regarding stripped topsoil, stockpiles of excavated subsoil material will be protected for the duration of the works.

Stockpiles of subsoil material will be located separately from topsoil stockpiles.

- Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site. This will help reduce the surface area of disturbed ground which will limit the potential for soil compaction, sediment runoff or dust generation.
- Refueling and servicing of construction machinery will take place in a designated hardstanding area, remote from surface water inlets (when it is not possible to carry out such activities off-site).
- In order to prevent the accidental release of hazardous materials (fuels, paints, cleaning agents, etc.) during construction site activity, all hazardous materials will be stored within secondary containment designed to retain at least 110% of the storage contents. Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase of the project. Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the project.
- Designated stockpile areas for the temporary storage of topsoil, subsoils and rock material required for site use will be established in areas where the ground flattest and well away (>20m) from surface water features and steep slopes.
- Phase 1 temporary storage of material acceptable for re-use surplus to on site requirements will be stockpiled until the completion of the Moneygurney Bridge is operational. The stockpile will be limited to a maximum height of 2.5m above existing ground levels. Stockpiles to be retained for a period greater than six months will be sown with a grass (a non-perennial ryegrass mix or sterile ryegrass) which will reduce the potential for weed germination. Topsoil stockpiles will be clearly signposted for easy identification and to avoid any inadvertent losses. Stockpiles will have sediment control measures installed (as detailed in Section 2 – Construction Management Plan).
- A contaminated soils management plan will be in place in case unexpected materials are encountered during the excavation of subsoils (in particular existing areas of made ground TP011, BH7 and BH 8 (south of the Templegrove Apartments) and TP 14 and BH10 (east of the Irish Water Pump Station). This will include the detailed site assessment, soil segregation, storage, testing and if necessary, removal from site, of any suspect or contaminated material.

6.7.2 Operational Phase

During the operational phase, there is a low risk of spillages of chemicals and fuels/lubricants (from an accident during maintenance of petrol interceptor for example). Given the small scale of potential pollutants that would arise during routine operational maintenance this impact is neutral, of imperceptible significance and of permanent duration.

6.8 Impact Determination for the Proposed Scheme

6.8.1 Do Nothing Scenario

If the proposed development did not proceed there would be no impact on the existing land, soils or geology of the site. The land is not suitable for intensive farming or tillage due to the topography of the site and it is envisaged that the land use would remain unchanged and remain used for unauthorised, informal use of the land for walking / dog walking with continued low-level anti-social behaviour in pockets of the site (litter and small bonfire markings).

6.8.2 Worst Case Scenario

The 'Worst Case' scenario in terms of land and soils would relate to the accidental loss of fuel from active machinery in the development or the spillage of fuel during the re-fuelling of construction machinery. This would impact on the soil quality which, if left undetected, could contaminate subsoil and/or groundwater which would impact on the water quality of the aquifer under the site and may result in groundwater flow discharging at surface waters being contaminated. Given the nature of the proposed development and the absence of a requirement to store large volumes of fuel on site it is envisaged that the spillage work be moderate temporary to short term.

The other potential worst - case environmental scenario would involve the collapse of soil from a stockpile or exposed excavation face during retaining wall or basement construction which could pose a human health risk or if weather conditions were bad, result in the runoff of sediment to the small local watercourse and away from the site to the local estuary. It is considered that this scenario would be very unlikely once stockpile heights and location are managed as per detailed in Section 2 (Construction Management Plan) and any steep excavations are properly supported again the duration of any impact would be brief to temporary.

6.8.3 Residual Impact of the Proposed Development

An overall analysis of the impacts in light of the proposed mitigation measures concludes that all of the potential impacts (both construction and operational impacts) are predicted to be reduced to neutral quality, imperceptible significance.

6.8.4 Cumulative Impact of the Proposed Development

The cumulative residual construction and operational impacts of the proposed development and the following projects and plans have been assessed:

- M28 Bloomfield to Ringaskiddy - Planning Ref: Ha 0053
- Construction of 200 no. residential units at Maryborough Ridge, Moneygurney, Douglas, Co. Cork. - Planning Ref: 16/07271

- 24 class-room Primary School - Planning Ref: 18/5369
- Greenway improvements - Planning Ref Part 8 Pending
- Lidl Discount shop and 5 apartments. - Planning Ref: 18/5814
- 48 residential units at Clarendon Brook. - Planning Ref: 18/6245
- 600 pupil secondary school. - Planning Ref: 18/6246

Cumulatively these other proposals do not effect the land/soil and bedrock criteria ratings used for the Castletreasure Development and will not influence the construction works given their scale and distance from the project.

Therefore, the significance of the impact of the proposed Castletreasure development both construction and operational activities is imperceptible and is considered not to change in combination with the other projects.

6.9 References

Environmental Protection Agency. "Advice Notes for Preparing Environmental Impacts Statements", (EPA 2015).

Environmental Protection Agency. "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports" (EPA 2017).

Geological Survey of Ireland (GSI) On-line Geological Datasets, (www.gsi.ie/mapping.htm),

CIRIA Environmental Good Practice on Site 3rd Edition, (C692), (CIRIA Publications, 2010).

The Institute of Geologists of Ireland, Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI, 2013);

Environmental Protection Agency Envision Environmental Maps - Subsoil Data (online).

Geological Survey Ireland, Geology of South Cork - Bedrock Map Series, scale 1:100,000, Sheet 25 (GSI, 1995).

Geological Map of Cork District, scale 1:40,000, (Ivor MacCarthy/UCC 1988).

Geological Survey of Ireland National Bedrock/Aquifer/Vulnerability Maps - (online).

National Roads Authority, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, (NRA 2008).

Ordnance Survey of Ireland Discovery Series Map No 86 - 1:50,000 Scale.

Ordnance Survey of Ireland On-Line Geohive Web Based Mapping, (online).



Chapter 7

Water

7

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

CHAPTER 07 WATER

7.1 Introduction

This Chapter has been prepared by John Fallon, Senior Environmental Engineer with J.B Barry & Partners Consulting Engineers who has over 17 years' experience in the environmental sector. John has an honours Degree in Geology from University College Cork (1998) and a MSc in Civil / Environmental Engineering from Trinity College Dublin (2005). John's experience includes the coordination and preparation of the environmental impact statements for both water and road infrastructure schemes. This Chapter addresses natural water bodies including surface freshwater (streams, bogs, ponds, rivers and lakes) and where applicable estuarine waters and marine waters which may be affected by the proposed development. Groundwater is assessed separately in Chapter 6: Land & Soils.

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description). A site-specific Flood Risk Assessment (FRA) has been completed by JB Barry & Partners and is included as a standalone report accompanying this planning application.. The FRA report has contributed to the contents of the EIAR and the assessment.

7.2 Methodology

The assessment of the potential impact of the proposed development on surface water bodies was carried out according to methodology specified by the following:

- EIA Directive 2014/52/EU;
- 'Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)' (EPA, 2017);

- 'Guidelines on the information to be contained in EIS' (EPA 2002); and
- 'Advice Notes on Current Practice in the preparation of EIS' (EPA 2003);

The scope of the work for the assessment involved undertaking site surveys and investigations, a Desk Study and a Site Walkover.

During the Desk Study, information on the surrounding surface water environment was derived from the following sources:

- Environmental Protection Agency (EPA) interactive mapping and water quality data;
- Ordnance Survey Ireland (OSI) mapping;
- Geological Survey of Ireland (GSI) online mapping service;
- Office of Public Works (OPW) National Flood Hazard Mapping & CFRAM Studies (Catchment Flood Risk and Management Studies);
- Irish Water records;
- Cork County Council records;
- Topographical survey;
- Site Investigations data;
- Site walkover;

Meetings were also undertaken with Cork County Council Planners and Drainage personnel and Irish Water as pre-planning consultations and all comments arising have been incorporated into the proposed design.

7.3 Existing Receiving Environment

7.3.1 Regional Hydrology & Water Quality

The study area is located within Hydrometric Area 19 which is the EPA Classification for the catchments flowing into the River Lee, Cork Harbour and Youghal Bay. This hydrometric area falls within the South Western River Basin District (SWRBD) which also includes Castletreasure and the Douglas area. The south western river basin district covers a land area of nearly 11,000km² and a further 4,000km² of marine waters including the marine waters of Cork Harbour.

Hydrometric Area 19 is 1,732km² in area with ground elevations ranging from sea level to above 500mOD. Agricultural land forms the majority of the hydrometric area land use with the main centres of population being Cork City and its suburbs, Carrigaline, Middleton, Blarney and Macroom.

Information on the status, objectives and measures in the SWRBD has been compiled for smaller, more manageable geographical areas termed water management unit action plans. The study area is located within the Lower Lee - Owenboy Water Management Unit (WMU).

The key measures to be implemented in the Lower Lee-Owenboy WMU are contained in Table 5-1 "Summary programme of measures for the South Western RBD" of the Southern River Basin Management Plan and are outlined below:

- Control of urban waste water discharges;
- Treatment Plants requiring further investigation;
- Pollution Reduction Programmes;

- Treatment plants requiring attention to meet Shellfish water PRPs (Pollution Reduction Programmes);
- Treatment plants requiring improvements in operational performance;
- Urban agglomerations requiring investigation of CSOs;
- Agglomerations that require management of development;
- Properties that will be subject to performance, operational and maintenance standards for onsite waste water treatment systems;
- Sub-basin plans for Natura 2000 sites designated for the protection of Freshwater;
- pearl mussel populations;
- Pollution Reduction Plans for designated shellfish waters;
- IPPC (Integrated Pollution Prevention and Control) licences with discharges to waters that require review;
- Licences for discharges to waters under the Water Pollution Acts that require review; and
- Number of river waterbodies assessed to be at risk from diffuse sources including agriculture.

With regard to future Pressures and Developments the Lower Lee - Owenboy WMU states that:

“Throughout the river basin management cycle future pressures and developments will need to be managed to ensure compliance with the objectives of the Water Framework Directive and the Programme of Measures will need to be developed to ensure issues associated with these new pressures are addressed”.

7.3.2 Local Hydrology & Water Quality

The Moneygurney stream rises approximately 1.5km south east of the proposed development in Moneygurney. The stream flows in a northerly direction generally parallel with the existing N28 where the catchment is generally arable land. It then flows in a north westerly direction away from the existing Carr's Hill Interchange and through a river valley located within the east / north east sector of the proposed site before flowing through urbanised areas of Templegrove and Berkley.

An unnamed stream (referenced as the Douglas Stream elsewhere in the EIAR and in Figure 7.1) forms the western boundary of the proposed site and rises approximately 350m south of the proposed site. This stream flows in a northerly direction and joins the Moneygurney stream at the north western corner of the proposed development.

Approximately 400m downstream the Moneygurney Stream joins the Grange Stream to form the Ballybrack Stream which then flows in a northerly direction through Ballybrack Woods, Ravensdale and Douglas Community Park. It is then culverted under Douglas Shopping Centre and joins the tidally influenced

Tramore River to the north of Douglas. The Ballybrack Stream is formed by the confluence of the Grange and Moneygurney Streams. It has a relatively natural flow pattern with areas of gravel suitable for salmonid spawning and a well-developed riparian zone and supports a population of brown trout as detailed in Chapter 8 – Biodiversity.

The catchment of the Moneygurney stream is included in the Tramore River (Costal) (IE_SW_19_1964) *Water Matters Report*, available at www.wfdireland.ie. As per the Tramore River downstream, the upstream watercourses in the immediate vicinity of the proposed site are classified as a “moderate” overall ecological status with watercourses classified as “at risk of not achieving good status”.

There are no EPA water quality monitoring stations located on the Moneygurney or Ballybrack Streams and therefore no biological ratings (Q Values) are available for the watercourses immediately adjacent to the proposed scheme.

7.3.3 Flood Risk

The national flooding website www.floodmaps.ie does not have any record of historic flooding at the site.

The proposed development is located within the South Western River Basin District (RBD) of Ireland. The OPW is working in partnership with their consultants, Local Authorities and other stakeholders to deliver the Catchment Flood Risk Assessment and Management (CFRAM) study for the RBD. In the meantime, the OPW had published the Preliminary Flood Risk Assessment (PFRA) maps, in the form of 420 maps covering the country. According to the explanatory leaflet published for public consultation on PFRA stage, the PFRA is only a preliminary assessment, based on available or readily derivable information. It also states that areas where an on-site inspection is required to investigate the issues more closely, then those inspections will be carried out as part of the CFRAM Studies.

The PFRA map (extract) is shown in Figure 7.2 indicating the fluvial, pluvial and coastal flood extents for the proposed development site location. Observation of the PFRA flood map extract indicates that the eastern portion of the site along the route of the Moneygurney Stream is located within the fluvial - indicative 1% Annual Exceedance Probability (100-yr) event and fluvial extreme events. Consequently, the proposed development site is partially situated within Flood Zone A where the probability of fluvial flooding is greatest, as stipulated by the FRM Guidelines. The PFRA map indicates that no groundwater flood risk or pluvial flood risk exists near the proposed development site.

The Ballybrack Stream is currently subject to flood alleviation works under the Douglas Flood Relief Scheme. Therefore, the importance of not increasing the flow in the Ballybrack Stream due to increased surface runoff is noted and measures to assure this are presented within this Chapter of the EIAR.

7.4 Characteristics of the Proposed Development

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

Consideration of the characteristics of the proposed development allows for a projection of the ‘level of impact’ on any particular aspect of the proposed environment that could arise. For this chapter the potential impact on Water is assessed and therefore characteristics of the proposed development that may impact on water bodies are outlined in Sections 7.4.1 to 7.4.4.

7.4.1 Surface Water

The extent, density and character of the proposed developments within the application site including the density, location of open spaces etc. will affect run-off rates, water quality in adjacent watercourses, groundwater recharge ability and impact existing smaller surface water channels. To facilitate development, it will be necessary to service the proposed development with physical infrastructure which will have the characteristics described below.

Within that area of the development west of the Moneygurney Stream, surface water runoff from roads/footpaths/houses and other impermeable areas will be collected by a network of surface water sewers and will discharge to proposed stormwater attenuation areas in the north-east and north-west corners of the site. Attenuated runoff from these areas will be directed for discharge to the Moneygurney Stream (on the east) and the Douglas Stream (on the west).

Within that area of the development east of the Moneygurney Stream, surface water runoff from impermeable paved and roof areas will be collected by a network of surface water sewers and will discharge to a proposed stormwater attenuation area within that location. Attenuated runoff from this area will be directed for discharge to the Moneygurney Stream.

The management of surface water for the proposed development will be designed to comply with the policies and guidelines outlined in the following:

- Greater Dublin Regional Code of Practice for Drainage Works;
- Greater Dublin Strategic Drainage Study (GDSDS);
- ‘The SuDS Manual (CIRIA C753, 2015);
- IS EN752, “Drain and Sewer Systems Outside Buildings”; and
- The requirements of Cork County Council.

The surface water strategy for the development will incorporate SuDS (Sustainable Drainage Systems) features to reduce run-off and provide biodiversity benefits. Parking surfaces will comprise permeable paving overlying a porous aggregate reservoir, which has been sized to ensure the runoff from these parking areas drains via the porous aggregate and not directly over the surface to the sealed surface water sewer pipework, thereby providing an additional element of source attenuation.



Figure 7.1: Features of the Area (Source: www.epa.ie, annotation by J.B. Barry & Partners)

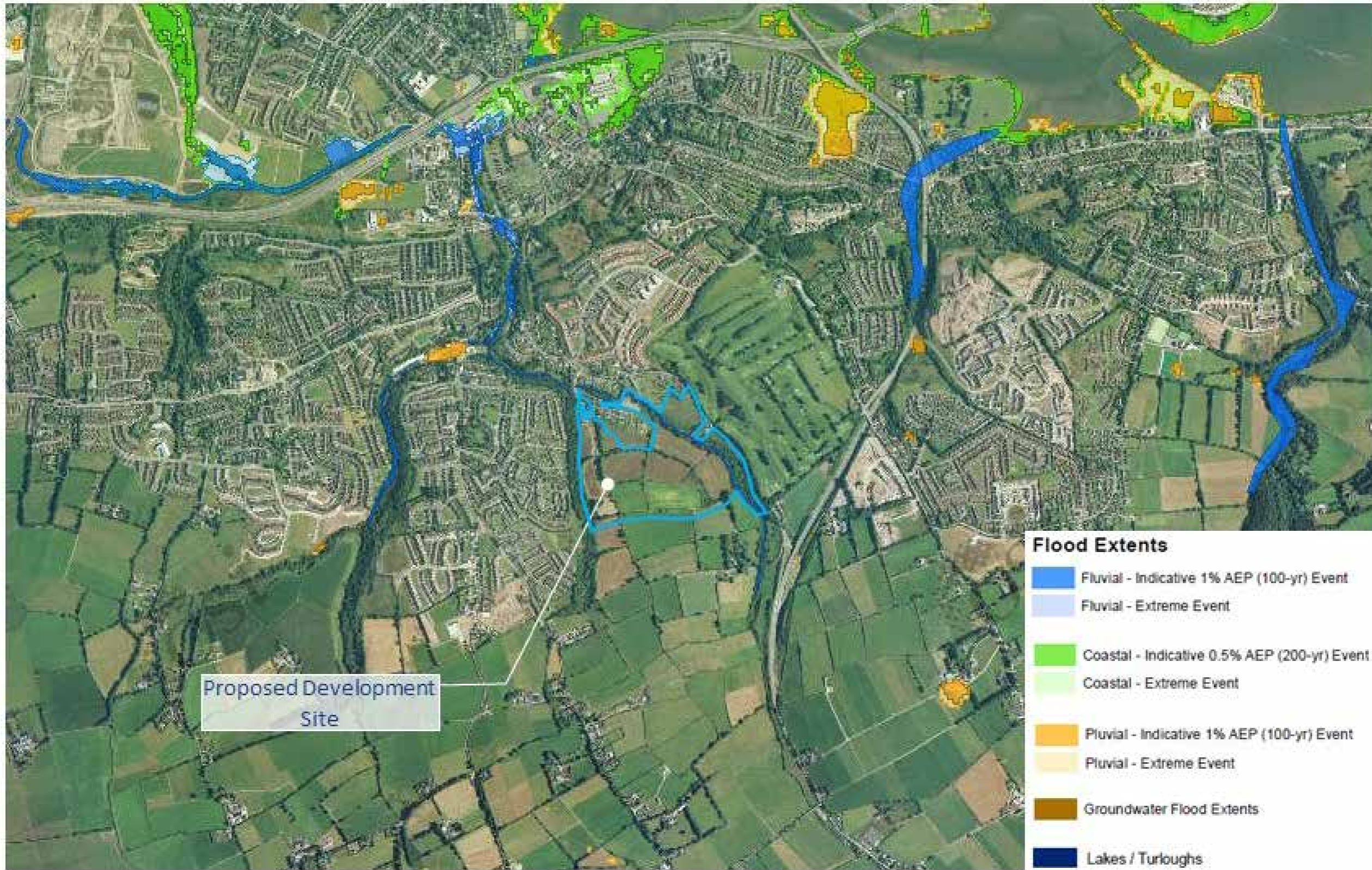


Figure 7.2: Extract of the PFRA map in the vicinity of proposed development site (Source: www.myplan.ie, annotation by J.B Barry & Partners)

Other SuDS measures such as filter drains behind retaining structures will be incorporated into the surface water drainage system.

Notwithstanding the above SuDS source measures, the development will include the construction of a gravity surface water drainage network throughout the site. The surface water drainage network will include installation of dedicated attenuation facilities upstream of proposed outfalls to the Moneygurney and Douglas Streams, to attenuate discharges to the undeveloped 'greenfield' runoff rates with the operation of proprietary hydrobrake flow-control devices.

These attenuation facilities are sized on the basis of a design storm with a 100-year return period and an additional 20% allowance for the effect of climate change. The attenuation facilities will be in the form of linear chambers similar to that supplied by StormTech or Triton. While not factored into the design volume assessment, these systems will permit an element of infiltration where underlying ground conditions are suitable.

The attenuation areas will be fitted with hydrobrake flow control devices to ensure that excess surface runoff from the developed site will be attenuated and discharged at the greenfield discharge rate.

A hydrocarbon interceptor will be installed upstream of each of the attenuation areas to remove any traces of oils which may be washed off road surfaces. Also, grit sumps will be incorporated into the manholes immediately upstream of the attenuation areas to ensure that the bulk of the grit suspended in runoff is settled out before entering the attenuation areas.

The sizing of the pipework collection system has been prepared using Micro-Drainage WINDES software.

Attenuation storage will be provided by the use of Stormtech attenuation units or similar approved proprietary product.

The surface water outfall structures will comprise stone-filled gabion block headwalls and wingwalls and a stone-filled apron, with headwalls set-back from the existing stream banks as detailed on accompanying drawing Ref:18203-JBB-IC-XX-DR-C-0173 and constructed to prevent scouring and erosion.

7.4.2 Potable Water Supply

Irish Water have a number of watermains running through the site. A 1200mm diameter trunk main runs along the eastern side of the site over which there is a 30m wayleave which prevents development along this corridor. It is not proposed to connect to or interfere with this strategically-important trunk main.

There is a 300mm diameter watermain running east to west through the middle section of the site over which there is a 10m wide wayleave. It will be necessary to re-locate this main to suit the proposed arrangement of roads and houses on the site. The route for this re-aligned main will generally be along new road corridors with connection to the existing main at the eastern and western boundaries of the site. The proposed route for this diverted 300mm

diameter main is shown in Figure 5B.3 (Material Assets Chapter) and on the accompanying planning application drawing 18203-JBB-1A-XX-DR-C-0510. Discussions with Irish Water will result in a finalised new route for this watermain.

The existing Vicarage development is served by a 150 mm diameter watermain which is connected to the 300mm main referred to above. This 150mm diameter main will be re-connected to the re-routed 300mm diameter watermain.

Within that area of the development west of the Moneygurney Stream, the development will be served by a network of 200mm, 150mm, 100mm and 80mm diameter watermains laid out as shown on the accompanying planning application drawings and connected to the re-routed 300mm diameter main.

Within that area of the development east of the Moneygurney Stream, the development will be served by a network of 150mm, 100mm and 80mm diameter watermains laid out as shown on the accompanying planning application drawings and connected to the existing 400mm diameter main in the adjacent R609, Carrigaline Road.

Fire hydrants will be provided such that each house will be within 45m of a hydrant and these hydrants will be provided so as to be fully accessible to the fire service.

Sluice valves will be installed on all principal watermain connections to ensure that sections of the development can be isolated for maintenance and repair as required.

A water-meter will be installed on the main connections, subject to detailed agreement with Irish Water/Cork County Council.

A Pre-Connection Enquiry application was submitted to Irish Water, the response to which confirmed that the proposed development can be serviced by the existing water supply network in the area.

7.4.3 Waste Water Proposals

Within that area of the development west of the Moneygurney Stream, 225mm and 150mm diameter sewers will collect discharges from houses and apartments and flow by gravity to the north-western corner of the site. It is proposed to connect the foul drainage system to the existing foul sewer network at two locations - in the adjacent Vicarage and Templegrove developments.

7.4.4 Bridge & Greenway Proposals

A bridge is required over the Moneygurney Stream to provide the main operational access and egress point for the proposed Castletreasure development. The proposed bridge will be as detailed in Chapter 2 (Project Description). The bridge is also required to span and provide 15m clearance either side of the existing 1200mm diameter Irish Water trunk main as detailed above in Section 7.5.3. The bridge will also span a greenway as detailed in

Chapter 2 (Project Description) and as detailed in accompanying planning application drawing 18203-JBB-1A-XX-DR-S-093. The Moneygurney Stream will be between 12m and 16m from the northern bridge foundation and the central concrete pier respectively, as detailed in Figure 3.8 (Alternatives Chapter) and accompanying planning application drawing 18203-JBB-1A-XX-DR-S-093.

A second bridge is required to provide pedestrian access over the Moneygurney Stream approximately 260m upstream of the main access bridge. This will be a relatively small structure formed of precast concrete beams spanning onto two abutments either side of the stream. (See Drawing Ref: 18203-JBB-1C-XX-DR-C-0139). Bridge Construction sequencing is detailed in Section 2.3.4. of Chapter 2 - Project Description.

7.5 Potential Impacts

The following provides an assessment of the potential impact of the proposed development on the existing water environment with and without mitigation measures being incorporated. The mitigation measures and resulting predicted impact of the proposed development are then set out in Section 7.5 and 7.6.

7.5.1 Hydrology & Water Quality - Construction Phase

Construction of the proposed development will require the removal of a large portion of the existing topsoil across the site and extensive earthworks to facilitate the construction of the dwellings, infrastructure service provision, road construction, surface water storage systems etc. Given the extent of disturbance, there is potential for weathering and erosion of the surface soils from precipitation and run-off.

Surface water runoff from the construction phase may also contain increased silt levels or result in pollution from the construction processes. The discharge of these contaminants, such as concrete and cement, which are alkaline and corrosive, to the Moneygurney and Douglas Streams has the potential to cause pollution. Accidental oil or fuel spillages or leaks from construction activities also have the potential to find their way into the adjacent water courses. Increased silt and contaminant levels lead to the risk of reducing water quality in the adjoining water courses.

Given the nature of the proposed scheme there is a requirement (as detailed in Section 7.4.4) to cross the Moneygurney Stream at two separate locations. Although construction works within watercourse channels are not required (which reduces the risk of contamination) the risk remains due to works required within the surface water catchment of the stream. The main contaminants arising from surface water runoff during construction activities include:

- Suspended solids: arising from ground disturbance and excavation;
- Hydrocarbons: accidental spillage from construction plant and storage depots;

- Faecal coliforms: contamination from coliforms can arise if there is inadequate containment and treatment of on-site toilet and washing facilities;
- Concrete / cementitious products: arising from construction materials.

These pollutants pose a significant temporary risk to surface water quality for the duration of construction if not properly contained and managed. Suspended solids, which can include significant quantities of silt, influence water turbidity and are considered to be the most significant risk to surface water quality from construction activities. Suspended solids can also reduce light penetration, visually impact the receiving water and damage the ecosystem. These suspended solids are likely to occur in:

- Water removed from surface excavations as a result of rainfall or groundwater seepage;
- Water in contact with exposed excavations within the watercourse channel;
- Vehicle wheel wash water;
- Runoff from exposed works areas and excavated material storage areas; and
- Cement wash-down areas: The potential for cement to increase the pH of water above a natural range, that is typically pH 6 to 9, can pose a threat to aquatic species living in a watercourse.

The potential impact from the construction phase on surface water is likely to be short term and significant without mitigation measures in place.

7.5.2 Flooding - Construction Phase

The proposed scheme will not require any in-channel works or diversions during the construction phase. There will be limited interaction during the construction stage mainly comprising temporary access over the Moneygurney Stream. The construction of the scheme may generate debris, including silt, which if handled incorrectly could result in blockage of the existing surface water channels downstream reducing the capacity of these channels and increasing the risk of flooding.

The potential impact from the construction phase on flooding is likely to be short term and significant without mitigation measures in place.

7.5.3 Hydrology & Water Quality - Operational Phase

Potential Operational phase impacts on Water are detailed below:

- Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads and in driveway areas). The likely impact may be characterised as imperceptible, temporary and adverse.
- Contamination risks arising from development use / leaking pipes / contaminated surface water runoff. The likely adverse impact arising from this activity may be characterised as imperceptible and temporary.

Increased impermeable surface area will reduce local groundwater recharge. It is likely that this activity would have a slight permanent, adverse, impact on groundwater recharge.

7.5.4 Flooding - Operational Phase

Surface water run-off discharge rates from the development sites may be increased due to the increase in the area of impermeable surfaces, shorter flow paths through pipes and reduced roughness co-efficient, however the implementation of SuDS features will maintain runoff rates at, or below, existing greenfield runoff rates.

Greater run-off volumes generated by the impermeable surfaces will require stormwater storage within the site to provide protection against pluvial flooding events. Surface water attenuation storage has been incorporated into the design to safeguard against storms and associated flooding throughout the lifetime of the development. Refer to the 'Flood Risk Assessment', (FRA) prepared by J.B Barry & Partners accompanying this planning application.

To prevent any increased flooding at the downstream reach of the Ballybrack Stream from the proposed development, it is proposed to implement SuDS in order to limit the discharge from the site to the current greenfield discharge rates. The implementation of these SuDS measures will mitigate the risk of flooding outside of the development site. Therefore, any potential impacts arising from this activity may be characterised as imperceptible and neutral.

7.6 Mitigation Measures - Construction & Operation

7.6.1 Construction Phase

To minimise the impact of the construction phase on the water environment, mitigation measures will be implemented as part of a site-specific Construction Management Plan.

As detailed in Section 2.6 of Chapter 2 Project Description a 20 m wide stream/river buffer (which will extend beyond the majority river woodlands) is proposed for surface water protection during construction. Most of the proposed development areas are significantly away from these zones on the site that have been determined to be hydrologically sensitive.

Where development occurs within 20m of a watercourse (i.e bridge works) or where there is insufficient space to achieve the desired 20m buffer (i.e extreme western portion of the site adjacent to Douglas Stream), additional mitigation measures will be put in place to ensure maximum protection of

the stream or river as outlined in Section 2.6 of Chapter 2 Project Description.

General Site: Works will be required to:

- Implement best practice construction methods and practices complying with relevant legislation to avoid or reduce the risk of contamination of watercourses or groundwater.
- A site-specific Construction Management Plan will be developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Construction and Environment Management Plan.
- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and treat sediment-laden runoff prior to discharge of surface water at a controlled rate.
- Weather conditions and seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations, with an objective of minimizing soil erosion.
- The extent of sub-soil and topsoil stripping to be minimised to reduce the rate and volume of the run-off during construction until the topsoil and vegetation are replaced.
- Precast concrete units fabricated off site will be specified for bridging structures with cast in-situ requirements minimised.
- Concrete batching will generally take place off site, or if carried out on site, in a designated area with an impermeable surface and appropriate drainage/interception/collection measures in place.
- Concrete wash down and wash out of concrete trucks will take place off site or in a designated area with an impermeable surface and appropriate drainage/interception/collection measures in place.
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds.
- Oil and fuel stored on site for construction will be stored in designated areas. These areas shall be bunded and should be located away from surface water drainage and features.
- Refuelling of construction machinery shall be undertaken in designated areas away from surface water drainage in order to minimise potential contamination of the water environment. Spill kits shall be kept in these areas in the event of spillages.
- Hazardous construction materials shall be stored appropriately to prevent contamination of watercourses or groundwater.
- Spill kits should be kept in designated areas for re-fuelling of construction machinery.
- Dewatering measures should only be employed where necessary and if such works are necessary an agreed Method Statement will be prepared to ensure full control of these works.

Bridge & Greenway Works:

To minimise the impact of the construction phase on the water environment, mitigation measures will be implemented as part of a site-specific Construction and Environmental Management Plan.

The proposed bridge designs and construction method have been prepared in accordance with Inland Fisheries Ireland's (IFI) "Guidelines on Protection of Fisheries During Construction Works In and Adjacent to Waters".

Bridge design avoids works within the watercourse and riverbanks. The Inland Fisheries Ireland's guidelines to achieve best practice will be observed during the construction phase and the following mitigation measures will be implemented.

- Best site management practice for the control of silt and solids discharge into the watercourse.
- Excavation must be properly monitored; all topsoil is to be stored at a safe distance from the excavation.
- Site clearance. All areas of vegetation removal will have appropriate surveys for wildlife/ecological purposes as outlined in the EIAR in accordance with and on approval of the IFI and NPWS (National Parks and Wildlife Services). Any mitigation or control measures within the survey will be detailed in the contractor's detailed construction management plan prior to construction.
- Earthworks to allow construction of abutments will be carried out to reduce existing ground levels to formation/foundation levels. Soil heap locations to be detailed in the contractor's detailed construction management plan.
- Piling Setup for installation of piled foundations (to be confirmed at detailed design stage). Temporary access routes for piling rig to be agreed prior to construction and be detailed in the contractor's detailed construction management plan. Construction of hard standing and management of spoil arisings and runoff to be included as detailed in Section 2.4, Outline Construction Management Plan.
- Crane Setup for installation of main spans. Temporary access routes for craneage to be agreed prior to construction and be detailed in the contractor's detailed construction management plan. Construction of hard standing including foundations for crane outriggers need to be included.
- Prefabricated beams transportation. Delivery of precast elements to site. Storage area of precast elements to be defined in contractor's construction management plan within reach of crane to minimise further disruption/construction traffic at river edge.
- Placement of prefabricated bridge beams. Crane position to be designed to minimise movements near stream edge.
- Bridge design and installation/construction including any associated temporary stream crossings to be agreed with IFI.

7.6.2 Operational Phase

Operational phase mitigation measures are detailed below:

- The design of proposed site drainage has been carried out to replicate, in as far as practicable, existing surface contours, break lines etc. and therefore replicating existing overland flow paths, and not concentrating additional surface water flow in a particular location.
- Surface water runoff from the site will be attenuated to the greenfield runoff rate as recommended in the Greater Dublin Strategic Drainage Study (GSDSDS). Surface water discharge rates will be controlled by Hydrobrake flow control devices, with underground attenuation tanks, provided to store runoff from a 1 in 100 year return period event. SuDS features such as the use of permeable paving are implemented in the surface water drainage network to reduce the rate of runoff from hard standing area and to improve the quality of surface water runoff.
- Surface water runoff from the development will be collected by an appropriately designed system with contaminants removed prior to discharge i.e. petrol interceptor.
- A regular maintenance and inspection programme of the flow control devices, attenuation storage facilities, gullies and petrol interceptor will be required during the Operational Phase to ensure the proper working of the development's networks and discharges.
- A regular maintenance and inspection programme for the bridge structures (main and pedestrian bridges) will be required during the Operational Phase to ensure the proper working of the development's infrastructure.

7.7 Impact Determination for the Proposed Scheme**7.7.1 'Do Nothing' Scenario**

If the proposed development did not proceed there would be no impact on the existing water environment of the site. The land is not suitable for intensive farming or tillage due to the topography of the site and it is envisaged that the land use (and associated surface-water runoff) would remain unchanged.

Some illegal dumping of waste material or other unauthorised use of the site, which could have a detrimental impact on the existing water environment, could occur if the site is not developed.

7.7.2 Worst Case Scenario

The 'Worst Case' scenario in terms of water would relate to the accidental loss of fuel from active machinery in the development or the spillage of fuel during the refuelling of construction machinery. This would impact on the soil quality which, if left undetected, could contaminate subsoil and/or groundwater which would impact on the water quality of the aquifer under the site and may result in groundwater flow discharging at surface waters being contaminated. In either case, given the nature of the proposed development and the absence of a requirement to store large volumes of fuel on site it is envisaged that the spillage work be moderate temporary to short term.

The other potential worst - case environmental scenario would occur if the works undertaken in the vicinity of the Moneygurney and Douglas Streams were not correctly planned or undertaken resulting in the release of significant quantities of suspended solids or other construction contaminants to the watercourses. Without the proposed mitigation (as outlined in Section 7.5) is likely to be short term and significant without mitigation measures in place with a temporary to short term duration.

7.7.3 Residual Impact of the Proposed Development

An overall analysis of the impacts considering the proposed mitigation measures concludes that all of the potential impacts (both construction and operational impacts) are predicted to be reduced to a neutral quality, imperceptible significance.

7.7.4 Cumulative Impact of the Proposed Development

The cumulative residual construction and operational impacts of the proposed development and the following projects and plans have been assessed:

- M28 Bloomfield to Ringaskiddy - Planning Ref: Ha 0053
- Construction of 200 no. residential units at Maryborough Ridge, Moneygurney, Douglas, Co. Cork. - Planning Ref: 16/07271
- 24 class-room Primary School - Planning Ref: 18/5369
- Greenway improvements - Planning Ref Part 8 Pending
- Lidl Discount shop and 5 apartments. - Planning Ref: 18/5814
- 48 residential units at Clarendon Brook. - Planning Ref: 18/6245
- 600 pupil secondary school. - Planning Ref: 18/6246

Cumulatively, these other proposals will not affect the hydrological criteria ratings used for the Castletreasure Development if best practice construction guidelines and planning conditions are adhered to.

Therefore, the significance of the impact of the proposed Castletreasure development, considering both construction and operational activities, is imperceptible and is considered not to change in combination with the other projects.

7.8 Monitoring

The site-specific Construction Management Plan will incorporate mitigation measures as outlined in Chapter 2, this will include monitoring of construction related activities during the construction phase.

Proposed monitoring during the operational phase in relation to the water and hydrogeological environment are as follows:

- The taking in charge of the water infrastructure will ensure the system is regularly inspected and maintained.
- The performance of all Suds features will be monitored by the relevant authorities during the life of the development.
- Monitoring of the installed Hydrobrake and gullies will be required to prevent contamination and increased runoff from the site.
- Monitoring of the installed bridge infrastructure will be required to prevent debris build up after storm events.

7.9 References

Environmental Protection Agency. "Advice Notes for Preparing Environmental Impacts Statements", (EPA 2015).

Environmental Protection Agency. "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports" (EPA 2017).

Office of Public Works (OPW) Guidelines for Planning Authorities – The Planning System and Flood Risk Management, (OPW 2009).

National Roads Authority (NRA) Environmental Impact Assessment for National Road Schemes A Practical Guide, (NRA 2008).

National Roads Authority (NRA) Guidelines in Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, (NRA 2008).

Environmental good practice on site - Third Edition, CIRIA (2010) C692.

Environmental Protection Agency Envision Environmental Maps – Water Quality Data (online).

Geological Survey of Ireland National Bedrock/Aquifer/Vulnerability Maps – (online).

Control of water pollution from construction sites guidance for consultants & contractors CIRIA (2001) C532.

Water Framework Directive (2000/60/EC), Irish Database (www.wfdireland.ie)



Chapter 8

Biodiversity

8

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

CHAPTER 08 BIODIVERSITY

8.1 Introduction

The biodiversity study and impact assessment of the proposed new residential development at Castletreasure/Maryborough townlands Douglas was undertaken by Kelleher Ecology Services Ltd. A series of baseline field surveys were completed at the EIAR study site including; habitat & flora, aquatic ecology, bird, mammal, bat and other taxa. The baseline field surveys along with desktop review were then used to inform the biodiversity evaluation of the EIAR study site, assessment of potential impacts arising from the proposed development and consideration of appropriate mitigation measures to reduce potential negative impact(s) to an acceptable level.

8.2 Statement of Competence

8.2.1 Dr Katherine Kelleher

Katherine Kelleher is a graduate of University College Cork with a BSc in Zoology and PhD in Ecology, and established Kelleher Ecology Services in 2011. She has over ten years of experience in ecological consultancy, acting as project manager on a range of ecological assessments & projects including solar/wind farm, road, gas pipeline, landfill, grid connection, industrial development, retail and housing. Katherine has significant experience of research, evaluative and analytical work in relation to planning applications, planning compliance, commitments, licensing, baseline assessments, scoping studies etc. Examples of similar scale projects that Katherine has managed the biodiversity aspect include Shannonpark residential development at Carrigaline, Midleton Distillery Phase 2 storage facility and Tullamore Dew Distillery.

8.2.2 Michelle O'Neill

Michelle has 10 years of experience working as an ecological consultant within the public and private sector on projects that include habitat and botanical surveys, breeding and winter bird surveys, mammal surveys, data analysis, assessment and report writing. To date, she has completed habitat and botanical surveys for a range of projects as part of National Surveys, Ecological Monitoring, Ecological Impacts Assessments (EclA/EIAR) and Appropriate Assessment (AA/NIS). She has a particular interest in botany and habitats and has worked on an Irish semi-natural grassland survey (2009–2012) and a habitat mapping project for the provision of a Teagasc pilot methodology for farmland habitat assessment of sustainability scheme. She has also contributed to ecological impact assessments for a range of developments including, Rossmore Quarry Extraction Works, Carrigtohill, Cork, Janssen Sciences Ireland Expansion Works, Ringaskiddy, Cork and Aughinish Alumina Burrow Pit Extension Works, Askeaton, Limerick.

8.2.3 Ross Macklin

Ross Macklin is a graduate of University College Cork. He has a BSc in Applied Ecology, Higher Diplomas in Integrated Pest Management and Geographical Information Systems. He is completing a PhD in fisheries science at UCC. His expert areas are aquatic ecology and fisheries science. Ross has 14 years of professional experience and worked on many of Ireland's largest infrastructural projects including flood relief schemes, renewables (solar & windfarms), greenways, blueways, residential, biodiversity, pipeline and bridge infrastructural projects. He has also worked on projects in the waste management, petrochemical, pharmaceutical, agricultural and aquaculture industry sectors.

8.2.4 Dr Isobel Abbott

Isobel Abbott is a freelance ecological consultant, specialising for >10 years in bat surveys, monitoring and mitigation. She graduated first in class in 2007 with a BSc in Zoology, and in 2012 with a PhD in Ecology from University College Cork. She has published a number of scientific papers relating to bat ecology and conservation. Isobel has worked on a variety of projects including national bat surveys, wind farms, solar farms, road construction, bridge repairs, quarries, and residential and industrial developments. She has extensive experience of designing and conducting bat surveys, evaluating potential impacts, and designing appropriate mitigation for a range of bat species. Isobel has been granted >35 NPWS bat licenses associated with planning permission applications or research. She currently holds nationwide NPWS licenses to capture/handle bat species, and to disturb bat roosts for the purpose of impact assessment. Examples of similar scale projects that Isobel has been involved with include Ballinglanna residential development at Glanmire and Shannonpark residential development at Carrigaline.

8.2.5 Dr Daphne Roycroft

Daphne has 11 years of experience in the field of Ecological Consultancy and holds a BSc and PhD in Ecology from the National University of Ireland, Cork. She is a self-employed Ecological consultant, trading as Croft Ecology. Daphne is experienced in the preparation of Ecological Impact Assessment Reports and Appropriate Assessment screening appraisals as well as Natura Impact Statements for a variety of projects including wind farms, solar farms, roads, pipelines, residential developments, ports and landfill sites. She has published research papers in several peer-reviewed scientific journals and has lectured on several degree and certificate courses in The National University of Ireland, Cork. Examples of similar scale projects that Daphne has been involved with include Shannonpark residential development at Carrigaline, Lisheen Mushroom Composting Facility, Co. Tipperary and Slaghbooly Wind Farm, Co. Clare.

8.3 Methods

This EIAR study involved undertaking a desktop review and a baseline field assessment, which are described in the relevant sections below. Cognisance was taken of guidelines relating to ecological assessments (e.g. EPA 2017, CIEEM 2018).

Field surveys were undertaken from May 2018 to August 2018 during suitable weather conditions (see Appendix 8.1), taking cognisance of standard ecology survey techniques. Appropriate survey equipment was used where required, e.g. GPS units, binoculars, bat detector, pond net). A desktop review of relevant data available for the study site included online ecology databases (e.g. National Biodiversity Data Centre NBDC, National Parks & Wildlife Service NPWS and Environmental Protection Agency EPA) and relevant publicly available documents such as the M28 Cork to Ringaskiddy Motorway Scheme EIS (RPS 2017), current Ballincollig Carrigaline Municipal District Local Area Plan (CCC 2017), current Cork County Development Plan (CCC 2014). Furthermore, relevant organisations/bodies were consulted (see Chapter 1 of this EIAR).

8.3.1 Designated Nature Conservation Sites

Nature conservation sites designated within 15km of the study site were identified through a desktop review in order to adequately assess potential sensitive receptors in the wider area; cognisance was also taken of any sites with a potential impact receptor pathway outside of the 15km assessment area, none of which are relevant in this case. Such conservation sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Nature Reserves and other Refuges for Fauna. Many designated sites overlap, e.g. a site can be designated as both NHA and SAC.

While NHAs are legally protected by the Irish Wildlife Acts (1976 - 2018), pNHAs are not and only have limited protection through recognition by planning/

licensing/forestry authorities and agri-environmental schemes. Nature Reserves and Refuges for Fauna are also protected under the Irish Wildlife Acts (1976 - 2018). SACs and SPAs are European designated nature conservation sites that have been designated under the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (2009/147/EC) respectively. SACs and SPAs are collectively known as Natura 2000 sites and are legally protected by Irish law. A Natura Impact Statement (NIS) in support of the Appropriate Assessment (AA) process has been undertaken to consider whether significant effects on potentially relevant Natura 2000 sites are likely to arise in relation to the proposed residential development here; this assessment is available as a separate standalone document (see KES 2019) with key findings summarised in this EIAR.

For the analysis of designated sites, particular focus was given to sites where a potential impact-receptor pathway or zone of influence with the study site may be relevant. In other words, designated sites that may have a link to the study site (e.g. through hydrological link, overlapping, proximity) were focused on for this aspect of the biodiversity assessment. Evaluation of the relevant designated conservation sites in terms of their biodiversity value was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2).

8.3.2 Habitats & Flora

A desktop review of botanical data available for the study site was undertaken by consulting online databases to identify botanical species of interest (e.g. rare, protected, invasive) previously recorded within the relevant national grid squares that overlap the study site; in this case a review was undertaken of the W76 (10km) national grid square from the NPWS online database, and of the W7067, W7068 & W7167 (1km) national grid squares from the NBDC online database.

The habitat and flora site assessment was carried out in accordance with current guidelines (Smith *et al.* 2010). This involved a walkover of the study site (see Appendix 8.1), where the dominant habitats present were classified according to Fossitt (2000) and recorded on a field map. The botanical survey was conducted in-parallel with the habitats survey, where botanical species were identified and recorded according to dominant habitat type. Any other records of interest (e.g. invasive plant species) were also noted.

The conservation status of habitats and flora was considered in respect of the following: Irish Red Data Book for Vascular Plants (Wyse Jackson *et al.* 2016); Red List of Bryophytes (Lockhart *et al.* 2012); Flora Protection Order (1999 as amended 2015); the EU Habitats Directive (92/43/EEC). Evaluation of the habitats present in terms of their ecological value was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2).

8.3.3 Aquatic Ecology

Field surveys were carried out in May 2018 during dry, bright weather conditions with good visibility (see Appendix 8.1). Stream levels were also at base flow to attain good representative early summer water quality samples and to obtain a clear view of the riverbed. Evaluation of the watercourses in terms of their ecological value was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2). A search of grey literature on the fisheries status of the receiving watercourses and also the WFD fish database (www.wfdfish.ie) was undertaken. The Environmental protection agency databases on water quality were also reviewed for data on water quality.

8.3.3.1 Biological Water Quality (Q Sampling)

Macro-invertebrate samples were collected by 'kick' sampling for approximately 2.5 minutes in the faster flowing areas (riffles) of the river using a standard hand net (250 mm width, mesh size 500 micron). The kick sample was taken moving across the riffle zone and also involved washing large rocks (if present) in the riffle zone to ensure a full representation of the species composition from this micro-habitat type. The samples were elutriated, sorted and fixed in 70% ethanol in the laboratory. Invertebrate taxa were identified to family and species levels using a Nikon SMZ 1000 stereo microscope and numerous Freshwater Biological Association invertebrate keys. The relative proportions of taxonomic groups were recorded based on the Environmental Protection Agency (EPA) categories (*i.e.* 8 categories ranging from present to excessive; Appendix I of Toner *et al.* 2005).

A total of three samples were taken overall (see Figure 8.1); Site 1 on the Douglas Stream (ITM 570244 567904), Site 2 on the Moneygurney Stream (ITM 570952, 567833) and Site 3 at the Ballybrack Stream¹ (ITM 570166, 568451). This sampling approach included two control sites c. 50m upstream of the study site and one sampling site below the confluence of both streams c. 200m downstream of the study site (see Figure 8.1). This provides upstream and downstream control points to establish baseline biological water quality to allow future comparisons with the recorded baseline.

The EPA group invertebrates into classes whereby pollution intolerant species are denoted class A, and species with greater pollution tolerance fall into successive classes (B through E, respectively). As such the presence or absence of these groups and their relative abundance facilitates an assessment of biological river health. Our results are discussed in this context in order to interpret potential changes in the river community composition.

8.3.3.2 Physicochemical Water Quality

Water samples were collected using sterilised 1 litre sampling bottles at the same three locations as per the biological sampling (see Figure 8.1). The samples were delivered to the Aquatic Services Unit in a cooler box within 3 hours of collection for analysis. The laboratory analysis tested samples for

Ammonia (mg N/l), DIN (mg N/l), MRP (mg P/l), BOD (mg O₂/l) and Suspended Solids (mg solids/l). Unionised ammonia was calculated based on a conversion of ammonia at the temperature and pH of the sample collected.

Other physicochemical properties were measured in-situ using calibrated hand-held meters. Dissolved oxygen was measured with a Lutron Dissolved Oxygen Meter PDO-519, while pH, dissolved solids and conductivity was measured with a Hanna instruments combo meter.

8.3.3.3 Fisheries Habitat

Fisheries (salmonid) habitat was assessed using an amended version of the Life Cycle Unit method (Kennedy 1984, Triturus Environmental 2016 unpub.) to evaluate the riverine sites as nursery, spawning and holding water, by assigning quality scores to each type of habitat (see Appendix 8.3). This procedure was applied in assessing fisheries habitat for the Douglas, Moneygurney and Ballybrack Streams relevant to the proposed residential development, and also downstream beyond the confluence point of the Douglas and Moneygurney Streams.

The stream habitat appraisal and fisheries assessment was also informed by utilising approaches of the River Habitat Survey Methodology (Environment Agency 2003) and Fishery Assessment Methodology (O'Grady 2006) to broadly characterise the stream channel fisheries status. This method includes an appraisal of the character of the channel in terms of its profile, naturalness, spawning substrata, connectivity with the downstream catchment and other accumulated knowledge of fisheries ecology.

8.3.4 Birds

A desktop review of bird data available for the study site was undertaken by consulting online databases to identify avian species of interest (e.g. rare, of ecological concern) previously recorded within the relevant national grid squares that overlap the study site; in this case a review was undertaken of the W7067, W7068 & W7167 (1km) national grid squares from the NBDC online database.

A baseline bird assessment was completed by undertaking a series of line-transect and point-count surveys (see Bibby *et al.* 2000 and Sutherland *et al.* 2004); where transects are appropriate at open type habitats (e.g. grassland) and point-counts are appropriate to closed type habitats (heavy scrub, wood). A total of three transects of approximately 200m length and three point-counts of 5-minutes were located within the study site, ensuring that an adequate distance was maintained between them in order to minimise double-counting individual birds across the site (see Figure 8.2). Two surveys were carried out overall, where the same transect and point-count locations were visited on both occasions (see Appendix 8.1).

¹ Called Moneygurney Stream at <https://gis.epa.ie/EPAMaps/>

At each transect and point-count, all bird species encountered (seen or heard) within 50m of the observer were recorded and their abundance noted. Only adult birds were counted where possible, although this proved difficult for flocking species that moved about quickly and frequently (e.g. corvids). The total number of birds per species was derived by adding abundance data from all transects or point-counts from each survey visit. This allowed a measure of relative abundance to be examined for all bird species recorded during the transect study. The maximum count per visit was then derived for each species and used for subsequent analysis and interpretation of results.

Any species occurring more than 50m from the observer, flying over the site and not using it, noted when walking between transects or casually noted during other aspects of the biodiversity field study were not included in subsequent abundance analysis, but were considered as 'additional' species for subsequent analysis. This approach allowed a current taxa list of the birds present at/near the study site and their relative abundance to be generated.

The conservation status of bird species recorded was considered in respect of the following: Irish Wildlife Acts (1976 - 2012); Birds of Conservation Concern in Ireland (BoCCI) Red, Amber and Green lists² (see Colhoun & Cummins 2013); EU Birds Directive Annex I list³. The ecological value of the site for birds was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2).

8.3.5 Mammals (non-volant)

A desktop review of mammal data available for the study site was undertaken by consulting online databases to identify mammal species of interest (e.g. rare, protected, of ecological concern) previously recorded within the relevant national grid squares that overlap the study site; in this case a review was undertaken of the W76 (10km) national grid square from the NPWS online database, and of the W7067, W7068 & W7167 (1km) national grid squares from the NBDC online database.

A baseline mammal assessment of the study site was undertaken by completing walkovers (see Appendix 8.1), which included all field boundaries within the study site here. The encroachment of relatively heavy scrub at the study site was a limiting factor for the mammal walkover at affected areas. Identification of mammal species or signs of mammal activity seen (e.g. droppings, tracks, burrows etc.), was confirmed where possible; observations were recorded using field notes and/or hand-held GPS units. Techniques used to identify mammal activity followed recognised guidelines (e.g. Clark 1988, Sutherland 1996, Bang & Dahlstrom 2004 and JNCC 2004). Trail cameras, which take photographs or video when triggered by heat or motion, were also deployed at six locations within the study site for varied periods of time to assist with recording mammal activity (see Figure 8.2 and Appendix 8.1).

² BoCCI Red-listed species are of high conservation concern, Amber-listed species are of medium conservation concern and Green-listed species are of no conservation concern.

³ Annex I bird species are afforded additional protection through the designation of Special Protection Areas (SPAs) in EU countries in addition to existing National legislation.

The conservation status of mammals was considered in respect of the following: Irish Wildlife Acts (1976 - 2012); Red List of Terrestrial Mammals (Marnell *et al.* 2009); EU Habitats Directive. The biodiversity value of the site for mammals was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2).

8.3.6 Bats

A desktop review of bat data available for the study site was undertaken by consulting online databases to identify bat species of interest (e.g. rare, of ecological concern) previously recorded within the relevant national grid squares that overlap the study site; in this case a review was undertaken of the W7067, W7068 & W7167 (1km) national grid squares from the NBDC online database. The NBDC online database also hosts the Model of Bat Landscapes for Ireland, which has assessed the relative importance of landscape and habitat associations for bat species across Ireland (see Lundy *et al.* 2011); therefore, the landscape resource value for bats in the relevant national W76 (10km) square overlapping the study site was also included here. Bat Conservation Ireland's bat roost database was also consulted regarding bat roost sites within 10km of an approximate central point of the study site (*i.e.* Irish Grid W 70512 68020) and within the national W76 (10km) square overlapping the study site.

A baseline bat assessment of the study site was undertaken by undertaking a combination of active and passive surveys (see Appendix 8.1) in accordance with current best practice guidelines (Collins 2016, Kelleher & Marnell 2006). As the study site does not have any buildings/structures potentially relevant to roosting bats, no bat roosting emergence/return study was undertaken. One **active** bat survey was conducted through a walkover of the study site and a driven transect along the local road network associated with the adjoining Templegrove residential area and R609 Carrigaline Road. In accordance with guidelines (Catto *et al.* 2004), the car-based transect was driven at approximately 24 km/hr. Bat activity registrations noted during the active bat survey were recorded using bat detectors (Wildlife Acoustics Echo Meter EM3 with attached GPS unit). A **passive** bat detector (Wildlife Acoustics SM3/SM4) was also deployed at six locations within the study site where bat call registrations were recorded from sunset to sunrise on each night (see Appendix 8.1 and Figure 8.2). All recorded bat registrations were analysed using Wildlife Acoustics Kaleidoscope Viewer sound analysis software to confirm bat species, times of activity and behaviour where possible. To standardise relative comparison between the passive locations and potentially control for the relatively large amount of registrations that passive detectors can generate, sound analysis focused on two nights per passive location (see Appendix 8.1).

The conservation status of bats was considered in respect of the following: Irish Wildlife Acts (1976 - 2012); Red List of Terrestrial Mammals (Marnell *et al.* 2009); EU Habitats Directive. The biodiversity value of the site for bats was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2).

8.3.7 Other Taxa

A desktop review of other taxa data available for the study site was undertaken by consulting online databases to identify other taxa species of interest (e.g. rare, protected, of ecological concern) previously recorded within the relevant national grid squares that overlap the study site; in this case a review was undertaken of the W76 (10km) national grid square from the NPWS online database, and of the W7067, W7068 & W7167 (1km) national grid squares from the NBDC online database.

Assessment of other taxa usage of the study site was achieved by noting observations made during other biodiversity field surveys undertaken overall (as described above; see Appendix 8.1).

The conservation status of other taxa was considered in respect of the following: Irish Wildlife Acts (1976 - 2012); Irish Red List for Butterfly (Regan *et al.* 2010); Irish Red List for Damselflies & Dragonflies (Nelson *et al.* 2011); Irish Red List for Amphibians, Reptiles & Freshwater Fish (King *et al.* 2011); Regional Red List of Irish Bees (Fitzpatrick *et al.* 2006); EU Habitats Directive. The biodiversity value of the site for other taxa was assessed using criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn & Fossitt 2004 (see Appendix 8.2).

8.3.8 Biodiversity Site Evaluation & Impact Assessment

Biodiversity evaluation of the study site follows criteria amended after Triturus Environmental 2016 (unpub.), NRA 2009 and Nairn and Fossitt 2004 (see Appendix 8.2). The description and evaluation of potential and residual impacts associated with the proposed development on the existing ecology of the study site and surrounding area follows guidelines published by the EPA (2017) with reference to CIEEM (2018).

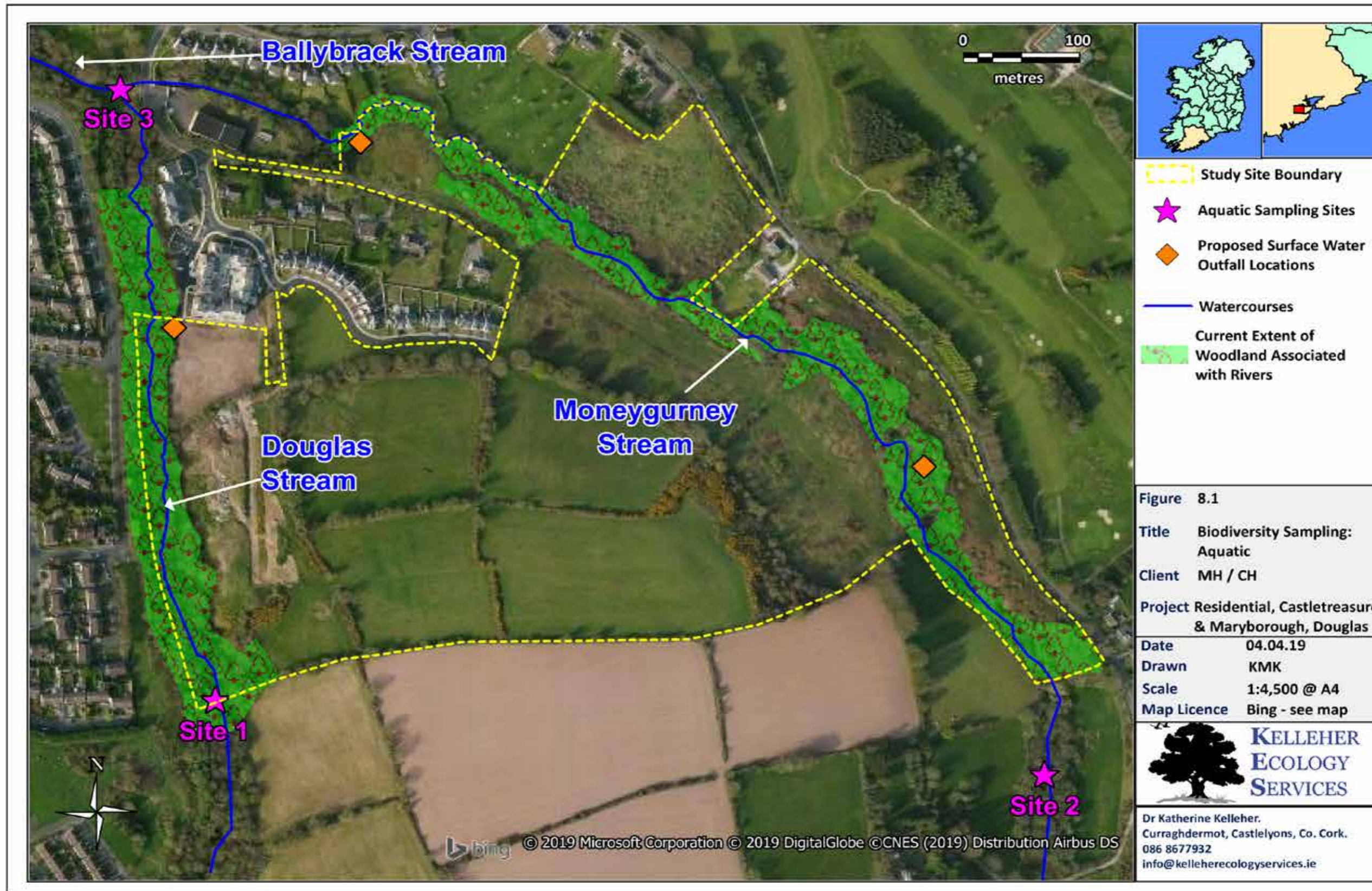


Figure 8.1 Biodiversity Sampling: Aquatic

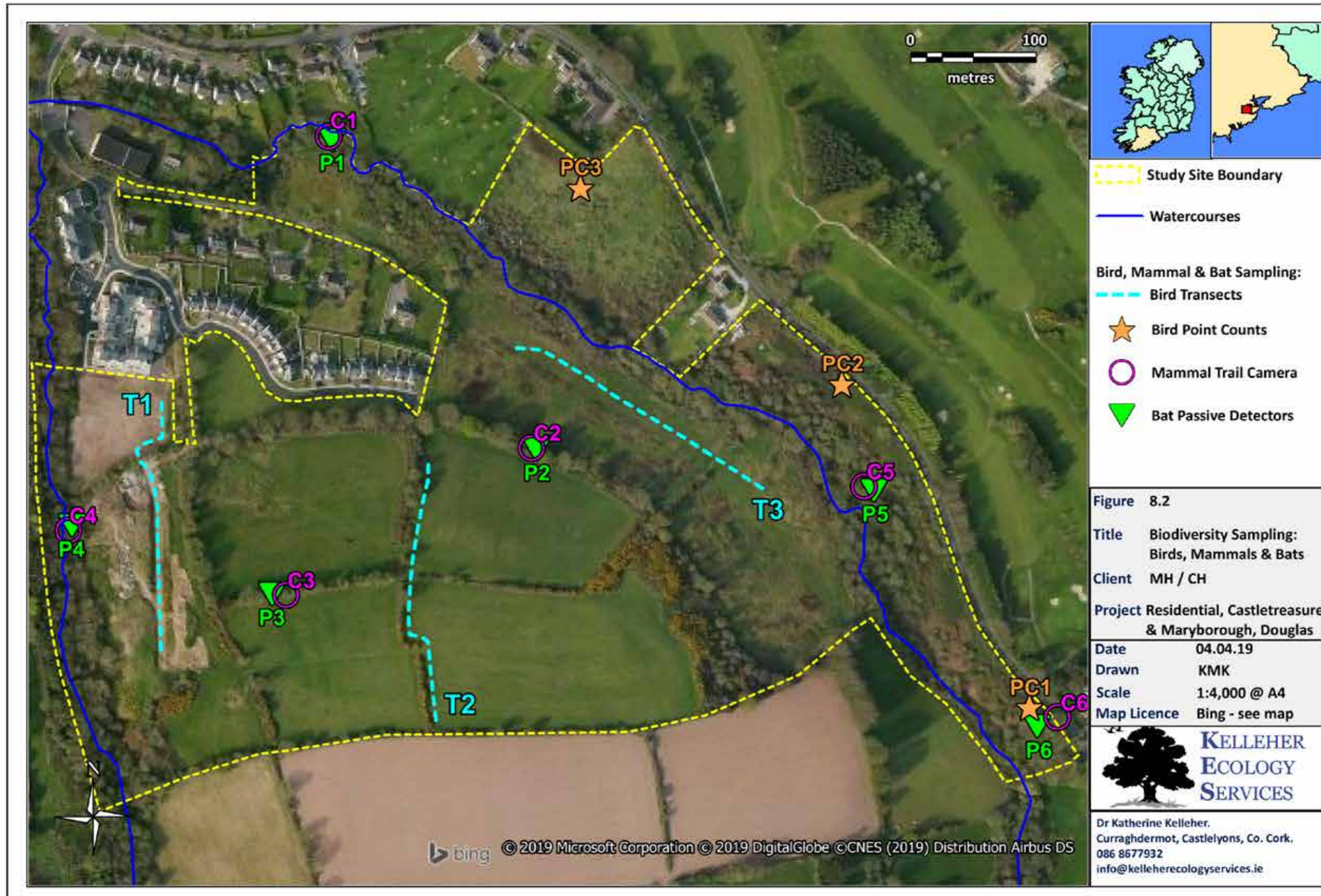


Figure 8.2 Biodiversity Sampling: Birds, Mammals & Bats

8.4 Existing Environment

8.4.1 Designated Nature Conservation Sites

The study site is not located within, or adjacent to any designated nature conservation area. The nearest designated conservation area to the study site is Douglas River Estuary pNHA, which is located c.1.4km from the study site boundary (see Figure 8.3). There are several designated sites within 15km of the study site as follows;

Douglas River Estuary pNHA 1046	1.36 km
Cork Harbour SPA 4030	1.37 km
Cork Lough pNHA 1081	4.26 km
Dunkettle Shore pNHA 1082	4.40 km
Monkstown Creek pNHA 1979	5.04 km
Glanmire Wood pNHA 1054	5.10 km
Rockfarm Quarry, Little Island pNHA 1074	5.54 km
Owenboy River pNHA 1990	5.83 km
Great Island Channel SAC 1058	6.16 km
Great Island Channel pNHA 1058	6.16 km
Lee Valley pNHA 0094	6.90 km
Lough Beg (Cork) pNHA 1066	7.63 km
Blarney Bog pNHA 1857	9.65 km
Cuskinny Marsh pNHA 1987	9.94 km
Shournagh Valley pNHA 0103	10.28 km
Templebreedy National School, Crosshaven pNHA 0107	10.98 km
Blarney Lake pNHA 1798	11.26 km
Ballincollig Cave pNHA 1249	11.27 km
Blarney Castle Woods pNHA 1039	11.38 km
Fountainstown Swamp pNHA 0371	11.54 km
Whitegate Bay pNHA 1084	11.56 km
Ardamadane Wood pNHA 1799	11.58 km
Minane Bridge Marsh pNHA 1966	11.68 km
Rostellan Lough, Aghada Shore and Poul nabibe Inlet pNHA 1076	13.34 km

As previously mentioned, a NIS in support of the AA process has been undertaken to consider whether significant effects on potentially relevant Natura 2000 sites are likely to arise in relation to the proposed residential development here (KES 2019) with key findings summarised in this EIAR.

8.4.1.1 Potential Impact-Receptor Zone of Influence: Overview

There is a potential impact-receptor pathway via **surface-water** links between the study site and two designated sites associated with Douglas estuary/Lough Mahon transitional waterbody; Cork Harbour SPA and Douglas River Estuary pNHA (that overlap each-other). Surface-water run-off arising from the site will discharge into the Moneygurney and Douglas watercourses at site, which ultimately flow into (a section of) Cork Harbour SPA and Douglas River Estuary pNHA c. 2km downstream of the closest proposed stormwater discharge points at site (see Table 8.1 & Figures 8.1 & 8.3). None of the other designated sites are considered relevant here due to a lack of hydrological link given their locations that are either (i) not downstream of the proposed surface-water run-off discharge points at Moneygurney and Douglas watercourses or (ii) are located within the estuary/harbour area where there is a very significant water throughput associated with the tidal regime (see Figure 8.3).

There is a potential impact-receptor pathway via **waste-water/foul effluent** links between the study site and two designated sites associated with Cork Harbour; Cork Harbour SPA and Monkstown Creek pNHA (that overlap each-other). Prior to the residential site being connected into the public foul sewer, construction stage waste-water/foul effluent will initially be managed and controlled at the temporary site compound through the use of portaloo's and welfare units with storage tanks, where sanitary waste will be removed from site via a licenced waste disposal operator. In this instance, no hydrological link via effluent will be relevant to any of the Natura 2000 sites under consideration here. However, when the site is connected to the public foul sewer network, construction and operational stage waste-water/foul effluent arising from the proposed development will be discharged into the public foul effluent network for treatment at Cork City Wastewater Treatment Plant (WWTP) that ultimately discharges into Cork Harbour at Lough Mahon, where Cork Harbour SPA and Monkstown Creek pNHA are downstream of the WWTP discharge point (see Table 8.1 & Figure 8.3). While Great Island Channel SAC is not downstream of the WWTP discharge point, tidal/wind movements could be of some relevance in relation to this SAC, where its boundary is c. 550m north-east of the WWTP's discharge point (see Figure 8.3). However, an assessment on the conservation status of the SAC does not highlight potential impacts arising from tidal/wind movements from Cork City WWTP's discharge point as a significant point of concern but instead highlights water quality management in relation to two other WWTPs (Midleton & Carrigtwohill WWTPs) to maintain/restore the favourable conservation status of the SAC's qualifying interest 'Mudflats and Sandflats' (O'Neill *et al.* 2014). None of the other designated sites are considered relevant here due to a lack of hydrological link given their locations that are either (i) not downstream of the WWTP discharge point or (ii) are located within the estuary/harbour area where there is a very significant water throughput associated with the tidal regime (see Figure 8.3).

Activities associated with development works can inadvertently result in the **spread of invasive plants**, where the surface-water links present here can also act as a potential impact-receptor pathway regarding indirect habitat loss/damage to designated nature conservation sites downstream that are associated with Douglas estuary/Lough Mahon transitional waterbody, primarily (one section of) Cork Harbour SPA and Douglas River Estuary pNHA. In this case, stands of the highly invasive **Japanese Knotweed** *Fallopia japonica* were noted growing at the study site but have since been removed; see Section 8.4.2 for further details. Therefore, potential impacts on designated sites related to the spread of invasive plants are not relevant here.

Consideration needs to be given to the potential for **disturbance/displacement impacts** of fauna that are listed as qualifying interests of a designated site through noise and/or visual cues arising from the proposed development. This also includes ex-situ disturbance/displacement impacts on highly mobile species that are qualifying interests of the relevant designated sites; ex-situ impacts occur when highly mobile species occur outside of the boundaries of their designated sites (e.g. to forage or commute). However, the study site here does not overlook any of the designated sites under consideration due to distance (>1.3km away) combined with existing screening in place (vegetation, topography). Furthermore, the study site does not support habitats of ecological value for mobile faunal species (largely waterbirds) of the relevant designated sites under consideration. Although, one potential exception to this could include Leisler's Bat associated with a maternity roost for this species at Templebreedy National School, Crosshaven pNHA. This pNHA is 10.98km from the study site and is considered to be largely outside the normal foraging range of breeding Leisler's Bat especially from the lactation phase of the breeding cycle (within c. 7km; see Shiel *et al.* 1999). Therefore, potential disturbance/

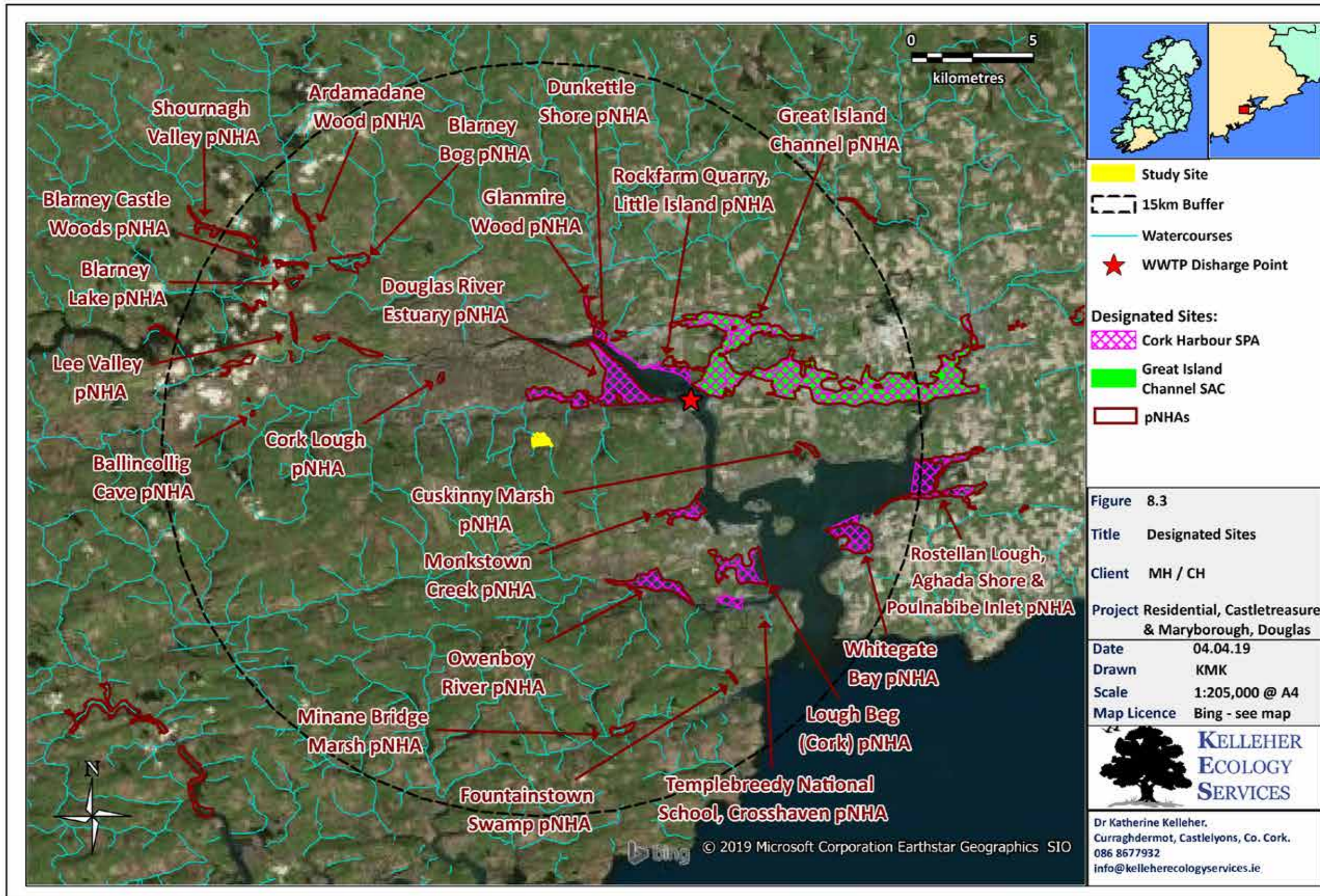


Figure 8.3 Designated Sites

displacement impacts (including ex-situ) on qualifying interest fauna for designated sites here are not considered relevant in this case.

In relation to potential **flooding/floodplain impacts**, a flood risk assessment for the proposed development has been undertaken (see JBB 2019). While a small number of dwellings at the western area are within close proximity to the relevant 0.1% AEP fluvial flood extent, all proposed dwellings will be constructed outside of the relevant fluvial flood extent at the study site. Furthermore, all development will be constructed at an elevation higher than the 1% AEP flood level with a suitable freeboard, and the proposed FFL of buildings will also be greater than the 0.1% AEP flood level. Therefore, there will be no loss of flood plain storage such that the development will have no impact on the remaining flood plain. The implementation of appropriate sustainable drainage systems (SuDS) will ensure no increase in surface-water run-off arising from the developed study site, where excess surface-water run-off will be attenuated and discharged at the greenfield discharge rate. Therefore, potential flooding/floodplain impacts on designated sites are not considered relevant in this case.

8.4.1.2 Potential Impact-Receptor Pathways: Summary

In summary, there is a potential link between the study site and the following designated nature conservation sites via (i) surface-water impacts: Cork Harbour SPA and Douglas River Estuary pNHA and (ii) waste-water impacts: Cork Harbour SPA and Monkstown Creek pNHA. While all pNHAs are of national importance, all SAC/SPAs are of international importance.

Table 8.1 Designated nature conservation sites with a potential link to the study site.

Site Name & Code	Key Conservation Objective	Relevant Minimum Distances
Douglas River Estuary pNHA 1046	Douglas River Estuary is a large site situated in the north-west corner of Cork Harbour, stretching from Blackrock to Passage West. The prime importance of this site is its birdlife, where it is a valuable area and high tide roost for waterfowl. This site is of interest because it is an essential part of the Cork Harbour complex and contains much higher densities of waders than would be expected from its relative size. (after NPWS Site Synopsis www.npws.ie)	Study Site Boundary: 1.36km Surface-Water Discharge point: c. 2.0km WWTP Discharge Point: n/a
Cork Harbour SPA 4030	Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000). Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive. The site provides both feeding and roosting sites for the various bird species that use it. Its conservation objectives relate to maintaining the favourable conservation condition of the following qualifying interests (after NPWS 2014); Wintering bird species: Little Grebe <i>Tachybaptus ruficollis</i> , Grey Plover <i>Pluvialis squatarola</i> , Great Crested Grebe <i>Podiceps cristatus</i> , Lapwing <i>Vanellus vanellus</i> , Cormorant <i>Phalacrocorax carbo</i> , Dunlin <i>Calidris alpina alpina</i> , Grey Heron <i>Ardea cinerea</i> , Black-tailed Godwit <i>Limosa limosa</i> , Shelduck <i>Tadorna tadorna</i> , Bar-tailed Godwit <i>Limosa lapponica</i> , Wigeon <i>Anas penelope</i> , Curlew <i>Numenius arquata</i> , Teal <i>Anas crecca</i> , Redshank <i>Tringa totanus</i> , Pintail <i>Anas acuta</i> , Black-headed Gull <i>Chroicocephalus ridibundus</i> , Shoveler <i>Anas clypeata</i> , Common Gull <i>Larus canus</i> , Red-breasted Merganser <i>Mergus serrator</i> , Lesser Black-backed Gull <i>Larus fuscus</i> , Oystercatcher <i>Haematopus ostralegus</i> , Golden Plover <i>Pluvialis apricaria</i> ; Breeding bird species: Common Tern <i>Sterna hirundo</i> Habitat: Wetlands	Study Site Boundary: 1.37km Surface-Water Discharge point: c. 2.0km WWTP Discharge Point: >4.0km
Monkstown Creek pNHA 1979	Monkstown Creek is a tidal inlet composed of mudflats, with limestone along the southern shore. A brackish lake also occurs, separated from the sea by a sluice gate. The area is of value because its mudflats provide an important feeding area for waterfowl and it is a natural part of Cork Harbour which, as a complete unit, is of international importance for waterfowl. The marsh interest of the site is ornithological, with the mudflats acting as winter refuge to at least locally important numbers of waterfowl, including Shelduck, Teal, Redshank and Dunlin. However, Cormorant may reach nationally important numbers with the jetty supporting a Cormorant roost of over 100 birds, in addition to a second roost in the woods. (after NPWS Site Synopsis www.npws.ie)	Study Site Boundary: 5.04km Surface-Water Discharge point: n/a WWTP Discharge Point: >4.0km

8.4.2 Habitats & Flora

No Annex I habitats listed under the EU Habitats Directive are present within the study site. The main habitats directly impacted by the proposed development footprint (and works area) include habitats of higher local value, scrub (WS1) and hedgerow (WL1); or of lower local value, neutral grassland (GS1), wet grassland (GS4), recolonising bare ground (ED3) and spoil and bare ground (ED2). Other semi-natural habitats present in the study area include eroding rivers (FW1) of local/county value and associated wet pedunculate oak-ash woodland (WN4) corridors of county value.

No botanical species protected under the Flora (Protection) Order 2015, listed in Annex II or IV of the EU Habitats Directive (92/43/EEC), or Red listed in Ireland were recorded. All species recorded during the botanical survey are considered common for similar habitats in the general area.

While no records of rare or protected plant species are known within the 1km national grid squares that overlap the study site (after NBDC database), four historic records of rare or protected plant species are known in the wider overlapping 10km national grid square (after NPWS database); Lesser Snapdragon *Misopates orontium* (last known record 1845, Carrigaline Castle), Annual Knawl *Scleranthus annuus* (last known record 1845, Cobh), Meadow Barley *Hordeum secalinum* (last known record 1990, Douglas Marshes) and Penny Royal *Mentha pulegium* (last known record 1850, Great Island at Belvelly). **Annual Knawl** is typically associated with dry, sandy soils on waste ground and road side verges. It is rare in the north west and very rare/declining elsewhere in Ireland (Parnell & Curtis 2012). **Lesser Snapdragon** has been primarily recorded (though rarely) in arable fields in the south-east and south west of Ireland and is considered a very rare casual elsewhere (Parnell & Curtis 2012). Given the historic nature of the last known records and limited suitable habitat (*i.e.* sandy soils, arable fields), the study site is unlikely to support populations of Annual Knawl or Lesser Snapdragon. **Meadow Barley** has a very local and mainly coastal distribution where it is associated with brackish margins, primarily near the coast across the south and inland along the River Shannon (Parnell & Curtis 2012). It has also been recorded in lowland meadows, pastures and/or coastal grazing marshes in unimproved grasslands on heavy, (often calcareous) clay soils (Cope & Gray 2009). Given the overall location of the study site, together with a lack of suitable habitat, Meadow Barley is unlikely to occur within the study area. **Penny Royal** is typically found on silt or clay substrates in damp, seasonally inundated grasslands, along margins of shallow pools or poached areas associated with grazing and or vehicular disturbance. Penny Royal has also been recorded in traditionally managed lowland pastures with short swards, on village amenity grassland, coastal grasslands and along the margins of tracks, lakes and reservoirs (Stroh 2014). In Ireland, Penny Royal is documented as occasional in Counties Kerry and Cork (rare elsewhere), where it has been recorded in damp, sandy habitats (Parnell & Curtis 2012). Suitable damp, clay substrate with recent vehicular disturbances, towards the north-eastern section of the study area (near Moneygurney Stream), may provide suitable habitat for this protected species. The main flowering period for Penny Royal is August to September and as such Penny Royal may not have been recorded here as field surveys occurred earlier in the summer (see Appendix 8.1).

Stands of the highly invasive plant species Japanese Knotweed were noted at the study site; one small and relatively recently established stand at one location within the proposed housing development area (Irish Grid Reference W70545 68195) and several stands within the proposed school development area. Japanese Knotweed is listed on the Third Schedule of the 2011 European Communities (Birds and Natural Habitats) Regulations where it is an offense to disperse, spread or otherwise cause to grow in any place. All Japanese Knotweed was removed in August 2018 through a new process known as 'Eraginate process' (see Appendix 8.4 for full details).

Other non-native invasive species noted within the study site (but not listed on the Third Schedule of the 2011 European Communities (Birds and Natural Habitats) Regulations) include Buddleia *Buddleia davidii* and Traveler's Joy *Clematis vitalba*. It is also worth mentioning that the non-native invasive plants Rhododendron *Rhododendron ponticum* and Laurel *Prunus laurocerasus* are also present in private properties adjoining the north-western boundary of the study site.

The following habitats (with Fossitt codes) were recorded within the study site (see Figure 8.4)

- Scrub (WS1)
- Dense Bracken (HD1)
- Neutral Grassland (GS1)
- Hedgerow (WL1)
- Treeline (WL2)
- Eroding River (FW1)
- Wet Pedunculate Oak-Ash Woodland (WN4)
- Wet Grassland (GS4)
- Spoil and Bareground (ED2)
- Recolonising Bareground (ED3)
- Buildings and artificial surfaces (BL3)
- Ornamental/Non-native Shrubberies (WS3)
- Amenity Grassland (GA2)

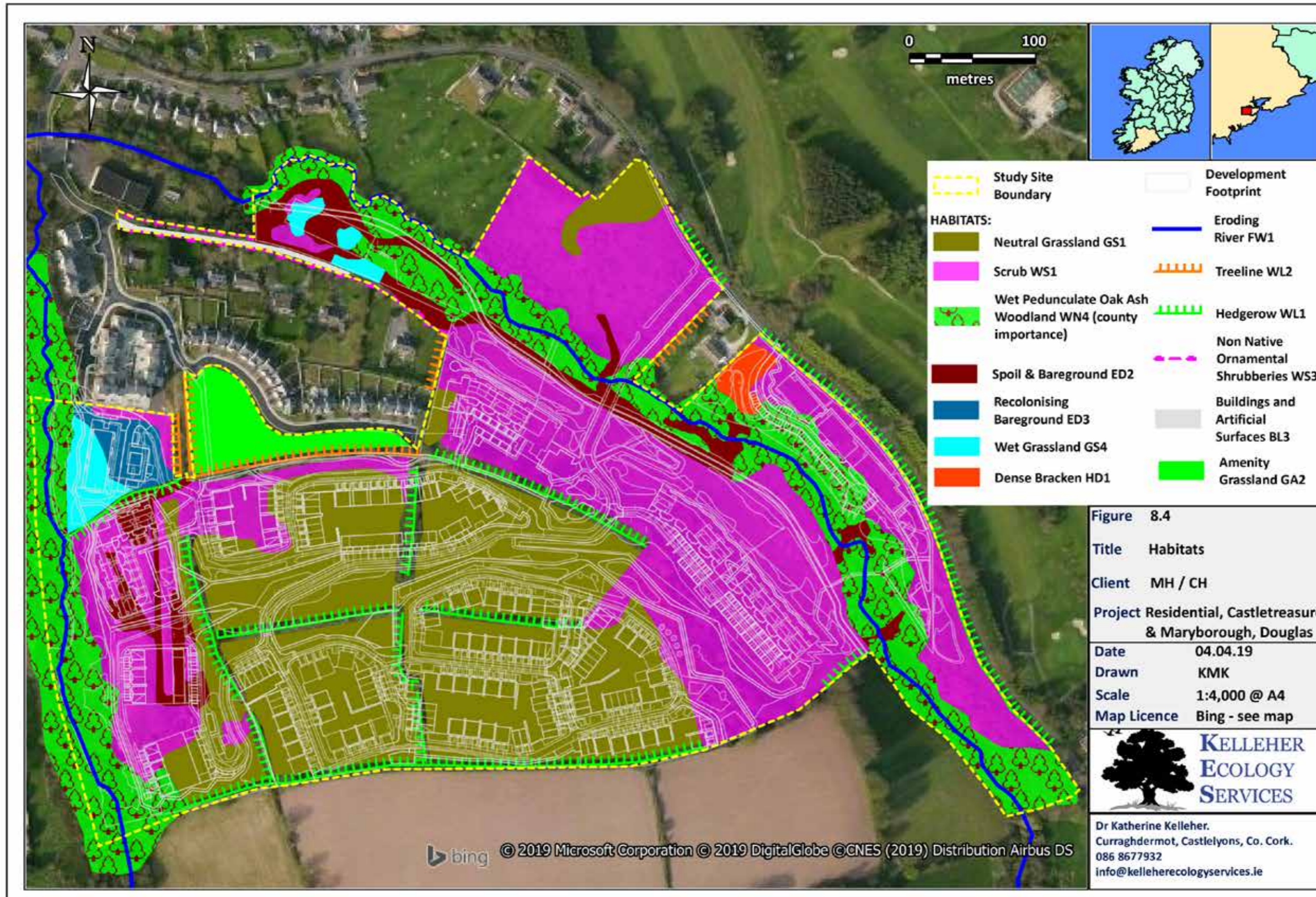


Figure 8.4 Habitats



Plate 8.1. Overview of young Willow scrub (WS1) habitat, with occasional Bramble and Gorse, which has established across abandoned agricultural fields in the eastern section of the study area.

8.4.2.1 Scrub (WS1) & Dense Bracken (HD1)

Scrub (WS1) habitat is common across the study area. On the eastern section of the study area, young scrub has established within abandoned agricultural fields (*i.e.* neutral grassland GS1) and on unmanaged, steeply sloping ground along the eastern boundary. Where young scrub has established within abandoned agricultural fields (neutral grassland), the habitat is dominated by young Grey Willow *Salix cinerea* subsp. *Oleifolia* shrubs. Low growing Bramble *Rubus Fruticosus* agg. and Gorse *Ulex europaeus* shrubs are frequent in parts (see Plate 8.1). Young Ash *Fraxinus excelsior* and Birch *Betula* species saplings are occasional. Non-native Buddleia *Buddleia davidii* is also present. Where the young scrub canopy is open a rank grassland understory comprised of species such as; Rough Meadow Grass *Poa Trivialis*, Sweet Vernal Grass *Anthoxanthum odoratum*, Yorkshire Fog *Holcus lanatus*, Creeping Bent *Agrostis stolonifera*, Soft Rush *Juncus effusus*, Common Nettle *Urtica dioica*, Rosebay Willowherb *Chamerion angustifolium*, Field Thistle *Cirsium arvensis*, Great Willowherb *Epilobium hirsutum*, Common Vetch *Vicia sativa* and Common Sorrel *Rumex acetosa* persists.

Across steeply sloping ground along the eastern boundary of the study area scrub habitat is more established and is comprised of abundant Blackthorn *Prunus spinosa*, Bramble, Hawthorn *Crataegus monogyna* and Willows (Plate 8.2). Dense Bracken *Pteridium aquilinum* is frequent in parts here and one larger open area dominated by dense Bracken was classified separately (*i.e.* Dense Bracken HD1). An area of dense Blackthorn and Gorse scrub is also present along the



Plate 8.2. Overview of dense scrub (WS1) along the eastern boundary of the study area.

boundary with open neutral grassland fields towards the southern boundary of the study area. This area of scrub had been disturbed recently.

Smaller areas of young Willow dominated scrub has also established in areas of previously disturbed ground towards the western section of the site. Birch, Bramble and Gorse are common in parts as is non-native Buddleia (Plate 8.3).

Due to the overall semi-natural state and biodiversity in a local context, scrub present within the study area is considered to be of higher local value. The stand of dense Bracken has low biodiversity potential and is of lower local value.

8.4.2.2 Neutral Grassland (GS1)

Neutral grassland (GS1) is present across the south/south-western section of the study area (Plate 8.4). The neutral grassland present has established as a result of agricultural abandonment and as such has not been fertilised, grazed or cut recently. A smaller area of neutral grassland also persists at the edge of scrub (WS1) habitat towards the northern boundary of the study area. The neutral grassland sward is comprised of a more diverse community than that of improved agricultural grassland (GA1), which is associated with more intensive agricultural practices. However, due to the lack



Plate 8.3 Overview of scrub (WS1) and neutral grassland (GS1) towards the western boundary of the study area.



Plate 8.4. Overview of neutral grassland (GS1) habitat present within the study site.

of management (*i.e.* cutting or grazing) the neutral grassland community is dominated by rank grasses; including Red Fescue *Festuca rubra*, Yorkshire Fog, Common Bent *A. capillaris*, Creeping Bent, Sweet Vernal Grass, Cock's-foot *Dactylis glomerata*, Crested Dog's-tail *Cynosurus cristatus* and Meadow Foxtail *Alopecurus pratensis*. Perennial Rye-grass *Lolium perenne* is present but does not dominate the sward. Due to the rank structure of the sward, herb cover is low overall but includes species such as Ribwort Plantain *Plantago lanceolata*, White Clover *Trifolium repens*, Seal-heal *Prunella vulgaris*, Creeping Buttercup *Ranunculus repens*, Hogweed *Heracleum sphondylium*, Common Sorrel and Germander Speedwell *Veronica chamaedrys*. Low growing Bramble is present along some of the neutral grassland field boundaries.

This neutral grassland has been improved in the past, but due to a lack of ongoing or recent management the grassland sward is now comprised of a more diverse community than that of improved agricultural grassland associated with more intensive agricultural practices (O'Neill *et al.* 2013). Despite increased grass diversity from its former improved agricultural state, neutral grassland is currently considered to be of lower local value.

8.4.2.3 Hedgerow (WL1)

Hedgerows (WL1) are present along the neutral grassland (GS1) field boundaries and along the eastern boundary with the R609, with one smaller section of hedgerow persisting between open recolonising/disturbed ground and young scrub (WS1) towards the western boundary of the study area. The hedgerows present are dominated by native species, including abundant Bramble, Gorse, Willows and Ivy *Hedera helix* and occasional Hawthorn, Blackthorn, Elder *Sambucus nigra*, Honeysuckle *Lonicera periclymenum*, Holly *Ilex aquifolium* and Dog Rose *Rosa canina*. Mature, semi-mature and maturing trees comprised of native Oak *Quercus robur*, Ash *Fraxinus excelsior* and Sycamore *Acer pseudoplatanus* are common, particularly along hedgerows towards the north eastern and south western neutral grassland field boundaries. Mature European Beech *Fagus sylvatica* is present along a section of hedgerow towards the south east of the study area. While to date tree species such as Sycamore and Beech have been considered non-native in Ireland, there has been more recent ongoing discussion on whether these two species may now be considered as archaeophytes here (*i.e.* ancient introductions; see Stolze & Monecke, 2017). Sections of hedgerow dividing fields towards the centre of the study area are lower growing, structurally poor and lack mature trees (Plate 8.5). The hedgerows present are associated with low to medium height earthen banks with occasional dry-stone walls (BL1). There is limited ground flora present except for occasional Ivy, Ground Ivy *Glechoma hederacea* and Foxglove *Digitalis purpurea*. The hedgerows are unmanaged and



Plate 8.5 Structurally poor hedgerow (WL1).

overgrown and have lost a typical hedgerow structure with gaps common throughout (Plate 8.6). Low growing Bramble is establishing out from the hedgerows and into the neutral grassland fields in places. There is a specific objective pertaining to the study site as part of the current Ballincollig Carrigaline Municipal District Local Area Plan that specifies the retention of existing hedgerows within the overall development of the site (under Objective SE-R-06 of CCC 2017).

Due to the overall semi-natural state and biodiversity value in a local context, the hedgerows (WL1) present within the study area are considered to be of higher local value.

8.4.2.4 Treeline (WL2)

Where hedgerows (WL1) are more overgrown and as such are now dominated by semi-mature and mature trees without any significant hedgerow understory structure the habitat was recorded as treeline (WL2). Treelines were recorded at four locations within the study area. Tree species include mature, semi-mature and maturing native Pedunculate Oak, native Ash and Sycamore and European Beech. Cultivated Apple *Malus domestica* and occasional Grey Willow has established along part of the treeline on the boundary with an existing residential development. There is a specific objective pertaining to the study site as part of the current Ballincollig Carrigaline Municipal District Local Area Plan that specifies the retention of existing trees within the overall development of the site (under Objective SE-R-06 of CCC 2017).



Plate 8.6. Overgrown hedgerow (WL1) with numerous mature trees.

Due to the overall degree of naturalness and biodiversity in a local context, treelines (WL2) present within the study area are considered of higher local value.

8.4.2.5 Eroding River (FW1)

Two semi-natural eroding rivers (FW1), Douglas (Plate 8.7) and Moneygurney (Plate 8.8), are situated towards the western and eastern boundaries of the study area. Both watercourses are comprised of shallow to relatively deep water, flowing steadily over narrow stream channels (c. 2-3m) of pebble, small stone and/or muddy substrate. The fast-flowing water prevents the establishment of any in stream vegetation with just occasional watercress *Rorippa nasturtium-aquaticum* on the stream margins. Eroded banks and evidence of occasional flooding (*i.e.* river borne debris) is common in parts along both watercourses. Both watercourses join to the north of the study site and continue in a northerly direction.

Both the Moneygurney and Douglas semi-natural watercourses are of biodiversity value in a local context, where the Moneygurney is known to support brown trout in its upper reaches as well as an urban population downstream (see Section 8.4.3). While the Douglas watercourse is of lower local value, Moneygurney watercourse is considered to be of county importance (see Section 8.4.3).



Plate 8.7. Overview of Douglas eroding river (FW1) with associated wet pedunculate oak-ash woodland (WN4) corridor.

8.4.2.6 Wet Pedunculate Oak-Ash Woodland (WN4)

Wet pedunculate Oak-Ash woodland (WN4) is present along the river margins of both the Douglas and Moneygurney eroding rivers (FW1) situated towards the western and eastern boundaries of the study area respectively.

Wet pedunculate Oak-Ash woodland towards the eastern boundary (associated with Moneygurney watercourse) is dominated by abundant Grey Willow and occasional Crack Willow *S. fragilis*. Sycamore and Beech are frequent and include numerous regenerating seedlings and saplings. Other occasional species include Pedunculate Oak *Quercus robur*, Hazel *Corylus avellana*, Alder *Alnus glutinosa*, Elder, Holly and Hawthorn. The woodland corridor is situated across relatively flat to steeply sloping ground (Plate 8.9). Where it is flat, it is damp in parts with evidence of occasional flooding (also see JBB 2019). Dead wood and fallen trees are occasional here. The understory is well developed in parts and typically comprised of Ivy, Bramble, Honeysuckle, Bugle *Ajuga reptans*, Wood Avens *Geum urbanum*, Primrose *Primula vulgaris*, Tutsan *Hypericum androsaemum*, Hart's-tongue *Phyllitis scolopendrium*, Common Polypody *Polypodium vulgare*, Remote Sedge *Carex remota*, Bluebell *Hyacinthoides non-scripta*, Barren Strawberry *Potentilla sterilis* and Golden-saxifrage *Chrysosplenium oppositifolium*. In damper areas species such as Meadowsweet *Filipendula ulmaria*, Lesser Spearwort *R. flammula*, Yellow Iris *Iris pseudacorus*, Brooklime *Veronica beccabunga*, Wild Angelica *Angelica sylvestris*, Wood Dock *Rumex sanguineus* and Common Nettle are common. Sections of wet woodland associated with Moneygurney watercourse that has been disturbed/removed in relatively recent times now comprises of spoil and bareground (ED2).



Plate 8.8. Overview of Moneygurney eroding river (FW1).

Wet pedunculate Oak-Ash woodland is also present on the river margin associated with Douglas watercourse. This wet woodland is also Grey Willow dominant, with Sycamore abundant in parts. Ash, Hawthorn, Elm *Elmus* spp. Alder and Hazel are also occasional. The woodland understory is comprised of typical species such as Bramble, Ivy, Honeysuckle, Hogweed, Lesser Celandine *Ranunculus ficaria*, Lords and Lady's *Arum maculatum*, False Broome *Brachypodium sylvaticum*, Bluebell, Remote Sedge, Scaly Male Fern *Dryopteris affinis* and Common Nettle. Trees associated with this wet woodland are protected (*i.e.* Tree Preservation Order TPO: 1 of 1984) for their amenity value. This wet woodland is more accessible and bare mud tracks are common with relatively newly built walk-ways also present in parts of this wet woodland corridor.

Though the wet woodlands present may be considered slightly modified by the presence of tree species Sycamore and Beech, due to the natural occurrence of abundant Willow and occasional Oak, together with the typical understory species recorded the wet woodland was classified as a semi-natural habitat type. While there is some evidence of occasional flooding, the woodland is not regularly inundated and as such heavily influenced by the watercourses such that the woodland corridors do not correspond to Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae; 91E0).

This habitat type is considered to be of county importance due to the high degree of naturalness and the biodiversity value of both wet woodland corridors, combined with the TPO assigned to that associated with the Douglas watercourse.



Plate 8.9. Overview of riparian woodland (WN5) corridor situated towards the eastern boundary of the study area

8.4.2.7 Wet Grassland (GS4)

Small areas of wet grassland GS4 were recorded at four locations within the study area (Plate 8.10). The wet grassland present has established on previously disturbed ground (probably contributing to poor draining soils) and as such are not managed as a grassland habitat. Wet grassland is at an early stage of establishment and is comprised of a very short sward with occasional bare soil. Wet grassland species recorded include; Hard Rush *J. inflexus*, Rough Meadow Grass, Creeping Bent, Yorkshire Fog, Self-heal, Lesser Bird's-foot Trefoil *Lotus corniculatus*, Square-stalked St. John-s-wort *H. teptaptrum*, Ribwort Plantain, Field Wood-rush *Luzula campestris*, Yellow Pimpernel *Lysimachia nemorum*, Eyebright *Euphrasia* agg., Creeping Buttercup, White Clover and Willowherb species. One patch of wet grassland (GS4) is particularly damp underfoot and is dominated by Mosses such as *Rhytidiadelphus squarrosus* and *Calliergonella cuspidata*. Additional species such as; Soft Rush, Pendulous sedge *Carex pendula*, Glaucous Sedge *Carex flacca* and Lady's-mantle *Alchemilla vulgaris* are occasional here. Young Alder and Willow saplings are frequent in the recently established wet grassland present towards the western boundary of the study area.

Due to some local biodiversity value, small areas of recently established wet grassland present within the study area is considered to be of lower local value.



Plate 8.10. Overview of wet grassland (GS4) which has established on previously disturbed ground towards the northern part of the study area.

8.4.2.8 Spoil and Bareground (ED2)

Spoil and bareground (ED2) was recorded for disturbed areas towards the western boundary, along wet woodland (WN4) edge and within sections of the wet woodland associated with Moneygurney watercourse which had been disturbed/removed relatively recently at the time of this field study. Due to the recent nature of the disturbance associated with Moneygurney watercourse, the remaining habitat type is now comprised of spoil and bareground with bare, loose mud and occasional stone and tree/shrub debris common, with little or no regeneration occurring here just yet (Plate 8.11). Towards the western boundary disturbance is not as recent and as such occasional vegetation including Self-heal, Daisy *Bellis perrenis*, Eyebright, Ragwort *Senecio jacobaea*, Silverweed *Potentilla anserina* and Procumbent Pearlwort *Sagina procumbens*, has begun to regenerate on the spoil and bareground substrate.

Spoil and bare ground is a highly modified/transient habitat type, with limited biodiversity potential and as such is of lower local value.



Plate 8.11. Overview of spoil and bareground (ED2) situated towards the Moneygurney watercourse.

8.4.2.9 Recolonising Bareground (ED3)

An area of recolonising bare ground (ED3) is present towards the north-western boundary of the study area. Here herbaceous vegetation has begun re-colonising on previously disturbed mud and gravel substrate. Vegetation cover is comprised predominately of a ruderal species mix of occasional herbs; Willowherbs, Eyebright, Daisy, Self-heal, Cat's-ear *Hypochaeris radicata*, Thyme-leaved Speedwell *Veronica serpyllifolia* and Ribwort Plantain. Grasses such as Annual Meadow Grass *Poa Annua*, Yorkshire Fog and Creeping Bent are present but do not dominant the sward. Mosses (e.g. *Brachythecium rutabulum* and *Calliergonella cuspidata*) are occasional.

Recolonising bare ground is a highly modified habitat type which is transient in nature. While vegetation cover is considered greater than 50%, the recolonising bare ground present is still at an early stage of re-colonisation with bare ground, a low sward height and low floral diversity and as such limited biodiversity value; this is considered to be of lower local value.

8.4.2.10 Buildings and Artificial Surfaces (BL3)

A tarmacked public access road (i.e. buildings and artificial surfaces BL3) is present on the north-western boundary of the study area with a concrete wall (BL3) present on the northern side of this road boundary. Other buildings and artificial surfaces (BL3) present within the study area include another section of concrete wall surrounding a private property at the northern boundary of the study area (in association with the proposed school site part of the overall study area).

Buildings and artificial surfaces (BL3) is a highly modified habitat type, comprised of manmade materials with no particular biodiversity potential and as such is of no particular biodiversity value.

8.4.2.11 Non-Native Ornamental Shrubberies (WS3)

Ornamental/non-native shrubberies (WS3) are present along the tarmacked road (BL3) boundaries, where this habitat type is primarily associated with private residential properties adjacent but off-site from the study area. The ornamental shrubs present are dominated by non-native shrubs and trees, including the invasive species *Rhododendron ponticum*.

Ornamental/non-native shrubberies (WS3) is a highly modified habitat type, comprised of non-native species with low biodiversity potential and as such is of lower local value.

8.4.2.12 Amenity Grassland (GA2)

An area of amenity grassland (GA2) is present towards the west of the study area, where it forms part of the open space associated with an existing residential development. The amenity grassland (GA2) is regularly maintained by mowing with a resulting very short sward, which is species poor and dominated by grasses (e.g. Rye-grasses, Fescues, Meadow grasses and Yorkshire Fog). Floral diversity is low overall but includes typical species such as Daisy, White Clover, Selfheal, Ribwort Plantain and Dandelion *Taraxacum agg.*

Amenity grassland is a modified grassland habitat which is regularly managed for amenity purposes and as such has low biodiversity potential and is of lower local value.

8.4.3 Aquatic Ecology

8.4.3.1 Biological Water Quality (Q Sampling)

At **Site 1 (Douglas Stream)** the numerical dominance of Baetid and Ephemerellid mayflies in the sample (*Baetis rhodani* and *S.ignita* species *i.e.* class C) and other class C dipterans (*i.e.* Simuliidae, Chironomidae & Ceratopogonidae) was indicative of slightly polluted water (see Table 8.2). Furthermore, the presence of Tubificidae worms was also indicative of slightly polluted water (*i.e.* organic pollution). Class A invertebrates were also absent on the Douglas Stream. This is a discerning factor in the difference between moderate status (Q3-4) and good status (Q4) riverine water bodies. As such, the biological water quality at Site 1 was thus considered slightly polluted or achieving moderate status water quality (*i.e.* Q3-4). The recorded water quality was therefore not meeting the good status (Q4) target required under the Water Framework Directive (2000/60/EC).

Based on the species compositions recorded, **Site 2 (Moneygurney Stream) and Site 3 (confluence point of Moneygurney and Douglas Streams)** were both achieving good status Q4 (see Table 8.2). Good status (Q4) unpolluted water quality is achieved according to the EPA if at least one Group A taxon is present in, at least, fair numbers (5-10% total sample composition), while Group B taxa may be common or absent and *B.rhodani* is often dominant. Other Group C taxa are never excessive and group D/ E taxa are present in small numbers or absent (Toner *et. al* 2005). The community of invertebrates is thus relatively balanced with no group particularly abundant apart from *B.rhodani*.

Both sampling Sites 1 and 2 had fair numbers of Class A mayfly and stonefly species from the families Heptageniidae and Chloroperlidae. Mayflies from families Baetidae and Ephemerellidae family were common to numerous. Other Class C invertebrates were present in small to fair numbers with the exception of Gammaridae being numerous at site 3. The numerical abundance of Gammarid shrimps at site 3 likely related to the presence of beds of well sorted gravel that the species burrows under. The overall invertebrate community composition at Sites 1 and 2 was therefore indicative of Q4 quality. This is representative of good status water quality as required under the Water Framework Directive.

Table 8.2 Macro-invertebrate composition (Q samples) collected on the Douglas, Moneygurney & Ballybrack Streams.

Family	Species	Site 1 Douglas Stream	Site 2 Moneygurney Stream	Site 3 Ballybrack Stream	EPA Class
Heptageniidae	<i>Rhithrogena semicolorata</i>		5		A
Heptageniidae	<i>Ecdynourus dispar</i>			4	A
Chloroperlidae	<i>Chloroperla tripunctata</i>		1	5	A
Ephemerellidae	<i>Serratella ignita</i>	6	12	13	C
Baetidae	<i>Baetis rhodani</i>	8	9	7	C
Baetidae	<i>Baetis scambus</i>		2		B
Seracostomatidae	<i>Seracostoma personatum</i>		2		B
Limnephilidae	<i>Limnephilus sp.</i>			1	B
Ryacophilidae	<i>Ryacophila dorsalis</i>	2	2	2	C
Hydropsychidae	<i>Hydropsyche sitalai</i>		1	1	C
Polcentropodidae	<i>Polcentropus sp.</i>		3		C
Philopotamidae	<i>Wormaldia occipitalis</i>	1			C
Gammaridae	<i>Gammarus duebenii</i>	5	1	14	C
Ancylidae	<i>Ancylus fluviatilis</i>		4		C
Hydrobiidae	<i>Potamopyrgus jenkinsi</i>			4	C
Tipulidae	<i>Tipula sp.</i>		1		C
Simuliidae	<i>Simulium sp.</i>	4	3		C
Ceratopogonidae	<i>Ceratopogonid sp.</i>	2			C
Chironomidae	<i>Cricotopus/ Orthocladius sp.</i>	12		4	C
Flatworm	<i>Polycelis felina</i>	2		2	C
Tubificidae	<i>Limnodrilus sp.</i>	8			D
Total Abundance		50	46	63	
Q Rating		Q3-4	Q4	Q4	
WFD Ecological Status		Moderate Status	Good Status	Good Status	

8.4.3.2 Physiochemical Water Quality

The results of the physio-chemical water quality sampling of the Douglas, Moneygurney and Ballybrack Streams (Sites 1-3; see Figure 8.1) indicate good quality water quality overall, when considering sampling locations both upstream and downstream of the study site.

The threshold targets for achieving good status in the Surface Water Quality Regulations (S.I. No. 272 of 2009) for parameters including BOD, Total Ammonia and MRP were within the respective thresholds (see Table 8.3). Of particular note is the lower levels of MRP (bioavailable phosphorous) that are critical in determining enrichment of surface waters and a key influence on the associated macro-invertebrate community and biological stream health. The MRP levels recorded between 0.022 mg/l and 0.035mg/l are equivalent to good status Q4 rivers. This would be supported by very low biological oxygen demands (0.4-2.4 mg/l BOD) and low levels of suspended solids (2.0-10.2 mg/l). The pH was also within the normal range for harder water 6.0 < pH < 9.0 according to the Surface Water Regs. S.I. No. 272/2009. However, dissolved inorganic nitrogen (DIN) was elevated across all three stream sites (between 5.88 and 7.09mg/l) and outside the good status range (see Table 8.3).

The Salmonid Regulations (S.I. No. 293 of 1988) provide targets for salmonid bearing watercourses or those watercourses with the capacity to support salmonids, even where they are non-designated rivers (i.e. outside those listed in the legislation). In this regard, the Salmonid Regulations provide a useful baseline to compare surface water quality levels with where salmonids are present (e.g. Douglas & Moneygurney Streams). In this regard all three sampling sites on the Douglas, Moneygurney and Ballybrack Streams had oxygen levels greater than 9mg/l (10.3-11.5mg/l) indicating well oxygenated water capable of supporting salmonids. Suspended solids levels were <25mg/l and unionised ammonia <0.01mg/l at all sites indicating water quality targets capable of supporting a balanced and healthy salmonid population (see Table 8.3).

The physiochemical water quality would indicate equivalent good status Q4 water overall with the exception of elevated Dissolved Inorganic Nitrogen (DIN), and thus the three streams are achieving target good status required under the Water Framework Directive (2000/60/EC) with the exception of elevated nitrogen as stated.

Table 8.3 Physiochemical water quality results for the Moneygurney, Douglas & Ballybrack Streams.

Parameter	Site 1 (Douglas Stream)	Site 2 (Moneygurney Stream)	Site 3 (Ballybrack Stream)	Observed levels relative to standards	Limits in respective EU water quality legislation
Dissolved Oxygen (mg/l)	11.5	10.3	11.2	Represent good oxygen levels capable of supporting salmonids.	50% of samples >9mg/l
BOD (mg O2/l)	2.4	0.4	0.5	BOD levels within the range of a good status river.	Good status ≤1.5 (mean value) - Surface Water Regs. S.I. No. 272/2009.
Suspended solids mg/l	4.6	2.0	10.2	Slight elevation at site 3 but within normal standards.	<25mg/l - Salmonid Regulations S.I. No. 293 of 1988.
Ammonia (mg N/l)	0.052	0.012	0.019	Ammonia levels within the range of a good status river.	Good status ≤0.065 (mean) or ≤0.140 (95%ile) - Surface Water Regs. S.I. No. 272/2009.
Unionised ammonia	<0.01	<0.01	<0.01	Unionised ammonia levels low across all sites.	≤ 0.02 mg/l NH3
DIN (mg N/l)	6.484	7.093	5.880	Indicative of moderate levels of DIN enrichment. Implications for downstream loading of estuary where DIN targets are presented in next column.	Good status ≤2.6 mg N/l ≤0.25 mg N/l
MRP	0.035	0.022	0.024	MRP levels on par or better than the standard for good status.	Good status ≤0.035 (mean) or ≤0.075 (95%ile) - Surface Water Regs. S.I. No. 272/2009.
pH	7.53	7.41	7.60	pH recorded is within the normal range for a Cork spate river.	Hard Water 6.0 < pH < 9.0 - Surface Water Regs. S.I. No. 272/2009.
Conductivity μS/cm	312	368	358	Conductivity normal for a mesotrophic stream on sandstone.	No thresholds available in legislation.
Temp	12.9	13.1	13.0	Temperature within normal range.	n/a
Water Clarity	Clear	Clear	Clear	Good water clarity across all 3 survey sites.	n/a
Siltation	Good (limited silt plumes and gravel interstitial spaces clear of silt)	Good (limited silt plumes and gravel interstitial spaces clear of silt)	Moderate (silt plumes underfoot but gravels unbedded)	Gravel condition moderate to good.	n/a

8.4.3.3 Fisheries Habitat: Salmonid

The upper reaches of the **Douglas Stream** (upstream of the Moneygurney confluence) had some limited suitability for salmonids. However, the value of the stream as a salmonid bearing watercourse was diminished due to the shallow nature of the stream (often <5cm deep) and limited pool holding habitat. The stream would thus be considered poor to moderate (life cycle unit score of 3-4) as a holding and spawning habitat and slightly higher as a low value nursery (moderate *i.e.* life cycle unit score of 3) due to the aforementioned reasons (*i.e.* very shallow with limited pool areas to support fish during low water levels). Similarly, insufficient depths make spawning less viable as fish have limited cover and find access upstream difficult as few resting pools with sufficient water for movement upriver exist. Juvenile salmonid fish are also prone to higher stress during low water periods and often in streams with poor flow volumes can become extirpated during pollution events. Larger streams and rivers are much more resilient to pollution in peri-urban and urban areas in this respect. There were evident levels of organic enrichment in the upper Douglas Stream as the stream was achieving moderate status (Q3-4).

The **Moneygurney Stream** upstream of its confluence with the Douglas Stream was considered a much better nursery, holding and spawning habitat when compared with the upper reaches of the Douglas Stream. In this respect it would be considered moderate to good (life cycle unit score of 2 to 3) for all categories (*i.e.* holding nursery & spawning characteristics). The presence of well sorted medium gravels and cobble with low levels of siltation indicated good spawning for brown trout (*Salmo trutta*). The presence of better water depth 10cm-20cm in places would support a salmonid population. While holding habitat again was more localised, the stream had pools capable of supporting salmonids, albeit improvements could be made by installing new pools within the stream to provide better cover for fish during low water flows. Holding habitat was therefore moderate at best (life cycle score of 3). The Moneygurney Stream was considered a moderate to good nursery stream (life cycle score of 2-3) as it had a semi-natural profile with pool, glide and riffle habitat with ample cobble to provide refugia for small salmonids. Its value as a nursery and holding habitat however, as stated would be improved if water depths were greater and more pool habitat was present. The Moneygurney Stream also had moderate to good spawning areas (life cycle score of 2-3), that would be improved if holding pool habitat adjoining spawning gravels was deeper.

Below the confluence with the Douglas Stream the Moneygurney Stream, where the watercourse is known as the Ballybrack Stream the channel attains much higher volumes of water and pool habitat becomes more prominent. This significantly benefits salmonids. The stream continues to improve moving downstream as it forms a further confluence with the Donneybrook Stream near Ballybrack Heights. The presence of deeper pools undercutting the banks have extant wild brown trout populations that have existed for thousands of years and remain some of the last small stream urban brown trout populations in Cork City (pers. obs. R. Macklin). Trout are present in many of the pools as far downstream as Tesco (Douglas) where the stream becomes culverted. At this location an impassable weir (at least to salmonids) exists adjoining the parkland. It remains unknown whether European eel (*Anguilla anguilla*) can traverse the weir structure, however provisions for fish passage should be retrofitted in the system in the future. No eels were recorded in the Moneygurney Stream during electro-fishing surveys carried out as part of the EIS prepared for the M28 (RPS 2017). This may indicate the species finds passage difficult in the Moneygurney/ Ballybrack river system.

8.4.3.4 Fisheries Habitat: Lamprey

The Moneygurney Stream was far more suited to salmonids than brook lamprey (*Lampetra planerii*) due to its typical habitat characteristics (*i.e.* low siltation, large proportion of gravel and cobble substrate) and higher energy nature of the system. There were some very localised areas of lamprey ammocoete habitat in the Ballybrack Stream (*i.e.* downstream of the Moneygurney & Douglas Stream confluences). No lamprey suitability existed upstream of the confluence of the Moneygurney and Douglas Streams due to the stated higher energy environments. This was reflected by limited or absent soft sediment areas as stated.

The very localised areas of brook lamprey habitat in the Ballybrack Stream existed 50-100m downstream of the Moneygurney and Douglas Streams confluence (ITM 0570121, 0568465). At this location in the Ballybrack Stream, accumulations of fine silt had built up in small pool areas and could potentially support brook lamprey.

8.4.3.5 Fisheries Habitat: Evaluation

The **Douglas Stream** is considered a semi-natural watercourse with local channel modifications but retaining a good semi-natural profile as the broad-leaved woodlands bordering the stream and more limited encroachment from urbanisation have helped preserve it overtime. The stream is of limited value for salmonids and if present likely persist at low densities. The stream also achieved Q3-4 moderate status water quality and thus was not achieving target good quality water as required under the water Framework Directive. It may be considered of lower local importance by virtue of its fisheries, water quality and overall aquatic ecological value.

The **Moneygurney Stream** is considered a semi-natural watercourse with local channel modifications but retains a good semi-natural profile with riffle, glide and pool sequences that supports brown trout in its upper reaches (after RPS 2017), with confirmed visual presence downstream of the confluence with the Douglas Stream in the **Ballybrack Stream** also. The presence of habitat supporting wild brown trout and potentially European eels would indicate that both streams are of county importance particularly in light of good quality water (Q4) and the presence of an urban brown trout population. Rivers with Q4 water are also achieving target good status under the Water Framework Directive and are rare in urban or peri-urban areas such as Castletreasure.

8.4.4 Birds

8.4.4.1 Transect & Point Count Study

A total of 22 bird species were recorded during the transect and point count study, 21 within 50m of the observer with an additional species (Rook *Corvus frugilegus*) also recorded flying or >50m from the observer (see Table 8.4).

Blackbird *Turdus merula*, Jackdaw *Corvus monedula*, Woodpigeon *Columba palumbus*, Blue Tit *Cyanistes caeruleus*, Chaffinch *Fringilla coelebs* and Hooded Crow *Corvus cornix* had the highest overall relative abundance for the transect study; while Robin *Erithacus rubecula*, Wren *Troglodytes troglodytes*, Blackbird and Woodpigeon had the highest overall relative abundance for the point count study. Blackbird, Robin and Wren were the most widely distributed species, occurring on all transects and point counts between both surveys.

Table 8.4 Summary of bird species recorded during the transect & point count study.

Species	Transects: Overall Maximum Abundance	Point Counts: Overall Maximum Abundance
Blackbird <i>Turdus merula</i>	9	4
Blackcap <i>Sylvia atricapilla</i>	1	2
Blue Tit <i>Cyanistes caeruleus</i>	5	2
Chaffinch <i>Fringilla coelebs</i>	5	1
Chiffchaff <i>Phylloscopus collybita</i>	3	2
Coal Tit <i>Periparus ater</i>	3	2
Dunnock <i>Prunella modularis</i>	1	2
Goldcrest <i>Regulus regulus</i>	1	2
Great Tit <i>Parus major</i>	2	0
Greenfinch <i>Carduelis chloris</i>	1	0
Hooded Crow <i>Corvus cornix</i>	5	1
Jackdaw <i>Corvus monedula</i>	9	0
Magpie <i>Pica pica</i>	1	0
Reed Bunting <i>Emberiza schoeniclus</i>	1	0
Robin <i>Erithacus rubecula</i>	3	6
Rook <i>Corvus frugilegus</i>	0	Additional
Song Thrush <i>Turdus philomelos</i>	0	1
Swallow <i>Hirundo rustica</i>	3	0
Willow Warbler <i>Phylloscopus trochilus</i>	1	3
Woodpigeon <i>Columba palumbus</i>	6	4
Wren <i>Troglodytes troglodytes</i>	4	4
Yellowhammer <i>Emberiza citrinella</i>	1	0
Number of Species: 22	20	15

8.4.4.2 Birds Overall: Study Site & Historical

A total of 27 bird species are noted overall (see Table 8.5). This includes a further two species that were casually recorded during the other biodiversity surveys at the study site (Buzzard *Buteo buteo* and Jay *Garrulus glandarius*) and three species historically noted at the 1km national grid square overlapping the study site (Grey Wagtail *Motacilla cinerea*, Long-tailed Tit *Aegithalos caudatus* and Raven *Corvus corax*).

No Annex I species of the EU Birds Directive were recorded or are known to occur historically within the study area (see Table 8.5). Two Red-Listed species of high conservation concern in Ireland were noted; Grey Wagtail *Motacilla cinerea* and Yellowhammer *Emberiza citrinella*. Grey Wagtail is reliant on riparian habitats such as available at the Moneygurney and Douglas watercourses present at the study site and wider area. Yellowhammer may nest along the hedgerows/treelines and/or scrub at the site, although this species is also likely to be associated with arable crop habitats in the wider area being a seed-eater (although its young need an insect diet).

A total of four Amber-Listed species of medium conservation concern in Ireland were noted (see Table 8.5). While there are no suitable breeding sites for Swallow *Hirundo rustica* at the study site, this species is likely to nest at buildings in the wider area and forage at the study site. The study site supports habitats for the other Amber-Listed species.

Most bird species are protected under the Irish Wildlife Acts (1976 - 2012), where it is an offence to hunt, interfere with or destroy their breeding or resting places (unless under statutory licence/permission). Woody habitats of the study site (scrub, hedgerow, treeline, woodland) support suitable foraging, commuting, nesting and perching habitats for bird species in general, where such similar habitats are also present in the wider agricultural landscape (e.g. field boundaries). The study site is therefore considered to be of lower to higher local value for birds overall.

Table 8.5 Overall summary of bird species: study site & historical 1km records.

Species Name	Scientific Name	Data Source	BoCCI*
Blackbird	<i>Turdus merula</i>	Transect & Point Count Study, Historical W7068	Green
Blackcap	<i>Sylvia atricapilla</i>	Transect & Point Count Study	Green
Blue Tit	<i>Cyanistes caeruleus</i>	Transect & Point Count Study	Green
Buzzard	<i>Buteo buteo</i>	Casual Record	Green
Chaffinch	<i>Fringilla coelebs</i>	Transect & Point Count Study	Green
Chiffchaff	<i>Phylloscopus collybita</i>	Transect & PC Survey, Historical W7068	Green
Coal Tit	<i>Periparus ater</i>	Transect & Point Count Study, Historical W7068	Green
Dunnock	<i>Prunella modularis</i>	Transect & Point Count Study	Green
Goldcrest	<i>Regulus regulus</i>	Transect & Point Count Study	Amber
Great Tit	<i>Parus major</i>	Transect Study, Historical W7068	Green
Greenfinch	<i>Carduelis chloris</i>	Transect Study	Amber
Grey Wagtail	<i>Motacilla cinerea</i>	Historical W7068	Red
Hooded Crow	<i>Corvus cornix</i>	Transect & Point Count Study, Historical W7068	Green
Jackdaw	<i>Corvus monedula</i>	Transect Study, Historical W7068	Green
Jay	<i>Garrulus glandarius</i>	Casual Record, Historical W7068	Green
Long-tailed Tit	<i>Aegithalos caudatus</i>	Historical W7068	Green
Magpie	<i>Pica pica</i>	Transect Study, Historical W7068	Green
Raven	<i>Corvus corax</i>	Historical W7068	Green
Reed Bunting	<i>Emberiza schoeniclus</i>	Transect Study	Green
Robin	<i>Erithacus rubecula</i>	Transect & Point Count Study, Historical W7068	Amber
Rook	<i>Corvus frugilegus</i>	Point Count Study (additional)	
Song Thrush	<i>Turdus philomelos</i>	Point Count Study, Casual Record	Green
Swallow	<i>Hirundo rustica</i>	Transect Study	Amber
Willow Warbler	<i>Phylloscopus trochilus</i>	Transect & Point Count Study	Green
Woodpigeon	<i>Columba palumbus</i>	Transect & Point Count Study	Green
Wren	<i>Troglodytes troglodytes</i>	Transect & Point Count Study	Green
Yellowhammer	<i>Emberiza citrinella</i>	Transect Study	Red
Number of Species	27		

*after Colhoun & Cummins 2013

8.4.5 Mammals (non-volant)

Evidence of three non-volant mammal species was recorded at the study site, with an additional seven species historically recorded in the wider area (see Table 8.6).

Fox (*Vulpes vulpes*) activity at the study site was noted through some observations (trail cameras) and occasional signs (footprint). Rabbit (*Oryctolagus cuniculus*) activity at the study site was recorded through numerous observations (both in the field and trail cameras) and signs (burrows, droppings) throughout. Rabbit forms part of the prey base for Fox, where a Fox was noted at rabbit burrow entrances by a trail camera on one occasion. One sign of Bank Vole *Myodes glareolus* was noted through a broken hazelnut found within the wet woodland associated with Douglas watercourse.

American Mink *Mustela vison*, Badger *Meles meles*, Hedgehog *Erinaceus europaeus*, Stoat *Mustela erminea hibernica*, Otter *Lutra lutra*, Pygmy Shrew *Sorex minutus* and Red Squirrel *Sciurus vulgaris* have been historically recorded in the wider area (see Table 8.6). A significant decline in Otter usage is known in relation to watercourses <2 metres wide (see Reid *et al.* 2013, Bailey and Rochford 2006), where the watercourses here are typically 2-3 metres wide. While both watercourses associated with the study site may be of some ecological value for Otter and Mink in general, the sections of the watercourses present at the study site lack significant feeding opportunities and are more likely to be used for commuting and resting for both of these species.

No Badger *Meles meles* setts or signs (latrines, footprint) were noted at the study site, where the nearest known records are associated with the nearby N28 road with a sett also located in the vicinity of Moneygurney watercourse upstream of the study site (RPS 2017; see Table 8.6). While no setts were noted within the study site, the presence of a sett cannot be entirely ruled out due to the encroachment of relatively heavy scrub that was a limiting factor in looking for setts. Otherwise semi-natural woody habitat present at site (scrub, hedgerow, treeline and woodland) supports commuting, feeding, breeding and resting opportunities for all other mammal species historically noted in the wider area.

All of the mammal species mentioned above are relatively widespread and common nationally; apart from the introduced Bank Vole, which has a more south-western distribution nationally (see Lysaght & Marnell 2016, Marnell *et al.* 2009). The conservation status of Red Squirrel and Otter is currently considered to be 'Near Threatened'; Red Squirrel has experienced a significant decline of approximately 20% in its range since 1911, which is largely attributed to competition from the invasive Grey Squirrel (see Marnell *et al.* 2009), while Otter has undergone a 20-25% decline between 1980 and 2005 (see Marnell *et al.* 2009). With the exception of Fox, Rabbit, Bank Vole and American Mink - all of the other mammal species noted are legally protected by the Irish Wildlife Acts (1976 - 2012), where it is an offence to hunt or interfere with or destroy their breeding or resting places (unless under statutory licence / permission). Otter is also listed on Annex II and Annex IV of the EU Habitats Directive as a species requiring SAC designation and in need of strict protection.

The study site currently provides commuting (*i.e.* wildlife corridors), resting, breeding and feeding opportunities for a number of non-volant mammals, largely through the presence of woody habitat (scrub, hedgerow, treeline, woodland), and is therefore considered to be of lower to higher local value for mammals overall.

Table 8.6 Overall summary of mammal species: study site & historical 1km & 10km records.

Species	Occurrence at Study Site/Wider Area	Conservation Status
American Mink <i>Mustela vison</i>	Historically recorded at Moneygurney watercourse upstream of site W7067 1km square in 2015 after NBDC database.	Not assessed as a post-1500 introduction*
Badger <i>Meles meles</i>	Historically recorded at N28 road W7167 1km square as roadkill in 2009 & 2012 after NBDC database. A sett is known in the vicinity of Moneygurney watercourse upstream of the study site (RPS 2017).	Least Concern*; listed on the Irish Wildlife Acts.
Bank Vole <i>Myodes glareolus</i>	One sign (broken hazel nut) at riparian woodland associated with Douglas watercourse.	Not assessed as a post-1500 introduction*
Fox <i>Vulpes vulpes</i>	Some observations (trail camera) & occasional signs (footprint) at study site.	Least Concern*; no legal protection.
Hedgehog <i>Erinaceus europaeus</i>	Historically recorded at Carrigaline W76 10km square in 1990 after NPWS database.	Least Concern*, listed on the Irish Wildlife Acts.
Irish Stoat <i>Mustela erminea hibernica</i>	Historically recorded at Moneygurney townland W7167 1km square as part of Atlas of Mammals in Ireland 2010-2015 after NBDC database and Carrigaline W76 10km square in 1990 after NPWS database.	Least Concern*, listed on the Irish Wildlife Acts.
Otter <i>Lutra lutra</i>	Historically recorded at Carrigaline W76 10km square in 1990 after NPWS database.	Near Threatened*; listed on Annex II and Annex IV of EU Habitats Directive and the Irish Wildlife Acts.
Pygmy Shrew <i>Sorex minutus</i>	Historically recorded at Carrigaline W76 10km square in 1990 after NPWS database.	Least Concern*, listed on the Irish Wildlife Acts.
Rabbit <i>Oryctolagus cuniculus</i>	Numerous observations (incl. trail camera) & signs (burrows, droppings) throughout study site.	Least Concern*; no legal protection.
Red Squirrel <i>Sciurus vulgaris</i>	Historically recorded at Carrigaline W76 10km square in 1990 after NPWS database.	Near Threatened*; listed on the Irish Wildlife Acts.

* after Marnell *et al.* 2009.

8.4.6 Bats

8.4.6.1 Active & Passive Detector Study

A total of four bat species were confirmed using the study site during the active and passive detector study (see Table 8.7). There were also some recordings of *Myotis* sp. that could not be identified to species level on seven occasions, as well as some 50 kHz Pipistrelles that could not be discerned to pipistrelle species (see Table 8.7). While no additional bat species have been historically recorded in the wider area (after NBDC), this is more likely due to a lack of historical survey effort at the wider area rather than an actual absence of bats. Lundy *et al.* (2011) suggest that the study site is part of a landscape that has a moderate to high resource value for several bat species including Brown Long-eared *Plecotus auritus*, Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Leisler's Bat *Nyctalus leisleri*, Daubenton's Bat *Myotis daubentoniid* and Natterer's Bat *Myotis nattereri* and Whiskered Bat *Myotis mystacinus*; the main exceptions being Nathusius' Pipistrelle *Pipistrellus nathusii* and Lesser Horseshoe Bat *Rhinolophus hipposideros* as the study site is primarily outside of their known national distribution (see Roche *et al.* 2014).

Common Pipistrelle dominated overall activity recorded during the passive study followed by Soprano Pipistrelle and Leisler's Bat (see Table 8.7). 50kHz Pipistrelle registrations were recorded by all of the passive detectors, while unidentified *Myotis* registrations occurred at two passive detectors (P3 & P4 located along the Douglas Stream riparian corridor and a connected treeline respectively) and Natterer's Bat was only recorded by one passive detector (P6) which was located in woodland habitat (see Table 8.7). Bat registrations confirmed feeding and social behaviour for Common/Soprano Pipistrelle and Leisler's Bat.

All of the bat species noted at site are considered to be relatively widespread and common nationally (Roche *et al.* 2014, Marnell *et al.* 2009) and are largely considered to be of 'Least Concern' in terms of conservation status apart from Leisler's Bat (Marnell *et al.* 2009). Even though Leisler's Bat is common in Ireland, it is scarce in the rest of Europe such that Ireland is regarded as a stronghold for its worldwide population (Marnell *et al.* 2009). All bat species occurring in Ireland are legally protected under the Irish Wildlife Acts (1976 - 2012), where it is an offence to hunt or interfere with or destroy their breeding or resting places (unless under statutory licence / permission). Furthermore, all bat species are listed on Annex IV of the EU Habitats Directive as species requiring strict protection.

The study site currently provides commuting and feeding opportunities for bats through the presence of linear woody habitats, where non-woody open grassland habitat of the study site is of less ecological value for bats in general; the study site is therefore considered to be of lower to higher local value for bats overall.

Table 8.7 Summary of bat species recorded during active & passive detector study.

Species	Active	Passive 1	Passive 2	Passive 3	Passive 4	Passive 5	Passive 6
Common Pipistrelle <i>Pipistrellus pipistrellus</i>	56.4% (62)	38.6% (17)	87.7% (742)	82.4% (136)	52.5% (21)	46.0% (746)	57.8% (108)
Soprano Pipistrelle <i>Pipistrellus pygmaeus</i>	34.5% (38)	20.5% (9)	7.0% (60)	5.5% (9)	25.0% (10)	47.0% (761)	15.0% (28)
Pipistrelle @ 50kHz <i>Pipistrellus</i> sp.	2.7% (3)	4.5% (2)	0.2% (2)	0.6% (1)	2.5% (1)	0.1% (2)	2.7% (5)
Leisler's Bat <i>Nyctalus leisleri</i>	5.5% (6)	36.4% (16)	5.6% (48)	10.9% (18)	7.5% (3)	6.9% (111)	23.0% (43)
Natterer's Bat <i>Myotis nattereri</i>	0	0	0	0	0	0	1.6% (3)
Myotis Sp. <i>Myotis</i> sp.	0.9% (1)	0	0	0.6% (1)	12.5% (5)	0	0
Totals	100% (110)	100% (44)	100% (852)	100% (165)	100% (40)	100% (1620)	100% (187)

*Total bat registrations in brackets

8.4.6.2 Bat Roost Review

A total of 10 bat roost sites are known for the wider review area of the study site, none of which are within the study site. The closest site appears to involve a Leisler's roost site at a building c. 1.2 km from the study site. One of the roost sites in question includes the designated Leisler's Bat maternity roost of Templebreedy National School, Crosshaven pNHA. As previously outlined in Section 8.4.1.1, this pNHA is considered to be largely outside the normal foraging range of breeding Leisler's. It is considered highly likely that there are other undiscovered bat roosts in the wider area of the study site here, as there is a general gap of such information nationally.

The passive and active detector study did not indicate the presence of a bat maternity roost at the study site. While there are no structures present at site that could provide permanent roosting opportunities for bats, some of the mature trees present may potentially provide transient roosting opportunities for bats during the summer period.

8.4.7 Other Taxa

A total of 10 other taxa were noted during this study with numerous other taxa records also historically recorded in the wider area, three of which are of conservation interest (see Table 8.8).

Both of the threatened bee species (*Andrena nigroaenea* and *Nomada goodeniana*; see Table 8.8) historically recorded at/near the study site have experienced significant declines in range nationally, where they occur at a range of habitats (see Fitzpatrick *et al.* 2006). Although the near threatened Red-tailed Bumblebee is widespread and common nationally, it is showing some evidence of decline where its preferred habitats (coastal dunes and unimproved grasslands) are also in decline (see Fitzpatrick *et al.* 2006). In this case, all three of these conservation interest bee species appear to have been noted in association with disturbed areas of the study site and/or housing in the surrounding area (presumably associated garden/landscaped areas). The disturbed areas of the site largely relate to spoil/recolonising bareground habitats, which are modified habitat types that are transient in nature.

One additional other taxa species that is of conservation interest is the high impact invasive ladybird, Harlequin Ladybird *Harmonia axyridis*. This species has been historically recorded at/near the study site in recent years (see Table 8.8). Harlequin Ladybird is listed on the Third Schedule of the 2011 European Communities (Birds and Natural Habitats) Regulations, as a species of which it is a legal offense to introduce or disperse.

The study site currently provides resting, breeding and feeding opportunities for other taxa in general through a mixture of woody, grassy and disturbed habitats present; the study site is therefore considered to be of lower to higher local value for other taxa overall.

Table 8.8 Overall summary of other taxa species: study site & historical 1km records.

Species	Occurrence at Study Site/Wider Area	Conservation Status
Butterfly Species		
Common Blue <i>Polyommatus icarus</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Green-veined White <i>Pieris napi</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Meadow Brown <i>Maniola jurtina</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Peacock <i>Inachis io</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Red Admiral <i>Vanessa atalanta</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Ringlet <i>Aphantopus hyperantus</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Small Tortoiseshell <i>Aglais urticae</i>	Occasional observations at study site.	Least Concern ^{**} ; no legal protection.
Bee Species		
White-tailed Bumblebee <i>Bombus lucorum</i>	Occasional observations at study site.	Least Concern [^] ; no legal protection.
<i>Andrena nigroaenea</i>	Historically recorded in association with disturbed area of study site near Douglas watercourse in 2016 at W7067 1km square & Berkely housing estate to the north in 2017 at W7068 1km square after NBDC database.	Vulnerable [^] ; no legal protection.
Gooden's Nomad Bee <i>Nomada goodeniana</i>	Historically recorded in association with Berkely housing estate to the north in 2017 at W7068 1km square after NBDC database.	Endangered [^] ; no legal protection.
Red-tailed Bumblebee <i>Bombus lapidarius</i>	Occasional observations at study site. Historically recorded in association with disturbed area of study site near Douglas watercourse in 2015/2016/2017 at W7067 & W7068 1km squares, area with private road, houses & disturbed ground of study site near Moneygurney watercourse in 2015/2016 at W7068 1km squares and several other records at surrounding housing estate sites after NBDC database.	Near Threatened [^] ; no legal protection.
True Fly (Diptera) Species		
St Marks fly <i>Bibio marci</i>	Swarms throughout grassy areas of the study site.	No status assigned; no legal protection.
Beetle (Coleoptera) Species		
Harlequin Ladybird (<i>Harmonia axyridis</i>)	Historically recorded in association with private road with houses & disturbed area of study site near Moneygurney watercourse in 2015 at W7068 1km square & two other records at nearby Ardarrig/Claredon Brook housing estate sites in 2015/2017 after NBDC database.	No status assigned - invasive species; no legal protection - listed on the Third Schedule of the 2011 European Communities (Birds and Natural Habitats) Regulations as a species of which it is a legal offense to introduce or disperse.

^{**} after Regan et al. 2010

[^] after Fitzpatrick et al. 2006

8.5 Potential Impacts

The proposed development area is primarily of lower to higher local importance for biodiversity, with Moneygurney Stream and wet woodland associated with both watercourses of county importance.

Potential impacts on existing biodiversity of the site and wider area arising from the proposed residential development at Castletreasure/Maryborough townlands requires consideration. Such impacts can arise during the construction and/or operational phases of the proposed development and are considered below for each biodiversity aspect examined here, as well as the do-nothing and cumulative scenarios.

8.5.1 Designated Nature Conservation Sites

The study site is not part of any designated site nor does it require any resources from them; thereby ruling out any direct habitat loss at these conservation sites. Designated nature conservation sites occur in the wider area that are of national and international importance in relation to biodiversity evaluation. As outlined in Section 8.4.1 above, there is a potential link between the study site and the following designated nature conservation sites via surface-water and/or waste-water impacts: Cork Harbour SPA, Douglas River Estuary pNHA and Monkstown Creek pNHA.

As previously mentioned, a NIS in support of the AA process has been undertaken to consider whether significant effects on potentially relevant Natura 2000 sites are likely to arise in relation to the proposed development here (KES 2019) with key findings summarised in this EIAR.

8.5.1.1 Construction Phase Impacts: Surface-Water Run-Off

The construction phase of the proposed development has the potential to result in temporary surface-water run-off siltation or contamination of Douglas and Moneygurney Streams through the excavation/movement of earth and building material, and through other contaminants such as accidental fuel/oil spillage. The topography of the site will require considerable preparatory earthworks. Construction of the proposed development will require the removal of a large portion of the existing topsoil across the site and extensive earthworks to facilitate the construction of the dwellings, infrastructure service provision, road construction, surface-water storage systems and other related works. The stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development (see Chapter 6 of this EIAR). Where possible, excess soil will be reused on the site for construction of embankments/backfill to retaining structures etc. Although, there will be a significant export of earth materials from site that will be surplus to requirements. Excavated topsoil will be protected and temporarily stored in designated storage areas >20m away from surface water-features (watercourses) and steep slopes (see Chapter 6 of this EIAR). There will also be a requirement to cross the Moneygurney Stream at two separate locations by means of a vehicular and pedestrian bridge. The proposed bridge

designs and construction method have been prepared in accordance with IFI guidelines (2016; see Chapter 3 of this EIAR) where there will be no in-stream works or alterations to Moneygurney Stream or its banks. Other than the two bridge crossings of Moneygurney Stream and the western portion of the site closest to Douglas Stream, a 20m buffer will be maintained between the streams and the proposed works area, inside of which no construction activity or construction related storage will occur (see Chapters 2 & 7 of this EIAR). This buffer fulfils IFI's request for a 10m such buffer from all watercourses (see Chapter 1, and Appendix 1.1 of this EIAR). Where development occurs within 20m of either watercourse additional measures will be put in place to ensure maximum protection of the water-feature (see Chapters 2 & 7 of this EIAR).

The proposed site development works will be carried out in accordance with best practice regarding standard environmental protection (e.g. CIRIA 2010 and 2001) to prevent damaging run-off from the site, where implementation of construction phase soils and water management proposals will adequately reduce potential risks arising from site associated hydrological or water quality impacts on the Douglas and Moneygurney Streams (see Chapters 2, 6 & 7 of this EIAR, Section 8.6.3 of this chapter). The proposed construction phase surface-water management controls will be specific to the site, proposed works and Douglas and Moneygurney Streams. However, such controls will also serve to minimise potential construction phase run-off impacts into the wider downstream environment including Douglas Estuary/Lough Mahon transitional waterbody and associated Cork Harbour SPA and Douglas River Estuary pNHA - even if not primarily designed to address any particular risks to the estuary/transitional waterbody and designated sites as such. Therefore, no measures are specifically required to address risks to Cork Harbour SPA and Douglas River Estuary pNHA in this case. Taking the above into consideration, potential construction phase impacts in relation to surface-water run-off on designated sites are considered neutral.

8.5.1.2 Construction Phase Impacts: Waste-water/Foul Effluent

As already outlined in Section 8.4.1 above, construction [and operational] stage waste-water/foul effluent arising from the proposed development will be discharged into the public foul effluent network for treatment at Cork City WWTP when the site is connected to the public foul sewer network. This WWTP ultimately discharges into Cork Harbour at Lough Mahon, where Monkstown Creek pNHA and sections of Cork Harbour SPA are downstream of the WWTP discharge point. While improvement requirements are currently under consideration in relation to Cork City WWTP, ambient monitoring of transitional and coastal receiving waters indicates that discharge from the WWTP does not have an observable negative impact on water quality while WFD status remains moderate at all monitoring points (Irish Water 2018). Furthermore, a pre-connection enquiry has been received from Irish Water that confirms that the proposed waste-water connection can be facilitated (see Appendix 5B.1 of this EIAR). Taking the above into consideration, potential construction phase impacts on designated sites in relation to treated sewage from Cork City WWTP are considered neutral.

8.5.1.3 Construction Phase Impacts: Other Impacts

As outlined in Section 8.4.1.1 above, potential construction phase impacts on designated sites via other impacts such as the spread of invasive plant species, disturbance/displacement on relevant fauna and flooding/floodplain are not relevant here and are therefore considered neutral.

8.5.1.4 Operational Phase Impacts: Surface-Water Run-Off

Operational phase surface-water will be managed and controlled prior to discharge into the environment via a surface-water strategy that will incorporate sustainable drainage systems (SuDS) to reduce run-off including permeable paving parking areas, filter drains, drainage network with attenuation to greenfield run-off rates and associated hydrocarbon interceptors and grit sumps, outfalls set-back from the existing stream banks (see Chapter 7 of this EIAR).

Implementation of operational phase water management proposals will adequately reduce potential risks arising from site associated hydrological or water quality impacts on the Douglas and Moneygurney Streams (see Chapter 7 of this EIAR, Section 8.6.3 of this chapter). The proposed operational phase surface-water management controls will be specific to the site, proposed works and Douglas and Moneygurney Streams. However, such controls will also serve to minimise potential operational phase run-off impacts into the wider downstream environment including Douglas Estuary/Lough Mahon transitional waterbody and associated Cork Harbour SPA and Douglas River Estuary pNHA - even if not primarily designed to address any particular risks to the estuary/transitional waterbody and designated sites as such. Therefore, no measures are specifically required to address risks to Cork Harbour SPA and Douglas River Estuary pNHA in this case. Taking the above into consideration, potential operational phase impacts in relation to surface-water run-off on designated sites are considered neutral.

8.5.1.5 Operational Phase Impacts: Waste-water/Foul Effluent

Potential operational phase impacts on designated sites in relation to treated sewage discharge from Cork City WWTP are not considered relevant here for the same reasons outlined in the construction phase above (Section 8.5.1.2), such that potential operational impacts on the designated sites via treated sewage discharge from Cork City WWTP are considered neutral.

8.5.1.6 Operational Phase Impacts: Other Impacts

As outlined in Section 8.4.1.1 above, potential operational phase impacts on designated sites via other impacts such as the spread of invasive plant species, disturbance/displacement on relevant fauna and flooding/floodplain are not relevant here and are therefore considered neutral.

8.5.2 Habitats & Flora

No Annex I habitats listed under the EU Habitats Directive or botanical species protected under the Flora (Protection) Order 2015, listed in the EU Habitats Directive or red-listed in Ireland were recorded at the study site. The protected species Penny Royal has been previously recorded for the relevant 10km gird square overlapping the study site. As the main flowering period for Penny Royal is August to September, it is possible that Penny Royal may not have been recorded at potentially suitable habitat present at the north-eastern section of the study area (near Moneygurney Stream) as the field study occurred earlier in the summer.

The main habitats that will be directly impacted by the proposed development footprint include habitats of lower local importance (neutral grassland GS1, dense bracken HD1, wet grassland GS4, amenity grassland GA2, recolonising bare ground ED3 and spoil and bareground ED2) or of no ecological value (buildings and artificial surfaces BL3). One other modified habitat of lower local importance, ornamental/non-native shrubberies WS3, is largely outside of the main development footprint (*i.e.* forming boundary with adjacent properties). Semi-natural habitat of higher local importance includes hedgerows WL1, treelines WL2 and scrub WS1. Two semi natural eroding streams FW1 of lower local importance (Douglas Stream) and county importance (Moneygurney Stream) are also present. Wet Pedunculate Oak-Ash woodland WN4 associated with the Douglas and Moneygurney riparian corridors are also of county importance. Two crossings of Moneygurney Stream (one road & one pedestrian) are proposed that will incur associated wet woodland loss but no instream works (see Chapter 7 of this EIAR). Other than the two bridge crossings of Moneygurney Stream and the western portion of the site closest to Douglas Stream, a 20m buffer will be maintained between the streams and the proposed works area, inside of which no construction activity or construction related storage will occur (see Chapters 2 & 7 of this EIAR). Where development occurs within 20m of either watercourse additional measures will be put in place to ensure maximum protection of the water-feature (see Chapters 2 & 7 of this EIAR). Also, excavated topsoil will be protected and temporarily stored in designated storage areas >20m away from surface water-features (watercourses) and steep slopes (see Chapter 6 of this EIAR). Note that potential impacts on the aquatic ecology of these watercourses are considered in Section 8.5.3 below.

Stands of the highly invasive plant species Japanese Knotweed were noted at the study site. However, all Japanese Knotweed was removed in August 2018 through a new process known as 'Eraginate process' (see Appendix 8.4 for full details).

8.5.2.1 Construction Phase Impacts

Construction of the proposed residential development and associated works will result in the permanent removal/loss of all or sections of the following habitats:

- Neutral grassland GS1 - lower local importance
- Recolonising bare ground ED3 - lower local importance

- Spoil and bare ground ED2 - lower local importance
- Wet grassland GS4 - lower local importance
- Amenity grassland GA2 - lower local importance
- Dense bracken HD1- lower local importance
- Sections of hedgerow WL1/treeline WL2 - higher local importance (c. 732m length will be removed)
- Scrub WS1 - higher local importance (bar 3,014m² of scrub situated within the south eastern area of site that will be retained)
- Sections of Wet Pedunculate Oak-Ash Woodland WN4 - county importance, (c. 10,500m² of existing wet woodland will be removed)

There will be a permanent increase in modified habitat, buildings and artificial surfaces BL3, as a result of the proposed development which will lead to a slight negative impact on semi-natural habitats and flora species at the site and surrounding locality. There will be a permanent increase in ornamental/non-native shrubberies WS3 and amenity grassland (GA2) as a result of the proposed development. However, the landscape masterplan also proposes c. 2,995m² area of wildflower meadow planting as well as native grass/clover planting at grassed/amenity areas that can allow natural recolonisation by species from adjacent plant communities in time (if not over managed *e.g.* frequent cutting). It is also worth noting that the planting species mixes proposed by the landscape masterplan have taken account of native and non-native pollinator friendly species (see NBDC 2016). Therefore, this increase in modified habitats (ornamental/non-native shrubberies WS3 and amenity grassland GA2), will have a neutral impact on habitats and flora at the site and surrounding locality.

The permanent loss of habitats of lower local importance (wet grassland GS4, neutral grassland GS1, dense bracken HD1, recolonising bareground ED3, spoil and bareground ED2 and amenity grassland GA2) as a result of the proposed development will lead to a neutral imperceptible impact on semi-natural habitats and flora species at the site and surrounding locality. The loss of sections of non-native ornamental shrubberies WS3, (located within the development works footprint only) will have a neutral impact on semi-natural habitats and flora at the site and surrounding locality. The permanent loss of habitats of no ecological value (buildings and artificial surfaces BL3) will have a neutral effect on existing semi-natural habitats and flora at the site and surrounding locality.

The permanent loss of areas/sections of semi-natural habitat of higher local importance (scrub WS1, hedgerow WL1, treeline WL2) will have a slight negative impact on semi-natural habitats and flora at the site and surrounding locality. However, one section of scrub c. 3,014m² will be maintained towards the south east of the site. While c. 732m length of existing hedgerow/treeline will be permanently removed, the proposed development will also retain c. 1,139m length of existing hedgerow/treeline. A landscape masterplan developed as part of the development proposes to plant c. 1,100m length of hedgerow with several native hedgerow species; this will compensate for the loss of existing hedgerow/treeline as well as resulting in a net gain of native hedgerow at the study site (see Landscape Masterplan Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning

application). The proposed landscape masterplan also allows the opportunity to undertake supplementary planting of retained hedgerows/treelines as necessary, where current structurally poor sections would benefit greatly from this. The feasibility to successfully retain tree specimens/groups has been assessed as part of this project in respect of the proposed layout infrastructure and root protection areas (see Tree Survey Report, April 2019 by Cunnane Stratton Reynolds accompanying the planning application). Therefore, the loss of semi-natural habitats; hedgerow WL1, treeline WL2 and scrub WS2 will have a neutral imperceptible impact on habitats and flora at the site and the surrounding locality.

The proposed development will result in a permanent loss of c. 10,500m² area of existing wet woodland WN4 associated with both watercourses. The vast majority of this woodland loss relates to wet woodland WN4 associated with Moneygurney Stream due to new bridging requirements (one road & one pedestrian), the provision of an active amenity space as well as apartment accommodation and associated parking/access. The permanent loss of sections of wet woodland (c. 10,500m²) will have a significant negative impact on semi-natural wet woodland habitat and flora at the site and surrounding locality. The landscape masterplan includes for new native woodland planting of c. 14,626m² using species that form part of the existing woodland habitat (see Landscape Masterplan Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application). The proposed landscape masterplan also allows the opportunity to undertake supplementary native woodland planting of retained wet woodland; this includes replanting sections of wet woodland associated with Moneygurney Stream that were disturbed/removed in relatively recent times. The feasibility to successfully retain tree specimens/groups has been assessed as part of this project in respect of the proposed layout infrastructure and root protection areas (see Tree Survey Report, April 2019, by Cunnane Stratton Reynolds accompanying the planning application). While the proposed development will lead to the permanent loss of some existing wet woodland, this will be offset through new native woodland planting that will result in a net gain of native woodland at the study site. However, though the proposed new native woodland planting will offset against wet woodland removal to a degree, a significant negative impact on wet woodland habitat and flora at the site and surrounding locality will remain.

There will be no permanent loss of semi-natural eroding streams FW1 and as such potential impacts on eroding stream habitats and flora at the site and surrounding locality are considered neutral. Furthermore, no instream works are proposed for the crossings (one road & one pedestrian) at Moneygurney. Other than the two bridge crossings of Moneygurney Stream and the western portion of the site closest to Douglas Stream, a 20m buffer will be implemented for all remaining wet woodland during the construction phase where no machinery/construction traffic access, material storage or other construction related activities will occur. Where development occurs within 20m of either watercourse additional measures will be put in place to ensure maximum protection of the water-feature (see Chapters 2 & 7 of this EIAR). Also, excavated topsoil will be protected and temporarily stored in designated storage areas >20m away from surface water-features (watercourses) and steep slopes

As already mentioned, it is possible that the protected species Penny Royal may potentially occur at suitable damp and/or disturbed substrate towards the north-eastern area of the study site (*i.e.* wet grassland GS4, spoil and bareground ED2 near Moneygurney Stream). It is worth remembering that Penny Royal is occasional in Counties Kerry and Cork (rare elsewhere), where the nearest known contemporary location to the study site here is c. 4-5km south-east at Raffeen/Shanbally (after M28 data by RPS 2017). There is also the fact that adventive or non-native populations of Penny Royal are also known to occur around Cork City (O'Mahony 2001). It is proposed to assess the potential presence of native Penny Royal with a pre-works assessment at the potential areas of interest within the study site during its optimum flowering period (see Section 8.6.2 below). If native Penny Royal occurs, the loss of supporting habitats would have a significant negative impact on this protected plant species; however, such a significant negative impact can be wholly ameliorated (*i.e.* reduced to an acceptable level) through successful translocation to suitable receptor areas (see Section 8.6.2 below).

8.5.2.2 Operational Phase Impacts

No additional removal of habitat or flora are anticipated during the operational phase, such that no potential impacts are relevant in relation to habitat and flora loss in general.

The landscape masterplan associated with the development will also be relevant to the operational phase. As new native/non-native pollinator friendly meadow, grassland, hedgerow and woodland habitats mature in the long-term resulting in a net gain of such habitats at the study site, potential effects on habitats and associated botanical species at the study site are regarded as neutral. A net loss of wet woodland habitat will occur and while proposed new native woodland planting will offset this loss to some degree, it will not entirely compensate for it. Therefore, a significant negative effect on wet woodland habitat and associated flora at the study site and surrounding locality will remain relevant for the operational phase.

8.5.3 Aquatic Ecology

The potential impacts associated with the proposed residential development on the aquatic ecology of the receiving environment are presented below relative to the construction and operational phases of the project. The relevant streams (Douglas, Moneygurney and Ballybrack) have a semi-natural character where the latter two can be considered to be value to brown trout while also achieving good status Q4 unpolluted water quality. The Douglas Stream is achieving lesser, moderate status water quality (Q3-4). Under the Water Framework Directive (2000/60/EC) there can be no deterioration in the existing chemical or biological status of the receiving watercourses and thus the baseline water quality should not deteriorate as a result of the construction or operational phases of the development. It is also important to recognise that adjoining woodland and riparian habitats are critical for aquatic ecosystem health as they supply nutrients, woody debris and shading to streams while also capturing solids and slowing down water flows.

Baseline suspended solids values were low at all sampling sites of the Douglas, Moneygurney & Ballybrack Streams (<15mg/l). The construction phase presents the most serious risk of pollution due to suspended solids escapement during earthworks and bridge construction works adjacent to watercourses. Suspended solids can also bind to other pollutants and carry them downstream. Most importantly solids can reduce the viability of spawning areas for fish by damaging spawning redds (reducing oxygenation and impacting egg and fry survival). The operational phase may result in longer-term impacts including increased runoff rates (changing river hydrology and erosional and depositional patterns). It can also contribute to water quality decline from storm drain pollution (*i.e.* hydrocarbons, solids and other pollutants) that are collected from hard-surface drainage. These impacts and others are discussed in the respective construction and operational impact sections below.

A total of three surface-water outfalls are proposed (one into Douglas stream and two into Moneygurney Stream) where the locations of the outfalls and associated headwall structures are set back from the watercourse at the nearest associated wet woodland edge (see Chapter 7 of this EIAR). Two bridge crossings of the Moneygurney Stream (one road & one pedestrian) are proposed that will incur associated wet woodland loss but no instream works (see Chapter 7 of this EIAR). Other than the two bridge crossings of Moneygurney Stream and the western portion of the site closest to Douglas Stream, a 20m buffer will be maintained between the streams and the proposed works area, inside of which no construction activity or construction related storage will occur (see Chapters 2 & 7 of this EIAR). Where development occurs within 20m of either watercourse additional measures will be put in place to ensure maximum protection of the water-feature (see Chapters 2 & 7 of this EIAR). This buffer fulfils IFI's request for a 10m such buffer from all watercourses (see Chapter 1, and Appendix 1.1 of this EIAR). Also, excavated topsoil will be protected and temporarily stored in designated storage areas >20m away from surface water-features (watercourses) and steep slopes (see Chapter 6 of this EIAR).

8.5.3.1 Construction Phase Impacts

Site clearance and preparatory works during the construction phase will result in significant earthworks that increase the risk of silt laden water entering the Douglas and Moneygurney Streams. This would include access road construction, soil stripping, soil storage and temporary stream crossings *etc.* The contribution of short-term heavy silt loadings during the construction phase would overtime seriously degrade the quality of instream gravels and impact clean water invertebrate species. This could affect fish production indirectly or through the degradation of spawning gravels (reduced egg survival and also reduced feeding opportunities for young of the year fish). This could result in a short to medium term moderate negative impact on the aquatic biodiversity of the receiving watercourses. A worse-case scenario in terms of water would relate to an operational failure or unforeseen event such as unprecedented storm rainfall event that compromises surface water management on site (*e.g.* silt control devices). In the absence of mitigation, this could result in the escapement of large volumes of silt which would compromise downstream spawning areas (notably in the Moneygurney & Ballybrack Streams). This could result in a short to medium significant negative impact to the aquatic biota (fish & invertebrates) of the Douglas, Moneygurney & Ballybrack Streams.

Incorrectly installed temporary river crossings can block fish passage and change the erosional and depositional characteristics of a stream. The installation and removal of temporary crossings can also contribute to suspended solids escapement. Poor installation and removal of temporary crossings may result in a short-term slight to moderate negative impact to the receiving watercourses.

The incorrect storage of fuels, lubricants, hydraulic fluids, construction chemicals and cleaning products may result in an environmental accident or incident through spillage into surface water or groundwater pathways. Similarly, in-situ concrete pouring near a watercourse could cause direct toxicity to aquatic biota through alkalinity changes *etc.* According to the EPA (2004) guidance note on Storage and Transfer of Materials for Scheduled Activities, '*Facilities must be designed, installed, operated and maintained in such a manner that potentially polluting substances do not escape to the surrounding environment*'. In this respect, attention to land gradients, proximity to water and existing surface and or groundwater pathways (*i.e.* source - pathway - receptor) should be reviewed when choosing locations for chemical storage and or open soil and other material. The storage of chemicals including hydrocarbons, cement, hydraulic fluid and cleaning agents should not occur within 10m of watercourses to reduce the risk of entering surface waters should an unplanned event occur (see Enterprise Ireland, BPGCS005). A significant event could kill fish and invertebrate populations in the receiving watercourses. Such events are difficult to predict and are strongly reliant on good site practices, correct storage of chemicals, site security and correct implementation of the construction management plan (see outline in Chapter 2 of this EIAR), in addition to other standard operating plans (SOPs), emergency response plans *etc.* A pollution event from a chemical source could have devastating consequences for smaller stream habitats with lower inherent dilution capacities such as Douglas, Moneygurney & Ballybrack streams here. As such a medium-term moderate negative impact could occur, particularly in light of a large fish kill that would take many years to recover from.

A worse-case accidental spillage of fuel or construction chemicals *e.g.* cement, adhesives, cleaning products *etc.* may impact the receiving watercourses (*i.e.* Douglas, Moneygurney & Ballybrack Stream) in addition to aquatic receptors further downstream (*i.e.* Douglas Estuary). This would impact on the soil quality which, if left undetected, could contaminate subsoil and/or groundwater which would impact on the water quality of the aquifer under the site and may result in groundwater flow discharging at surface waters being contaminated. Direct entry into surface water pathways through overland flow or direct entry into the named watercourses through mal-practice on site may also result in a worse-case scenario event. However, given the nature of the proposed development and the absence of a requirement to store large volumes of fuel or chemicals on site, it is envisaged that such an impact would be temporary to short-term moderate effect on aquatic ecology.

Another potential worse-case environmental scenario would occur if the works undertaken in the vicinity of the Moneygurney and Douglas Streams were not correctly planned or undertaken resulting in the release of significant quantities of suspended solids or other construction contaminants to the watercourses. Without mitigation measures in place, impacts are likely to be short-term and significant negative.

8.5.3.2 Operational Phase Impacts

The new hard-surfaces created during the construction of the project could contribute to excessive runoff, encouraging erosion and impacting stream biota. Increased storm water flows could damage the spawning redds of brown trout and impact invertebrate populations, which could result in long-term moderate negative impacts to the receiving stream habitats.

Pollutants built up in hydrocarbon interceptors and rainfall storage areas may be liberated after dry periods and subsequent pulse rainfall events. These could when concentrated and in the absence of a maintenance regime, contribute to long-term moderate negative impacts to the receiving stream habitats.

Incorrectly designed and installed bridge crossings and or culvert headwalls could contribute to stream blockages and or poor fish passage. Blockage of fish migration during spawning could affect brown trout spawning and recruitment. This could result in a long-term moderate negative impact to the fisheries value of the receiving watercourses.

8.5.4 Fauna: Birds, Mammals (non-volant), Bats & Other Taxa

The study site is of lower to higher local importance for fauna overall, supporting habitats of ecological interest/value for some species of conservation interest. Red-Listed Grey Wagtail is reliant on riparian habitats as associated with Moneygurney and Douglas watercourses of the study site. Both watercourses associated with the study site may also be of some ecological value for the Near Threatened Otter in relation to commuting and resting opportunities. Wet woodland associated with both watercourses may also support the Near Threatened Red Squirrel that has historically occurred in the wider area. While the Red-Listed Yellowhammer may nest along the hedgerows/treelines and/or scrub at the site, this seed-eater is also likely to be associated with arable crops of the wider area (although its young need an insect diet). Both of the threatened bee species, *Andrena nigroaenea* and *Nomada goodeniana*, and Near Threatened Red-tailed Bumblebee are associated with disturbed areas of the study site and/or housing in the surrounding area (presumably associated garden/landscaped areas). The disturbed areas of the site largely relate to spoil/recolonising bareground habitats; these are modified habitat types that are transient in nature.

Woody habitats (scrub, hedgerow, treeline, woodland) present at the study site provide commuting (*i.e.* wildlife corridors), resting/roosting, breeding and feeding opportunities for fauna in general. Some existing mature trees may potentially provide transient roosting opportunities for bats, while unmanaged grassy and disturbed habitats provide opportunities for other taxa as well.

8.5.4.1 Construction Phase Impacts

The permanent loss of woody, grassy and disturbed habitats arising from construction of the development will negatively affect fauna through reduced commuting, resting/roosting, breeding and feeding opportunities, the loss of

which will be undertaken in four phases overall over a 4-5 year-period. Such habitats are available in the surrounding farmland as well as garden/parkland habitats of the urban environment such that affected fauna can move into the wider area as development phases progress. This also includes the potential loss of Badger setts; although not found at the study site, occurrence cannot be ruled out due to the limiting accessibility factor posed by relatively heavy scrub.

The removal of woody vegetation during the bird nesting season has the potential to cause injury, fatality or nest failure of adult birds and eggs/chick. While fatality for adult nesting birds is unlikely as they can escape, eggs and chicks are likely to suffer fatality in such a scenario. The significance of such impact on nesting birds depends on variables involved such as scale (number of affected nests), seasonal timing (the later the season, the less likely that nesting pairs will try another breeding attempt for that season) and species (multi or single brooders, conservation concern). In general terms here, a significant/very significant negative temporary effect is possible for bird nests that fail due to woody vegetation removal during the bird nesting season.

While c. 732m length of existing hedgerow/treeline will be permanently removed to facilitate the proposed development, this will be compensated by the planting of c. 1,100m length of new hedgerow with several native hedgerow species that will result in a net gain of native hedgerow at the study site as part of the overall proposed landscape masterplan (see Landscape Masterplan Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application). Also, the proposed landscape masterplan allows the opportunity to undertake supplementary native planting of retained hedgerows/treelines as necessary, where the proposed development will retain c. 1,139m length of existing hedgerow/treeline. Existing structurally poor sections will greatly benefit from such native enhancement supplementary planting. The proposed development will also result in a loss of c. 10,500m² area of existing wet woodland associated with both watercourses (largely Moneygurney Stream). While this will lead to a permanent loss of existing wet woodland, the loss in question will be offset to some degree by new native woodland planting of c. 14,626m² using primary native species that occur at existing wet woodland habitat, which will result in a net gain of native woodland at the study site (see Landscape Masterplan Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application). The proposed landscape masterplan also allows the opportunity to undertake supplementary native woodland planting of retained wet woodland; this includes replanting sections of wet woodland associated with Moneygurney Stream that were disturbed/removed in relatively recent times. It is important to highlight that the feasibility to successfully retain tree specimens/groups (part of hedgerows, treelines, woodland being retained) has been assessed as part of this project in respect of the proposed layout infrastructure and root protection areas (see Tree Survey Report, April 2019 by CSR accompanying the planning application). New areas of wildflower meadow planting (c. 2,995m²) as well as native grass/clover planting at grassed areas that can allow natural recolonisation by species from adjacent plant communities in time (if not over managed *e.g.* frequent cutting) are also proposed as part of the landscape masterplan (see Landscape Masterplan Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application). It is also worth noting that the planting species mixes proposed by the landscape

masterplan have taken account of native and non-native pollinator friendly species that will greatly benefit and support pollinators that are vital for crop, fruit and vegetable production as well as the general health of our environment (see NBDC 2016). Otherwise, all other existing habitats will be permanently lost bar c. 3,014m² area of scrub at the south-eastern area of the study site. Proposed new/supplementary native/non-native pollinator friendly planting will enhance the availability and quality of woody, grassy, parkland and flower/shrub habitats that fauna can use in general, as well as maintaining wildlife corridors to provide a necessary and essential role for the movement of fauna to fulfill their various ecological needs and support species richness.

The permanent loss of mature trees can potentially negatively affect bats through reduced transient roosting opportunities. In this case, there will be a loss of trees to facilitate the development that may include trees of potential relevance to such transient bat roosting opportunities; it is proposed to assess this with a pre-felling assessment (see Section 8.6.4.1 below). Where trees due for felling are identified as potentially providing supporting transient bat roosting opportunities, such trees can be appropriately felled in accordance with best practice guidelines (*e.g.* NRA 2005b). The loss of such trees is unlikely to be of significance in relation to transient bat roosting loss given the significant retention of other trees at the study site where bat roosting opportunities are possible combined with the proposed installation of bat boxes as a precautionary mitigation measure (see Section 8.6.4 below).

Works and associated activities arising from the development will lead to a disturbance of fauna through displacement at and close to the study site. For bats such disturbance displacement also arises from artificial light used during the construction stage, where most bat species are negatively affected by artificial light in general (see Bat Conservation Ireland 2010, Stone 2013). As previously mentioned, similar habitats are available in the surrounding landscape so that affected fauna can move into the wider area as development phases progress and move back to the site and adjoining area as phases are complete and landscaped areas are planted. In relation to potential disturbance/displacement of Badger that may use the study site as part of their territory; this species is active during the hours of darkness and as such would be active outside of the construction hours here when associated construction activities will have ceased.

Taking the above into consideration, potential effects on fauna at the site arising from the construction of the proposed development are primarily considered slight negative due to habitat loss and reduction of associated opportunities presently available, and possibly significant/very significant negative temporary for bird nests that fail due to the removal of woody vegetation during the bird nesting season.

8.5.4.2 Operational Phase Impacts

There will be an on-going level of disturbance potentially affecting fauna species during the operational phase of the proposed development, although such affected fauna will be able to move into the surrounding landscape where similar habitats are present. As per the construction phase, the landscape masterplan associated with the development will also be relevant to fauna

(including pollinators) for the operational phase by retaining and creating new woody, grassy, parkland and flower/shrub habitats (see Landscape Masterplan Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application). Proposed new/supplementary native/non-native pollinator friendly planting will enhance the availability and quality of habitats that fauna can use in general, as well as maintaining wildlife corridors to provide a necessary and essential role for the movement of fauna to fulfill their various ecological needs and support species richness. As no further tree removal is required during the operational phase, potential impacts on tree-based bat roosts are not relevant.

Operational stage disturbance effects also include disturbance to bats arising from artificial light spillage into the environment from the associated lighting scheme. Lighting types that emit a narrow spectrum with no UV (e.g. low pressure sodium) attract relatively less insects than broad spectrum types with high or low UV (e.g. high pressure sodium, Metal halide and mercury; see Bat Conservation Ireland 2010, Stone 2013). Therefore, the narrow spectrum types with no UV have a relatively lower impact on bats by not attracting their insect prey base away from the nearby habitats where bats will be searching for prey (see Bat Conservation Ireland 2010, Stone 2013). The use of directional lighting and luminaire accessories (shield, louvre) are also very successful approaches to reducing light spillage nuisance into the surrounding environment (see Bat Conservation Ireland 2010, Stone 2013, BCT & ILP 2018) in relation to bats. Of course, minimising light spillage nuisance also benefits other fauna that are active/resting at night. In this case, areas of the study site that are considered sensitive to artificial lighting in relation to bats coincide with linear woody habitats or wildlife corridors; this has been taken into account by the proposed public lighting design for the residential scheme (see OCSC 2019).

No perimeter wide fencing is proposed as part of the development, with only some sections of permanent security fencing required internally (for example, in association with retaining walls). Therefore, access for small and medium sized mammals will be maintained throughout the study site (including wildlife corridors) during the operational phase of the residential development.

Taking the above into consideration, potential effects on fauna at the study site arising from the operation of the proposed residential development are considered neutral and not significant as new planting/landscaping matures and neutral imperceptible where the lighting scheme ensures that artificial light spillage is kept to a minimum.

8.5.5 Do-Nothing Scenario

If the existing unmanaged regime in relation to vegetation continues to persist at the study site in terms of a 'do-nothing' scenario, then the site will primarily continue to be of lower to higher local importance for biodiversity, with Moneygurney Stream and wet woodland associated with both watercourses continuing to be of county importance. In such a scenario, however, it is very likely that scrub habitat present will continue to encroach and expand on other existing unmanaged open habitats (grass and bareground habitats) in the short-term to long-term/permanent.

Another possible 'do-nothing' scenario is where some of the proposed development lands revert back into agricultural pasture management. This would likely contribute some level of pollutants (e.g. enrichment) of the Moneygurney, Douglas & Ballybrack streams from overland flow (rainfall) carrying nutrients and solids from the farmland. While some levels of natural attenuation in soils and grassy areas would occur, appreciably some increases in nutrients and solids would occur above what would be expected in the absence of grassland improvement for farming. The water quality of the Moneygurney, Ballybrack and Douglas Streams would likely hold their current water quality of Moderate to Good Status.

However, a change from current management regimes (including trends currently evident in the wider environment) is most likely to involve future residential development (as proposed here) given the residential development objectives set out for the site under SE-R-06 within Cork City South Environs of the Ballincollig Carrigaline Municipal District Local Area Plan in relation to CCC 2017.

8.5.6 Cumulative Effects

The proposed development comprises of a residential development and all associated site development works such as landscaping, lighting, services, access arrangements and surface/foul water drainage and network system. There are a number of other developments in the vicinity of the site that are currently permitted, proposed (i.e. decision still pending) or permitted but under appeal/judicial review, which are not yet commenced or completed including; (i) permitted but under judicial review M28 Bloomfield to Ringaskiddy (under Ha 0053); (ii) proposed Greenway improvements (under Part 8 pending), (iii) permitted 24 class-room Primary School (under 18/5369 & ABP-302924-18), (iv) permitted Lidl Discount shop with 5 apartments (under 18/5814), (v) permitted but under appeal 48 residential units at Clarendon Brook (under 18/6245), (vi) proposed 600 pupil secondary school (under 18/6246) and (vii) permitted 200 residential units at Maryborough Ridge Moneygurney (under 16/07271). Consequently, there is a potential for cumulative impacts on biodiversity arising from the combined impacts of all these other developments.

8.5.6.1 Habitat Loss/Change

The biodiversity value of the proposed development site in question here is primarily of lower to higher local importance for biodiversity. While there are some habitat elements of county importance present, the removal of such habitats will be confined to areas of wet woodland associated with both watercourses to facilitate the development under consideration. The landscape masterplan associated with the development proposes to retain and enhance existing hedgerows/treelines and plant new native hedgerows and woodland resulting in a net gain of such habitats (including wildlife corridors), along with a gain in new wildflower meadows, native grass/clover areas as well as parkland and flower/shrub habitats using native/non-native pollinator friendly planting. However, there will be a net loss of existing wet woodland and while this will be offset to some degree by new native woodland planting, it will not entirely be compensated for at the same time. Existing wet woodland may also be

negatively impacted through direct loss with some of the other developments under consideration (school proposed under 18/5369 & ABP-302924-18; proposed greenway), although the extent will be substantially less and relatively minor in comparison to the residential site under consideration here. Otherwise habitat loss for the remaining other developments appears to be of either no/little biodiversity value or of local value that can be offset/improved through appropriate landscaping proposals. Therefore, potential cumulative impacts in respect of loss/change in habitat and associated flora and fauna primarily relate to the loss of wet woodland associated with Douglas and Moneygurney Streams in relation to the residential site under consideration here.

8.5.6.2 Aquatic Ecology: Douglas, Moneygurney & Ballybrack Streams

Cumulatively, these other proposals should have a non-significant negative effect on the aquatic ecology of the Douglas, Moneygurney & Ballybrack Streams, with the exception of the M28 Bloomfield to Ringaskiddy road. This is considered as the M28 road will involve diversion of the Moneygurney Stream in addition to road drainage. Residual impacts from the M28 according to the EIS prepared by RPS were considered 'not significant'. However, in combination short term Slight Effects are considered likely on the Moneygurney and downstream Ballybrack Streams during the construction phase (i.e. 'noticeable changes to the environment without changing its sensitivities'). This is considered based on an objective working knowledge of large infrastructural projects when taking into account the scale of both projects and proximity to the connecting watercourses.

The in-combination effects of the operational phase are however, considered imperceptible on the Moneygurney, Ballybrack and Douglas Streams. This is considered given a conversion of the existing improved grassland (which itself can contribute to water quality decline) to hard surfaces (with surface water attenuation from surface water drainage) and treatment of road drainage on the proposed M28 (no existing treatment or attenuation measures on existing N28).

When viewing in combination effects during construction and operation on the Douglas Streams, impacts are however, considered imperceptible. This is considered given poor connectivity between the stream and other developments in addition to its lower overall ecological value.

8.5.6.3 Off-Site Water-Features: Designated Nature Conservation Sites

Potential off-site cumulative effects arising from the proposed development here includes surface-water and foul effluent inputs into Douglas Estuary/Lough Mahon transitional waterbody and associated designated sites (Cork Harbour SPA, Douglas River Estuary pNHA and Monkstown Creek pNHA); where biodiversity/qualifying interests associated with these aquatic sites could be subject to cumulative impact through hydrological or water quality impacts such as increased siltation, nutrient release, contaminated run-off arising from other housing development sites.

The current Cork County Development Plan outlines a county-based objective in relation to the management of surface water by new developments through the incorporation of SuDS (Section 11.5 & Objective WS 5-1; CCC 2014). The surface-water management proposals incorporated into the development here compliments the Cork County Development Plan objective through the inclusion of SuDS related aspects such as greenfield attenuated storm-water, hydrocarbon/silt containment, permeable paving, separation of surface and foul water. The current Ballincollig Carrigaline Municipal District Local Area Plan also makes reference to an objective for new development within Cork City South Environs to adequately provide for storm-water disposal (Objective SE-GO-04; CCC 2017).

While improvement requirements are currently under consideration in relation to Cork City WWTP and waste-water/foul effluent treatment, ambient monitoring of transitional and coastal receiving waters indicates that discharge from the WWTP does not have an observable negative impact on water quality while WFD status remains moderate at all monitoring points (Irish Water 2018). Furthermore, a pre-connection enquiry has been received from Irish Water that confirms that the proposed waste-water connection here can be facilitated, where all new developments have to check if connection to Cork City WWTP can be facilitated through Irish Water's pre-connection enquiry process.

Assuming that all other developments closely adhere to best practice regarding soil and water management during construction and operational phases, as proposed by the development under consideration here, then significant negative cumulative impacts are considered unlikely in relation to off-site water-features and associated designated nature conservation sites.

8.6 Mitigation

8.6.1 Designated Nature Conservation Sites

No particular mitigation measures are required in relation to designated nature conservation sites during the construction and operational phases.

8.6.2 Habitats & Flora

8.6.2.1 Construction Phase

- No removal of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff. Other than the two bridge crossings of Moneygurney Stream and the western portion of the site closest to Douglas Stream, a buffer zone of 20m will be maintained between the works area and both streams. Designated temporary storage areas for

any excavated spoil will be at least 25m away from the Douglas and Moneygurney Streams.

- As per the proposed Landscape Masterplan (see Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application), new landscaping will take existing native tree/shrub species representative of the study site and soil conditions as well as non-native pollinator friendly species into account (see NBDC 2016), and also ensure that new planting connects to woody habitat/other vegetation in order to maintain and provide connectivity for fauna via wildlife corridors.
- Existing trees being retained at/near the site will be protected in line with current guidelines (e.g. NRA 2006a).
- A pre-works (including enabling, clearance or other construction related activities) survey for native Penny Royal will be undertaken by a suitably qualified/experienced ecologist at potentially suitable locations at the study site, during the optimum flowering survey period (August to September inclusive). Any areas where native Penny Royal are noted will be cordoned off in the field to allow easy identification for all site staff and thereby ensure protection from inappropriate disturbance/loss (e.g. erect a notice and hazard tape). A translocation management plan will then be drawn up and implemented by a suitably qualified/experienced ecologist in accordance with best practice guidelines and in consultation with NPWS where relevant (e.g. translocation licence) using suitable receptor areas within the study site where possible.

8.6.2.2 Operational Phase

- No particular mitigation measures are required in relation to Habitats & Flora during the operational phase.

8.6.3 Aquatic Ecology

8.6.3.1 Construction Phase

- To minimise the impact of the construction phase on the water environment, soils and water management measures will be implemented (see Chapters 2, 6 & 7 of this EIAR). This includes measures relating to the storage and management of potentially polluting substances (e.g. chemicals, hydrocarbons, cement, hydraulic fluid and cleaning agents).
- In advance of all site clearance and soil stripping, a siltation management plan will be prepared and implemented in full. This will include silt fences and settlement ponds that are sized and positioned in order to minimise pollution escapement and maximise attenuation efficiency. The performance of such devices will be reviewed and upgraded as appropriate by suitably qualified staff. The construction footprint will be fenced to prevent ingress of machinery within 20m of watercourses with the exception of areas for bridging construction

works or unavoidable 'pinch points' (e.g. western portion of the site closest to Douglas Stream). The zone between the fence and river will not be interfered with, as adjoining woodland and riparian habitats are critical for aquatic ecosystem health.

- All temporary crossings constructed will be agreed with Inland Fisheries Ireland to ensure appropriate culvert size, burial depth, width etc. This will reduce the potential for solids to enter watercourses and facilitate fish passage. Silt fences and other control measures will tie into temporary crossings to prevent 'weak points' where silt laden water can enter the adjoining streams.
- The suspended solids control measures will follow best practice guidance: (i) Technical Guidance C532: Control of Water Pollution from Construction Sites (CIRIA 2001); (ii) Technical Guidance C648: Control of Water Pollution from Linear Construction Projects (CIRIA 2006) and (iii) Guidelines for the protection of Fish during construction works in and adjacent to waters (IFI 2016).
- The suspended solids levels will aim to remain below 25mg/l as per the Guidelines on Protection of Fisheries during construction works in and adjacent to waters (IFI 2016). The same guidance also specifies that there will be no deposition of silts resulting from construction works on the gravels of the receiving watercourses.
- Significant works/earthworks near water will not take place if storm rainfall events are predicted (e.g. >10mm/hr, >25mm in a 24hour period) as heavy rain will significantly increase the risk of suspended solids escapement to the adjoining stream habitats.
- Concrete pouring will be undertaken in the dry and away from surface-water pathways. Ready mix trucks will not be washed on site. *In-situ* mixing will use faster setting concrete. When using *in-situ* concrete near watercourses an approach will be agreed with IFI as it presents a risk to fish and invertebrates should residues enter the receiving watercourses (i.e. Douglas, Moneygurney & Ballybrack Streams here).
- All structural/bridge designs adjacent to/within watercourses (including method of construction and proposed mitigation measures to prevent damage to riparian habitats and instream fisheries habitat) will be agreed with Inland Fisheries Ireland to minimise impacts to the riverbed, riparian zone and fish. In such an approach the design of such structures will not encourage downstream erosion or deposition, as such hydrological impacts to the channel will not occur and instream works will be avoided as the channel widths in this case are small.
- Instream works will only take place between July and September (IFI 2016, p. 16). However, the precise allowable timing of instream works can vary between regions and will be agreed with IFI in advance of construction commencement.
- An ecological clerk of works (ECoW) will be present during all bridge crossing construction, but also for culvert/outfall headwall construction near watercourses or indeed any works potentially presenting a serious risk to water quality.
- An emergency response plan will be prepared to ensure accidental or intentional spillages (e.g. security breach) of chemicals can be dealt with to minimise harm to the environment. This will include suitably trained

and qualified personnel, the availability of spill kits and suitable means of disposal.

8.6.3.2 Operational Phase

- Operational phase mitigation for aquatic ecology will broadly follow measures stipulated in Chapter 7 of this EIAR (which should be read in conjunction with this chapter). The mitigation measures include surface water runoff at greenfield rates using adequately sized attenuation facilities etc. for storm runoff and attenuation of the collected runoff. This includes the use of integrated silt traps and petrol interceptors. These structures will be inspected and maintained. Maintenance will prevent the excessive build-up of sludge that can be removed to reduce the risk of pollution during storm rainfall events (particularly after dry periods). A maintenance plan and schedule will therefore be developed for silt traps and hydrocarbon interceptors to prevent impacts to the receiving stream habitats due to operational failures.

8.6.4 Fauna: Birds, Mammals (non-volant), Bats & Other Taxa

8.6.4.1 Construction Phase

- Subject to other environmental concerns (e.g. soil and water management), and as far as is reasonable, the removal of woody vegetation (hedgerow, treeline/trees, scrub & woodland) will not be undertaken during the bird breeding season (currently defined by the Irish Wildlife Acts 1976 – 2018 as March 1st to August 31st inclusive); this will protect nesting birds and eggs/chicks from disturbance (especially through nest failure), injury, fatality.
- In tandem with study site clearance (as part of enabling, construction or other associated works), a suitably qualified/experienced ecologist will supervise/check areas where hedgerow, treeline, scrub & woodland removal is due to identify potential unforeseen wildlife issues (e.g. unknown badger sett, Harlequin Ladybird *Harmonia axyridis* infestation) so that appropriate measures can be undertaken in accordance with best practice guidelines and in consultation with NPWS where relevant (e.g. derogation licence for removal or works in the vicinity of a Badger sett; see NRA 2005a).
- Where a fauna species is found actively using the development footprint for breeding/resting (e.g. bird nest, bat roost, Badger sett) during study site clearance/construction phase, relevant works will cease immediately, and the area will be cordoned off until advice is sought from a suitably qualified/experienced ecologist.
- To minimise disturbance to fauna that are roosting/resting or active at night, construction operations during the hours of darkness will be kept to a minimum.
- Where open excavations must be left in-situ overnight, measures will

be taken to ensure that mammals do not become inadvertently trapped and potentially injured within such open excavations. Such measures (covering, fencing off, allowing access/egress) will be decided under the advice of a suitably qualified/experienced ecologist at construction stage.

- Trees due for felling will be assessed in advance by a suitably qualified/experienced ecologist in accordance with best practice guidelines (e.g. BTHK 2018) to identify tree specimens with potential to support bat roosts, all of which will be marked in the field to allow easy identification for all site staff and thereby ensure protection from inappropriate felling (e.g. erect a notice as per NRA 2005b). The subsequent felling of all trees with potential to support bat roosts will be undertaken under the advice/supervision of a suitably qualified/experienced ecologist in accordance with best practice guidelines (e.g. NRA 2005b) and in consultation with NPWS where relevant (e.g. derogation licence to remove bat tree roost; see NRA 2005b).
- At least one month prior to the commencement of construction related works (as part of enabling, construction or other associated works) a minimum of twenty woodcrete (or equivalent) bat roosting boxes will be erected on suitable trees of woodland being retained that is associated with Douglas and Moneygurney Streams at the study site. The box type(s), location and installation of the bat boxes will be undertaken under the advice/supervision of a suitably qualified/experienced ecologist in accordance with best practice guidelines (e.g. Aughney 2008, NRA 2006b).
- All bat boxes installed will be monitored every two years post-installation by a suitably qualified/experienced ecologist to check for usage and to conduct maintenance as appropriate in accordance with best practice guidelines (e.g. Aughney 2008) and under NPWS derogation licence (which will be in place prior to monitoring). Usage of the boxes by bats will be reported to Bat Conservation Ireland and NPWS. As the overall development will take c. 4-5 years, post-installation bat box monitoring will be relevant to the construction phase.
- The study site will not be floodlit during the construction phase; instead all lighting systems will be designed to minimise light spillage nuisance by using shielded, downward directed lighting wherever possible and switching off all non-essential lighting during the hours of darkness. This will benefit bats as well as other fauna generally active at night Public Lighting Report, C874-OCSC-XX-XX-RP-E-0001-S8-P01.
- As per the proposed Landscape Masterplan (see Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application), landscaping will include Hazel *Corylus avellana* as part of the native woodland planting mix to allow a year-round food supply for Red Squirrel of the wider area that may use the existing on-site wet woodland riparian corridors of the Douglas and Moneygurney Streams. As per the Landscape Masterplan, new landscaping will take existing native tree/shrub species representative of the study site and soil conditions as well as non-native pollinator friendly species into account (see NBDC 2016), and also ensure that new planting connects to woody habitat/other vegetation in order to maintain and provide connectivity for fauna via wildlife corridors.

8.6.4.2 Operational Phase

- Until the development is taken in charge by the Local Authority, the developer will be responsible for ensuring that all bat boxes installed will be monitored every two years post-installation by a suitably qualified/experienced ecologist, to check for usage and to conduct maintenance as appropriate in accordance with best practice guidelines (e.g. Aughney 2008) and under NPWS derogation licence (which will be in place prior to monitoring). Usage of the boxes by bats will be reported to Bat Conservation Ireland and NPWS. After the development is taken in charge, monitoring procedures for the bat boxes will become the responsibility of the Local Authority.
- As per the proposed lighting design plan (see OCSC 2019), the operational phase lighting scheme will be designed to minimise light spillage nuisance on retained/new wildlife corridors by using shielded, downward directed lighting wherever possible, switching off all non-essential lighting during the hours of darkness, using narrow spectrum lighting types with no UV and luminaire accessories (backlight shielding plates). This will benefit bats as well as other fauna active/resting at night.

8.7 Monitoring

8.7.1 Construction Phase Monitoring

A suitably qualified/experienced ecologist will be engaged in the role of Ecological Clerk of Works (ECoW) for the construction phase of the project, whose role will include the following monitoring in relation to relevant proposed mitigation measures (as outlined in Section 8.6) and liaising with relevant experts/team-members where required;

- Adherence to the proposed 20m buffer zone between the works area and both Douglas and Moneygurney Streams and proposed distances of at least 25m between designated temporary storage areas for any excavated spoil and both streams.
- Review new landscaping to ensure it is in line with/equivalent to proposed mitigation regarding native tree/shrub species, non-native pollinator friendly species and wildlife corridor connectivity.
- Ensure that retained trees are adequately protected.
- Ensure that the pre-works survey for native Penny Royal is undertaken with subsequent protection and translocation where relevant.
- The site-specific Construction Management Plan will incorporate mitigation measures as outlined in Chapter 2 of this EIAR, which will include monitoring of construction related activities during the construction phase. The ECoW will monitor water quality during critical stages of the construction schedule including soil stripping and works adjacent to watercourses. It is recommended that suspended solids and turbidity at a minimum are monitored at these stages. Visual checks of the riverbed of the Moneygurney and Ballybrack Streams should also be

undertaken to ensure suspended solids are not impacting stream gravels for spawning brown trout. These should be undertaken along the works boundary but also upstream and downstream.

- Ensure that areas where hedgerow, treeline, scrub & woodland removal is due are checked for unforeseen wildlife issues (e.g. unknown badger sett) with appropriate follow-up actions where required.
- Ensure that a pre-felling tree survey is undertaken to identify tree specimens with potential to support bat roosts, with subsequent protection and appropriate follow-up actions where required.
- Ensure that at least twenty woodcrete (or equivalent) bat roosting boxes are appropriately installed on suitable trees at retained woodland associated with Douglas and Moneygurney Streams at least one month prior to the commencement of construction related works. Also ensure adherence to post-installation monitoring requirements.
- Review construction/operational phase lighting plan to ensure minimal light spillage nuisance on retained/new wildlife corridors.

8.7.2 Operational Phase Monitoring

The following proposed monitoring items as outlined in Chapter 7 of this EIAR regarding the water and hydrogeological environment during the operational phase will have associated benefits for aquatic biota:

- The taking in charge of the water infrastructure will ensure the system is regularly inspected and maintained (see Chapter 7 of this EIAR).
- The performance of all SuDS features will be monitored by the relevant authorities during the life of the development (see Chapter 7 of this EIAR).
- Monitoring of the installed Hydrobrake and gullies will be required to prevent contamination and increased runoff from the site (see Chapter 7 of this EIAR).

The monitoring of bat boxes by a suitably qualified/experienced ecologist installed during the construction phase will also be relevant to the operational phase monitoring; as outlined in Section 8.6.4.2 (mitigation), monitoring will be undertaken every two years post-installation to check for usage and to conduct maintenance as appropriate in accordance with best practice guidelines (e.g. Aughney 2008) and under NPWS derogation licence (which will be in place prior to monitoring). Usage of the boxes by bats will be reported to Bat Conservation Ireland and NPWS. The developer will be responsible for this until the development is taken in charge by the Local Authority, after which this will become the responsibility of the Local Authority.

8.8 Conclusion: Residual Impacts

The proposed development area is primarily of lower to higher local importance for biodiversity, with Moneygurney Stream and wet woodland associated with both watercourses of county importance. The landscape masterplan associated with the development proposes to retain and enhance existing hedgerows/

treelines and plant new native hedgerows and woodland resulting in a net gain of such habitats (including wildlife corridors), along with a gain in new wildflower meadows, native grass/clover areas as well as parkland and flower/shrub habitats using native/non-native pollinator friendly planting. However, there will be a net loss of existing wet woodland and while this will be offset to some degree by new native woodland planting, it will not entirely be compensated. Existing wet woodland may also be negatively cumulatively impacted through direct loss with two other developments, although the extent will be substantially less and relatively minor in comparison to the residential site under consideration here.

Potential construction stage effects arising from the general loss/damage of some habitats and reduction of associated opportunities for biodiversity are generally considered slight negative to neutral, with the exception of wet woodland associated with both watercourses that will incur a significant negative effect through direct loss. Construction stage effects relating to the failure of bird nests due to the removal of woody vegetation during the bird nesting season are possibly significant/very significant negative temporary. Potential operational stage effects are considered slight positive for habitats/flora as new landscaping matures, again with the exception of wet woodland associated with both watercourses that will remain a significant negative effect through direct loss. Potential operational stage effects on fauna are considered neutral and not significant as new planting/landscaping matures and neutral imperceptible where the lighting scheme ensures that artificial light spillage is kept to a minimum.

Residual impacts on the aquatic ecology of the Douglas Stream are considered short-term imperceptible. However, given the presence of salmonids in both the Moneygurney and Ballybrack Streams, and also good water quality in the both, impacts may be considered higher than imperceptible. Therefore, residual impacts on the aquatic ecology of the Moneygurney & Ballybrack Streams are considered short-term and slight when also taking into account cumulative impacts.

There is a potential link between the study site and three aquatic based designated nature conservation sites via surface-water in the wider area that are of national and international importance in relation to biodiversity evaluation. Potential impacts arising from the development site on such designated aquatic habitats in the wider area and associated biodiversity are considered neutral with the implementation of construction and operational phase soils and water management proposals, even if these proposals are not primarily designed to address any particular risks to the designated nature conservation sites as such.

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Chapter 9

Noise and Vibration

9

Environmental Impact Assessment Report (EIAR)

CAIRN
PLC

CHAPTER 09 NOISE AND VIBRATION

9.1 Introduction

This section of the EIAR has been prepared by AWN to assess the noise and vibration impact of the proposed development in the context of current relevant standards and guidance. This assessment has been prepared by Leo Williams BAI MAI PgDip AMIOA, Acoustic Consultant at AWN Consulting who has over 4 years experience as an environmental consultant specialising in Acoustics and Environmental Impact Assessment.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development during both the short-term construction phase and the long-term operational phase on its surrounding environment. The assessment of direct, indirect and cumulative noise and vibration impacts on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

9.2 Assessment Methodology

The study has been undertaken using the following methodology:

- Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site;

- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development, this is summarised in the following sections;
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the project at the nearest sensitive locations (NSL's) to the site;
- Predictive calculations have been performed to assess the potential impacts associated with the operation of the development at the most sensitive locations surrounding the development site; and,
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational phases of the proposed development.

9.2.1 Construction Phase - Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Cork County Council typically controls construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In order to set appropriate construction noise limits for the development site, reference has been made to BS 5228 2009 +A1 2014 *Code of practice for noise and vibration control on construction and open sites*. Part 1 of this document *Noise* provides guidance on selecting appropriate noise criteria relating to construction works.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

The closest neighbouring noise sensitive properties to the proposed development are the residential dwellings to the west and north of the site, which are located approximately 10 - 15m from the EIAR Study area boundary. There is also a nursing home located to north of the site, some 110m from areas of construction activity.

Table 9.1 Example Threshold of Significant Effect at Dwellings

Assessment category and threshold value period (L _{Aeq})	Threshold value, in decibels (dB)		
	Category A ^A	Category B ^B	Category C ^C
Daytime (08:00 - 19:00) and Saturdays (08:00 - 14:00)	65	70	75
Evenings and weekends ^D	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

- A. Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- B. Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
- C. Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
- D. 19:00 - 23:00 weekdays, 13:00 - 23:00 Saturdays and 07:00 - 23:00 Sundays.

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5dB. If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur.

9.2.2 Construction Phase - Vibration

9.2.2.1 Building Response

In terms of vibration, *British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Vibration* recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant

pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in Table 9.2 are recommended.

Table 9.2 Recommended Vibration Criteria During Construction Phase

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:		
Less than 15Hz	15 to 40Hz	40Hz and above
12 mm/s	20 mm/s	50 mm/s

Expected vibration levels from the construction works will be discussed further in Section 9.5.

9.2.2.2 Human Perception

It is acknowledged that humans are sensitive to vibration stimuli and that perception of vibration at high magnitudes may lead to concern. Vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin of vibration is known. For example, piling can typically be tolerated at vibration levels up to 6 mm/s respectively if adequate public relations are in place. These values refer to the day and evening time periods only.

9.2.3 Operational Phase - Noise

9.2.3.1 Traffic Noise

Given that traffic to and from the development will make use of existing roads already carrying traffic volumes, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 9.3 offers guidance as to the likely impact associated with any particular change in traffic noise level (Source DMRB, 2011). It shows that small changes in noise levels are not normally noticeable, whereas an increase of 10dB would be described as a doubling of loudness. In summary the assessment looks at the impact with and without development at the nearest noise sensitive locations.

Table 9.3 Significance in Change of Noise Level

Change in Sound Level (dB)	Subjective Reaction	Magnitude of Impact	EPA Glossary of Effects ¹
0	None	No Change	Neutral
0.1 - 2.9	Imperceptible	Negligible	Imperceptible
3 - 4.9	Perceptible	Minor	Slight
5 - 9.9	Up to a doubling of loudness	Moderate	Moderate
10+	Over a doubling of loudness	Major	Significant

¹ EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (Draft August 2017)

9.2.3.2 Mechanical Plant

During the operational phase, potential noise sources relate to building and mechanical services plant used to serve the creche facilities.

In order to set appropriate operational noise criteria for these potential sources, guidance has been taken from BS 8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings*. The recommended internal noise levels for dwellings are set out in Table 9.4.

Table 9.4 Summary of Recommended Internal Noise Levels from BS 8233:2014

Rooms	Design Range, L _{Aeq,T} dB	
	Daytime L _{Aeq,16hr} (07:00 to 23:00hrs)	Night-time L _{Aeq,8hr} (23:00 to 07:00hrs)
Living rooms	35 - 40	n/a
Bedrooms	35	30

In order to set an external noise level based on the internal criteria noted above, this is done by factoring in the degree of noise reduction afforded by a partially open window, which BS 8233 suggests as 15dB. Using this value, external noise levels of 50 and 45dB L_{Aeq,T} are considered appropriate for day and night-time periods respectively. The time period for day-time noise levels has been set over a 1-hour period to provide a robust criterion. Given the higher sensitivity of people to noise at night, the time period for night-time levels is set as 15mins. In this instance, the following criteria relate to the nearest noise sensitive properties external to the site.

- Daytime (07:00 to 23:00hrs) 50dB L_{Aeq,1hr}
- Night-time (23:00 to 07:00hrs) 45dB L_{Aeq,15min}

9.2.4 Operational Phase - Vibration

Taking into account the proposed development under consideration here, there are no vibration sources associated with the operational phase. Operational criteria relating to this issue are therefore not included.

9.3 Characteristics of the Proposed Development

9.3.1 General Characteristics

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

When considering a development of this nature, the potential noise and vibration impact on the surroundings is considered for each of two distinct stages:

- Construction and demolition phase; and,
- Operational phase.

The construction phase will involve excavation over the development site, landscaping and construction of internal roads, excavation and piling of bridge foundations, house building and transport of materials to site using the local road network. This phase will generate the highest potential noise impact due to the works involved, however the time frame is short term in nature.

The primary sources of outward noise in the operational context are deemed to be long term in duration and will comprise traffic movements to site using the existing road network. These issues are discussed in detail in the following sections.

9.4 Receiving Environment

The site is located at Carr's Hill, Douglas, approximately 1 km from Douglas village. The R609 main road runs to the east of the site and connects to the N28. The site is bounded to the west and north by a residential housing estate, to the south by farmland, and to the east by the Douglas Golf Club.

9.4.1 Baseline Noise Environment

Baseline noise monitoring is to be undertaken across the development site to determine the range of noise levels at varying locations across the site

9.4.1.1 Environmental Noise Survey

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics - Description, measurement and assessment of environmental noise*. Specific details are set out below.

Choice of Measurement Locations

The measurement locations are described below and shown in Figure 9.1.

- NM1 located on Calderwood Road, west of the proposed site.
- NM2 located along a cul-de-sac near Templegrove, north of the proposed site.
- NM3 located off the Carrigaline Road adjacent to the east of the proposed site.
- NM4 located along the southern boundary of the proposed site.

Survey Periods

The noise survey was carried out over the period 10:45hrs to 18:30hrs on 29th May 2018. Wind speeds ranged between 0 and 3m/s depending on the location, with 0 -1 m/s at NM1, 2 and 3 and slightly higher wind speeds, 2-3 m/s at the elevated location, NM4.

Instrumentation

The noise measurements were carried out using a Larson Davis 813 sound level meter. The instrument was calibrated before and after the survey with no significant drift noted.

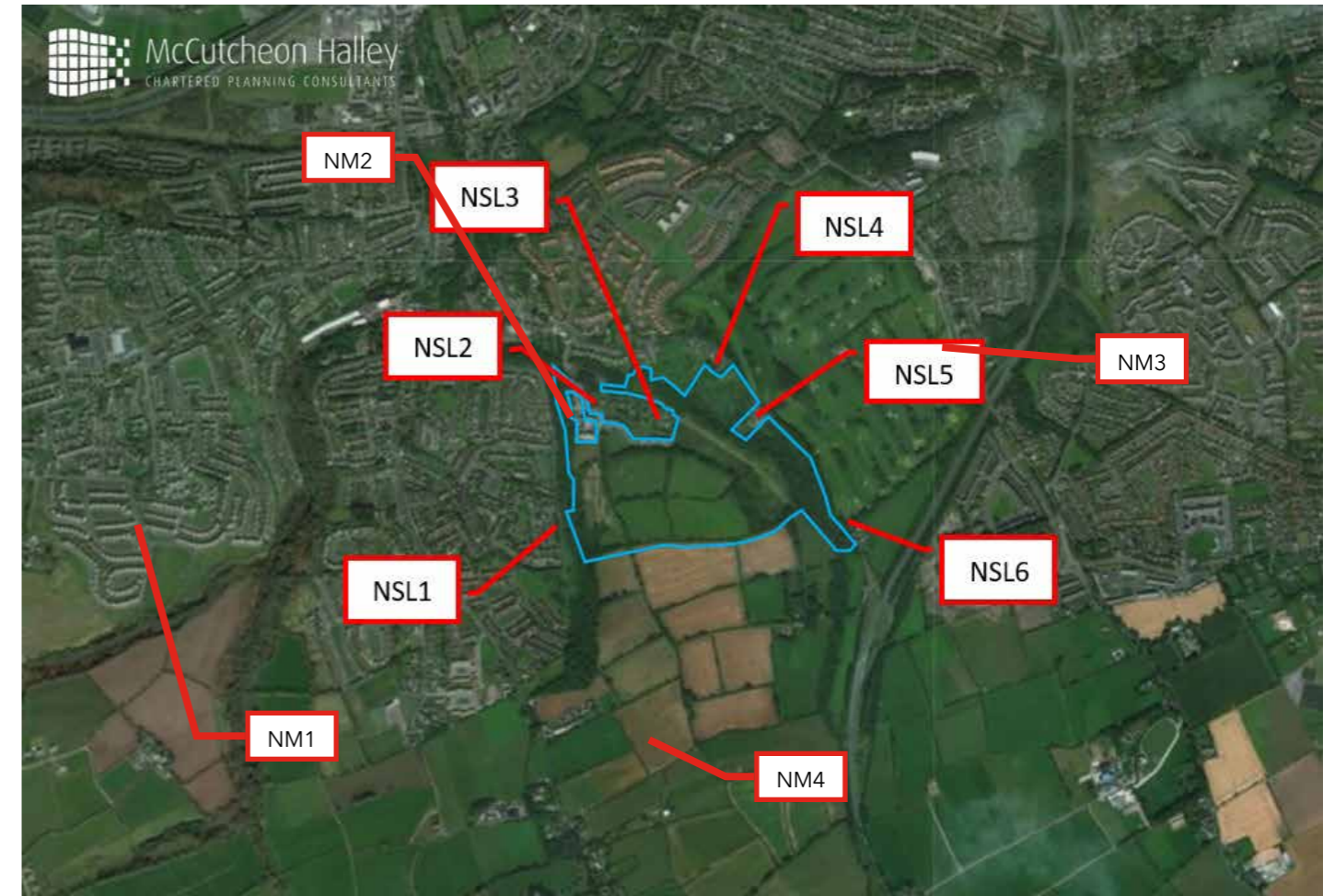


Figure 9.1 Noise Monitoring Locations (Image Source: Google Maps)

Measurement Parameters

The noise survey results are presented in terms of the following parameters.

- L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.
- L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
- L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.
- L_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.
- L_{AFmin} is the instantaneous minimum sound level measured during the sample period using the 'F' time weighting.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

Survey Results and Discussion

The results of the noise survey at the four monitoring locations are summarised below.

Location NM1

Table 9.5 Measured Noise Levels at NM1

Time L_{Aeq}		Measured Noise Levels (dB re. 2×10^{-5} Pa)				
		L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
Day	12:16	50	72	38	51	41
	14:07	47	69	36	48	40
	15:42	45	61	37	39	45

The existing noise environment at NM1 is made up of the various activities within the estate. These include cars on the estate roads, dogs barking in back gardens and out walking, lawnmowers (distant noise source during 1st measurement), children playing etc. Background noise from the N28 was faintly audible but was not a significant noise source at this location. Low flying light aircraft were clearly audible occasionally during 1st and 2nd reading, and when present made a significant contribution to the ambient noise levels. Birdsong was also a contributing noise source. The L_{Aeq} ranged from 45 to 50 dB. The L_{A90} ranged from 40 to 45 dB. The variation in L_{Aeq} can be attributed to the noise from low flying aircraft (present or absent) and noise from car doors slamming near the measurement location (1st Measurement).

Location NM2

Table 9.6 Measured Noise Levels at NM2

Time L_{Aeq}		Measured Noise Levels (dB re. 2×10^{-5} Pa)				
		L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
Day	12:41	46	62	36	48	40
	14:36	51	67	41	53	43
	17:51	46	57	39	47	43

NM2 was located at the end of the cul de sac, in front of an unoccupied house in a quiet residential location. The ambient noise environment was primarily made up of background traffic noise from the N28. Other noise sources included birdsong, low flying light aircraft and occasional residential activity within the estate. Birdsong was also a contributing noise source. The ambient noise fluctuated when a low flying light aircraft passed overhead. The L_{Aeq} ranged from 46 to 51 dB. The L_{A90} ranged from 40 to 43 dB. The variation in L_{Aeq} can be attributed to low flying aircraft and cars passing the measurement location.

Location NM3

Table 9.7 Measured Noise Levels at NM3

Time L_{Aeq}		Measured Noise Levels (dB re. 2×10^{-5} Pa)				
		L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
Day	13:04	54	69	32	58	40
	15:00	54	65	40	59	45
	18:12	57	65	44	61	48

The dominant noise source at this location was traffic on the N28. Low flying light aircraft were clearly audible occasionally. Other minor noise sources included birdsong, cars in and out of the nursing home and tee offs from the Douglas golf course across the road. The L_{Aeq} ranged from 54 to 57 dB. The L_{A90} ranged from 40 to 48 dB. The variation in L_{Aeq} can be attributed to an increase in traffic volumes on the N28 after 6 pm, rush hour.

Location NM4

Table 9.8 Measured Noise Levels at NM4

Time L_{Aeq}		Measured Noise Levels (dB re. 2×10^{-5} Pa)				
		L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
Day	10:46	50	68	39	49	42
	13:32	47	62	39	49	42
	16:13	49	57	43	51	47

NM4 is an elevated location in an agricultural setting. The ambient noise environment was made up of background traffic noise from the N28, birdsong and occasional low flying light aircraft. The L_{Aeq} ranged from 47 to 50 dB. The L_{A90} ranged from 42 to 47 dB.

9.4.1.2 Do Nothing Scenario

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged.

9.5 Potential Impacts

The potential noise and vibration impacts associated with the construction and operational phases of the proposed development are discussed in the following sections.

9.5.1 Construction Phase

9.5.1.1 Noise

Review of the baseline noise survey and the threshold values detailed in Table 9.1 indicates that the daytime noise guidance limit for construction noise is **65dB L_{Aeq}**. It is assumed that construction works will take place during normal working hours only. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, dumper trucks, compressors and generators. It is anticipated that piling will be required during the construction of the bridge in the eastern sector of the site.

Due to the nature of daytime activities undertaken on a construction site of this nature, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels.

Taking into account the outline construction programme, it is possible to predict typical noise levels using guidance set out in BS 5228-1:2009+A1:2014. Table 9.9 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

Table 9.9 Reference Plant Noise Emissions

Activity	Item of Plant (BS5228 Ref)	L _{Aeq} at 10m
Site Clearance/Demolition	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Diesel Generator (C4.76)	61
General Construction	Dump Truck (C2.30)	79
	Piling Operations (C.3.14)	83
	Tracked excavator (C2.21)	71
	Compressor (D7.8)	70
	Telescopic Handler (C4.54)	79
	Hand Held Circular Saw (C4.72)	79
	Diesel Generator (C4.76)	61
Road Works/Landscaping	Internal Fit out	70
	Asphalt Paver & Tipping Lorry (C5.30)	75
	Electric Water Pump (C5.40)	68
	Vibratory Roller (C5.20)	75

The calculations also assume that the equipment will operate for 66% of the 12-hour working day (i.e. 8 hours) and that a standard site hoarding, typically 2.4m height will be erected around the perimeter of the construction site for the duration of works. It is assumed that construction works will take place during normal working hours only.

The closest noise sensitive locations have been identified as shown in Figure 9.2 and described below.

- **NSL 1** This represents a residential housing estate located to the west of the proposed site some 90m from the nearest significant site works;
- **NSL 2** This represents an apartment complex located along the north-west boundary of the proposed site some 10m from the nearest significant site works;
- **NSL 3** This represents residential houses located adjacent to the boundary near the centre of the proposed site some 15m from the nearest significant site works;
- **NSL 4** This represents a nursing home located off the Carrigaline Road to the north of the proposed site some 200m from the nearest significant site work;
- **NSL 5** This represents a residential property located off the Carrigaline Road to the east of the proposed site some 50m from the nearest significant site work, and;
- **NSL 6** This represents the residential property located off the Carrigaline Road to the south east of the proposed site some 100m from the nearest significant site work.



Figure 9.2 Site Context & Noise Assessment Locations (Image Source: Google Maps)

Table 9.10 below presents the predicted daytime noise levels from an indicative construction period at these noise sensitive locations (NSL's).

Table 9.10 Indicative Construction Noise Levels at Nearest Noise Sensitive Locations

Construction Phase	Item of Plant (BS 5228-1 Ref)	L _{Aeq} at distance (m)					
		NSL1 (90m)	NSL2 (10m)	NSL3 (15m)	NSL4 (200m)	NSL5 (50m)	NSL6 (100m)
Site Clearance	Tracked excavator (C2.21)	45	64	61	38	50	44
	Dump Truck (D2.30)	53	72	69	46	58	52
	Diesel Generator (C4.76)	35	54	51	28	40	34
	Cumulative Site Clearance	54	73	69	47	59	53
General Construction	Dump Truck (C2.30)	53	72	69	46	58	52
	Piling Operations * Note (C.12.14)	51	55	62	63	70	52
	Tracked excavator (D2.21)	45	34	61	38	50	44
	Tracked Mobile Crane (C4.50)	44	63	60	37	49	43
	Compressor (D7.08)	53	72	69	46	58	52
	Hand Held Circular Saw (C4.72)	53	72	69	46	58	52
	Diesel Generator (C4.76)	35	54	51	28	40	34
	Internal Fit out	44	63	60	37	49	43
	Cumulative General Construction	59	78	74	64	70	59
	Road Works/Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	49	68	65	42	54
Electric Water Pump (C5.40)		42	61	58	35	47	41
Landscaping	Vibratory Roller (C5.20)	49	68	65	42	54	48
	Cumulative Landscaping and Road Works	53	72	68	45	58	51

* Note - piling is anticipated during the construction of the bridge in the north eastern sector of the site. Distances to the nearest NSLs have been adjusted to take this into account, i.e. piling not being carried out at nearest point to sensitive properties.

Taking into account these assumptions and allowing for the attenuation of sound over distance, the predicted construction noise level at the nearest sensitive properties is above the relevant construction noise criteria, i.e. the level at which a potential significant impact could be expected to occur, at noise sensitive locations within ~20m of the site works. Also, considering the proximity of NSL5 to anticipated piling works (some 58m at nearest point), a potential significant impact is associated with this aspect of the construction during this phase of works, in the absence of mitigation.

Specifically, the closest residential buildings to the works are some 10-15m away (properties represented by NSL2, NSL3 and NSL5 (influenced by piling)). Review of the predicted noise levels at these locations are above the criteria at which a significant impact is deemed to occur (65dB L_{Aeq,T}) and therefore, in the absence of noise mitigation, a **negative, significant** and **short-term** impact is likely.

At greater distances (properties represented by NSL1, NSL4 and NSL6) predicted construction noise levels are lower, therefore any impact is expected to be **negative, moderate and short-term**.

Construction Traffic

The noise levels associated with mobile plant items such as concrete mixer trucks, loaders etc. operational on site have been included as part of the construction noise assessment and calculated noise levels in Table 9.9. Consideration should also be given to the addition of construction traffic along the site access routes. Access to the development site for construction traffic will be via the road south of the Templegrove Apartments and later, via Carrigaline Road.

It is possible to calculate the noise levels associated with the passing vehicle using the following formula.

$$L_{Aeq,T} = L_{AX} + 10\log_{10}(N) - 10\log_{10}(T) + 10\log_{10}(r_1/r_2)dB$$

where:

L_{Aeq,T} is the equivalent continuous sound level over the time period T in seconds);

L_{AX} is the "A-weighted" Sound Exposure Level of the event considered(dB);

N is the number of events over the course of time period T;

r₁ is the distance at which L_{AX} is expressed;

r₂ is the distance to the assessment location.

A calculation distance of 5m from the road has been used to assess noise levels at the closest buildings along the construction routes. The mean value of Sound Exposure Level for truck moving at low to moderate speeds (i.e. 15 to 45km/hr) is of the order of 82dB L_{AX} at a distance of 5 metres from the vehicle. This figure is based on a series of measurements conducted under controlled conditions. Construction vehicle numbers have been provided by JB Barry for peak hours associated with each key phase. Table 9.11 below summarises the calculated noise level associated with passing haul vehicles during each phase, assuming the peak hour flows per day.

Table 9.11 Calculated Construction Traffic Noise Levels at Edge of Road

Construction Phase	No. of trucks/peak hour	Calculated Noise level at edge of road (5m), dB L _{Aeq,1hr}
Phase 1	2	51
Phase 2	16	61
Phase 3	6	56
Phase 4	2	51

The calculated noise levels associated with the various phases are in the range of 51 to 61dB L_{Aeq,1hr}. The calculated noise levels are below the construction noise criterion of 65dB. In addition, it should be noted that, in order to assess a worst-case scenario, a large proportion of the daily vehicle numbers have been assumed to arrive/depart over an hour-long period.

9.5.1.2 Vibration

The main potential source of vibration during the construction programme is associated with piling and ground-breaking activities.

For the purposes of this assessment the expected vibration levels during piling have been determined through reference to published empirical data. The British Standard BS 5228 - Part 2: *Vibration*, publishes the measured magnitude of vibration of rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock, (Table D.6, Ref. No. 106):

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Considering the low vibration levels at very close distances to the piling rigs, vibration levels at the nearby buildings are not expected to pose any significance in terms of cosmetic or structural damage to any of the residential or sensitive buildings in proximity to the development works. In addition, the range of vibration levels is typically below a level which would cause any disturbance to occupants of nearby buildings.

It is anticipated that excavations will be made using standard excavation machinery, which typically do not generate appreciable levels of vibration close to the source. Taking this into account and considering the distance that these properties are from the works and the attenuation of vibration levels over distance, the resultant vibration levels are expected to be well below a level that would cause disturbance to building occupants or even be perceptible.

The associated impact with these activities is considered to be **neutral** and **imperceptible**.

9.5.2 Operational Phase

9.5.2.1 Additional Traffic on Adjacent Roads

During the operational phase of the proposed development, there will be an increase in vehicular traffic associated with the site on some surrounding roads.

A traffic impact assessment relating to the proposed development has been prepared by J B Barry, consulting engineers, as part of this EIAR. Using this information, the related noise impacts along the relevant road links has been assessed.

Cork County Council have requested analysis be undertaken for both the existing road network and the proposed road network (including the proposed upgrade to the N28 to motorway status). The following scenarios are considered:

- Scenario A - No public road improvements; Castletreasure Primary School (incl. signalised junction); no Cairn Homes development; (Base)
- Scenario B - With public road improvements (i.e. M28); two schools (incl. two signalised junctions) no Cairn Homes development; (Base)
- Scenario C - No public road improvements; Castletreasure Primary School (incl. signalised junction); with Cairn Homes development; (Post Development)
- Scenario D - With public road improvements (i.e. M28 and Junction 9); two schools (incl. two signalised junctions); with Cairn Homes development; (Post Development)

Table 9.12 below displays the predicted change in noise level at different road links around the site for the year of opening and the design year using the Annual Average Daily Traffic (AADT) flows along the road links under consideration for Scenarios A and C described above.

Table 9.12 Predicted Change in Noise Level associated with Vehicular Traffic - Existing Road Network

Road Link	Opening Year (2024)		
	Scenario A - AADT Without Development	Scenario C - AADT With Development	Change in Noise Level (dB)
Entrance: R609 between Jct 4 and 5	7384	8,883	0.8
R609 between Jct 1 and 6	12,149	14642	0.8
R610 Douglas Relief Road	18,007	19,258	0.3
Mayborough Hill between Jct 1 and 24	11029	12,013	0.4
Mayborough Hill between Jct 2 and 3	11,433	12,488	0.4
R610 Rochestown Road	15,079	16,011	0.3
Mayborough Woods	2,860	3,203	0.5
Road Link	Design Year (2039)		
	Scenario A - AADT Without Development	Scenario C - AADT With Development	Change in Noise Level (dB)
Entrance: R609 between Jct 4 and 5	7,769	9,236	0.8
R609 between Jct 1 and 6	12,973	15,255	0.7
R610 Douglas Relief Road	19,767	20,513	0.2
Mayborough Hill between Jct 1 and 2	11,574	12,231	0.2
Mayborough Hill between Jct 2 and 3	12,143	12,542	0.1
R610 Rochestown Road	16,029	16,852	0.2
Mayborough Woods	3,209	3,333	0.2

With reference to Table 9.3, the predicted change in noise level associated with additional traffic accessing the proposed development, for the existing road network, has a negligible effect. The impact is therefore **imperceptible** and **long term**.

Table 9.13 below displays the predicted change in noise level at different road links around the site for the year of opening and the design year using the Annual Average Daily Traffic (AADT) flows along the road link under consideration for Scenarios B and D described above.

Table 9.13 Predicted Change in Noise Level associated with Vehicular Traffic - Proposed Road Network

Road Link	Opening Year (2024)		
	Scenario B - AADT Without Development	Scenario D - AADT With Development	Change in Noise Level (dB)
Entrance: R609 between Jct 4 and 5	11,011	13,079	0.7
R609 between Jct 1 and 6	14,018	15,947	0.6
R610 Douglas Relief Road	20,225	20,951	0.2
Mayborough Hill between Jct 1 and 2	13,659	13,775	0.0
Mayborough Hill between Jct 2 and 3	13,192	13,198	0.0
R610 Rochestown Road	20,196	21,148	0.2
Mayborough Woods	2,681	2,864	0.3
Carr's Hill Underbridge	11,453	12,514	0.4
Mayborough to Carr's Hill Link Road	11,171	11,262	0.0
Road Link	Design Year (2039)		
	Scenario B - AADT Without Development	Scenario D - AADT With Development	Change in Noise Level (dB)
Entrance: R609 between Jct 4 and 5	13497	15584	0.6
R609 between Jct 1 and 6	16549	18478	0.5
R610 Douglas Relief Road	23276	24002	0.1
Mayborough Hill between Jct 1 and 2	14357	14472	0.0
Mayborough Hill between Jct 2 and 3	15093	15093	0.0
R610 Rochestown Road	22568	23520	0.2
Mayborough Woods	3576	3758	0.2
Carr's Hill Underbridge	13497	15584	0.6
Mayborough to Carr's Hill Link Road	16549	18478	0.5

With reference to Table 9.3, the predicted change in noise level associated with additional traffic accessing the proposed development, for the proposed road network, has a negligible effect. The impact is therefore **imperceptible** and **long term**.

9.5.2.2 Mechanical Plant

It is expected that the principal items of building and mechanical services plant will be associated with the proposed creche. These items will be selected at a later stage, however, they will be designed and located so that there is no negative impact on sensitive receivers within the development itself. The services plant will be designed/attenuated to meet the relevant plant noise criteria for day and night-time periods at nearby sensitive receivers as set out in Section 9.2.2.2.

Taking into account that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria is achieved within the development it is expected that there will be no negative impact at sensitive receivers off site.

9.5.3 Cumulative Impacts

There are several proposed or permitted developments in the wider area surrounding the proposed development under assessment. These are as follows:

- M28 works to the south east of site;
- Greenway improvements;
- Primary School adjacent to north site boundary;
- Lidl retail store and apartments 1.8km to north of site;
- Residential scheme 500m to south east of site;
- Residential scheme 350 to north west of site, and;
- Secondary school 1.5km to the north west of site.

During the construction phase of the proposed development, construction noise on site will be localised and will therefore likely be the primary noise source at the nearest noise sensitive receivers. In the event that construction activities associated with the majority of developments noted above occur simultaneous to the proposed development, they are at sufficient distances such that the cumulative noise levels will remain dominated by the localised works referred to in Table 9.10.

In the event that works on site and works associated with the proposed primary school were ongoing simultaneously, there is potential for cumulative noise impacts at assessment location NSL3, NSL4 and NSL5. Under this scenario, construction activities will be audible at both the front and rear of the houses due to their location with respect to both areas of works. Similarly, should M28 works be carried out simultaneously to the south east of the site there is a potential for cumulative construction noise impacts at residences represented by NSL6.

The contractor will be required to control noise impacts associated with this development in line with the guidance levels included in Table 9.1 and follow the best practice control measures within BS 8228 -2.

The impact from any construction works associated with the other developments listed above is considered to be imperceptible as these works are expected to take place at large distances to the most exposed noise sensitive receivers to the proposed development under assessment.

The operational phase of the developments listed above have the potential to generate additional traffic on the roads in the vicinity of the Castletreasure site. These additional vehicle movements have been taken into account in the traffic assessment in Section 9.5.2.1. The cumulative impact of this source is determined to be imperceptible and long term.

9.6 Mitigation Measures

9.6.1 Construction Phase - Noise

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Parts 1 and 2. Whilst construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Parts 1 and 2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- noise control at source;
- screening;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

9.6.1.1 Selection of Quiet Plant

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

9.6.1.2 Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

Referring to the potential noise generating sources for the works under consideration, the following best practice mitigation measures should be considered:

- Site compounds will be located in excess of 30m from noise sensitive receptors within the site constraints. The use lifting bulky items, dropping and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling.
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

9.6.1.3 Piling

Piling is the construction activity which is most likely to cause disturbance. General guidance in relation to piling is outlined in the following paragraphs.

Piling programmes should be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working programme should be phased so as to prevent unacceptable disturbance at any time.

During consultation the planner, developer, architect and engineer, as well as the local authority, should be made aware of the proposed method of working of the piling contractor. The piling contractor should in turn have evaluated any practicable and more acceptable alternatives that would economically achieve, in the given ground conditions, equivalent structural results.

On typical piling sites the major sources of noise are essentially mobile and the noise received at any control points will therefore vary from day to day as work proceeds. The duration of piling works is estimated to be of the order of 4.5 to 6 weeks which is relatively short in relation to the length of construction work as a whole, and the amount of time spent working near to noise sensitive areas can represent only a part of the piling period.

Noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.

Screening by barriers and hoardings is less effective than total enclosure but can be a useful adjunct to other noise control measures. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken in location, having due regard also for access routes. When appropriate, screens or enclosures should be provided for such equipment.

Contributions to the total site noise can also be anticipated from mobile ancillary equipment, such as handling cranes, dumpers, front end loaders etc. These machines may only have to work intermittently, and when safety permits, their engines should be switched off (or during short breaks from duty reduced to idling speed) when not in use.

9.6.1.4 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Construction site hoarding will be constructed around the site boundaries as standard. The hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m² to provide adequate sound insulation.

In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

9.6.1.5 Liaison with the Public

A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

9.6.1.6 Monitoring

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics - Description, measurement and assessment of environmental noise*.

9.6.1.7 Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ piling or when other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

9.6.2 Construction Phase - Vibration

9.6.2.1

The vibration from construction activities will be limited to the values set out in Section 9.2. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Limit values have been provided for soundly constructed residential and commercial properties.

9.6.3 Operational Phase

9.6.3.1 Additional Traffic on Adjacent Roads

During the operational phase of the development, noise mitigation measures with respect to the outward impact of traffic from the development are not deemed necessary.

9.6.3.2 Mechanical Services Plant

Taking into account that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria is achieved within the development it is expected that there will be no negative impact at sensitive receivers off site, and therefore no further mitigation required.

9.7 Residual Impacts

9.7.1 Construction Phase

During the construction phase of the project there is the potential for significant and moderate impacts on nearby noise sensitive properties due to noise emissions from site activities. The application of binding noise limits, hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact will have a **negative, moderate** and **short-term** impact on the surrounding environment.

9.7.2 Operational Phase

9.7.2.1 Additional Vehicular Traffic

The predicted change noise levels associated with additional traffic is predicted to be of imperceptible impact along the existing road network. In the context of the existing noise environment, the overall contribution of induced traffic is considered to be of **neutral, imperceptible** and **long-term** impact to nearby residential locations.

9.7.2.2 Mechanical Plant

Noise levels associated with operational plant are expected to be well within the adopted day and night-time noise limits at the nearest noise sensitive properties taking into account the site layout, the nature and type of units proposed and distances to nearest residences. Assuming the operational noise levels do not exceed the adopted design goals, the resultant residual noise impact from this source will be of **neutral, imperceptible, long term** impact.

9.8 Difficulties Encountered

No difficulties were encountered during the preparation of the EIAR chapter.

9.9 References

- EPA Guidelines on the Information to be contained in Environmental Impact Statements, (EPA, 2002);
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), (EPA, 2003);
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (Draft August 2017);
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015);
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1 - Noise.
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2 - Vibration.
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration;
- BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound;
- DMRB, 2011;
- ISO 1996: 2017: *Acoustics - Description, measurement and assessment of environmental noise*.



Chapter 10

Air Quality and Climate

10

Environmental Impact Assessment Report (EIAR)

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CHAPTER 10 AIR QUALITY AND CLIMATE

10.1 Introduction

This chapter assesses the likely air quality and climate impacts, if any, associated with the Castletreasure residential development in Douglas, Co. Cork. The site is located at Carr's Hill, approximately 1km from Douglas village. The site is bounded to the east by the R609 and to the north and west by residential areas. A full description of the development can be found in Chapter 2 (Project Description).

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10.1.1 Background Information

10.1.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 10.1 and Appendix 10.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC, which has set limit values for NO₂, PM₁₀, PM_{2.5}, benzene and CO (see Table 10.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions (see Appendix 10.1).

Table 10.1 Air Quality Standards Regulations

Pollutant	Regulation Note 1	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m ³
		Annual limit for protection of human health	40 µg/m ³
		Critical level for protection of vegetation	30 µg/m ³ NO + NO ₂
Particulate Matter (as PM ₁₀)	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m ³
		Annual limit for protection of human health	40 µg/m ³
Particulate Matter (as PM _{2.5})	2008/50/EC	Annual limit for protection of human health	25 µg/m ³
Benzene	2008/50/EC	Annual limit for protection of human health	5 µg/m ³
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m ³ (8.6 ppm)

Note 1 EU 2008/50/EC - Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

10.1.1.2 Dust Deposition Guidelines

The concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM₁₀) and less than 2.5 microns (PM_{2.5}) and the EU ambient air quality standards outlined in Table 10.1 have set ambient air quality limit values for PM₁₀ and PM_{2.5}.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m²*day) averaged over a one year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Health & Local Government (DOEHLG, 2004) apply the Bergerhoff limit of 350 mg/(m²*day) to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction of the proposed development.

10.1.1.3 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002 (UNFCCC, 1997; UNFCCC, 1999). For the purposes of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998, Ireland agreed to limit the net growth of the six GHGs under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012 (ERM, 1998; European Commission, 2014). The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP24) took place in Katowice, Poland from the 4th to the 14th December 2018 and focussed on advancing the implementation of the Paris Agreement. The Paris Agreement was established at COP21 in Paris in 2015 and is an important milestone in terms of international climate change agreements. The Paris Agreement was agreed by over 200 nations and has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions.

The EU, in October 2014, agreed the "2030 Climate and Energy Policy Framework" (EU 2014). The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the ETS and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Secondly, it was agreed that all Member States will participate in this effort, balancing considerations of fairness and solidarity. The policy also outlines, under "Renewables and Energy Efficiency", an EU binding target of at least 27% for the share of renewable energy consumed in the EU in 2030.

10.1.1.4 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The initial objective of the Protocol was to control and reduce emissions of Sulphur Dioxide (SO₂), Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOCs) and Ammonia (NH₃). To achieve the initial targets Ireland was obliged, by 2010, to meet national emission ceilings of 42 kt for SO₂ (67% below 2001 levels), 65 kt for NO_x (52% reduction), 55 kt for VOCs (37% reduction) and 116 kt for NH₃ (6% reduction). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for PM_{2.5}. In relation to Ireland, 2020 emission targets are 25 kt for SO₂ (65% on 2005 levels), 65 kt for NO_x (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH₃ (1% reduction on 2005 levels) and 10 kt for PM_{2.5} (18% reduction on 2005 levels).

European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005 (DEHLG, 2004; 2007). Data available from the EU in 2010 indicated that Ireland complied with the emissions ceilings for SO₂, VOCs and NH₃ but failed to comply with the ceiling for NO_x (EEA, 2012). Directive (EU) 2016/2284 "On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC" was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO₂, NO_x, NMVOC, NH₃, PM_{2.5} and CH₄. In relation to Ireland, 2020 - 2029 emission targets are for SO₂ (65% below 2005 levels), for NO_x (49% reduction), for VOCs (25% reduction), for NH₃ (1% reduction) and for PM_{2.5} (18% reduction). In relation to 2030, Ireland's emission targets are for SO₂ (85% below 2005 levels), for NO_x (69% reduction), for VOCs (32% reduction), for NH₃ (5% reduction) and for PM_{2.5} (41% reduction).

10.2 Assessment Methodology

10.2.1 Local Air Quality Assessment

The air quality assessment has been carried out following procedures described in the publications by the EPA (2002, 2003, 2015, 2017) and using the methodology outlined in the guidance documents published by the UK DEFRA (2016a; 2016b). The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA (2016b). The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of possible key pollutants was carried out and the likely location of air pollution "hot-spots" identified. An examination of recent EPA and Local Authority data in Ireland (EPA, 2018) has indicated that SO₂, smoke and CO are unlikely to be exceeded in the majority of locations

within Ireland and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential issues in regards to nitrogen dioxide (NO₂), PM₁₀ and PM_{2.5} at busy junctions in urban centres (EPA, 2019). Benzene, although previously reported at quite high levels in urban centres, has recently been measured at several city centre locations to be well below the EU limit value (EPA, 2018). Historically, CO levels in urban areas were a cause for concern. However, CO concentrations have decreased significantly over the past number of years and are now measured to be well below the limits even in urban centres (EPA 2017; 2018). The key pollutants reviewed in the assessments are NO₂, PM₁₀, PM_{2.5}, benzene and CO, with particular focus on NO₂ and PM₁₀.

Key pollutant concentrations will be predicted for nearby sensitive receptors for the following scenarios:

- The Existing scenario, for model verification;
- Opening Year Do-Nothing scenario (DN), which assumes no development in place;
- Opening Year Do-Something scenario (DS), which assumes the proposed development in place;
- Design Year Do-Nothing scenario (DN), which assumes no development in place; and
- Design Year of the Do-Something scenario (DS), which assumes the proposed development in place.

The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (Version 1.03c, July 2007), the NO_x to NO₂ Conversion Spreadsheet (Version 6.1, October 2017) (UK DEFRA, 2016), and following guidance issued by the TII (2011), UK Highways Agency (2007), UK DEFRA (2016a; 2016b; UK DETR 1998) and the EPA (2002; 2003; 2015; 2017).

The TII guidance (2011) states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK DMRB guidance (UK Highways Agency, 2007), on which the TII guidance was based, states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGV flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

Concentrations of key pollutants are calculated at sensitive receptors that have the potential to be affected by the proposed development. For road links which are deemed to be affected by the proposed development and within 200 m of the chosen sensitive receptors inputs to the air dispersion model consist of: road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles, annual average traffic speeds and background concentrations. The UK DMRB guidance states that road links at a distance of greater than 200 m from a sensitive receptor will not influence pollutant concentrations at the receptor. Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume 11 Section 3 Part 1 - HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards. The TII Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (2011) detail a methodology for determining air quality impact significance criteria for road schemes, which can be applied to any project that causes a change in traffic flows. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The TII significance criteria have been adopted for the proposed development and are detailed in Appendix 10.2, Table 1 to Table 3. The significance criteria are based on PM₁₀ and NO₂ as these pollutants are most likely to exceed the annual mean limit values (40 µg/m³). However, the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual PM_{2.5} concentrations for the purposes of this assessment.

10.2.2 Regional Impact Assessment (Including Climate)

The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland (2011) and the methodology provided in Annex 2 in the UK Design Manual for Roads and Bridges (2016a). The assessment focused on determining the resulting change in emissions of volatile organic compounds (VOCs), nitrogen oxides (NO_x) and carbon dioxide (CO₂). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes and can be applied to any development that experiences a change in traffic volumes. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds.

10.2.3 Conversion of NO_x to NO₂

NO_x (NO + NO₂) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGV's the proportion of NO_x emitted as NO₂, rather than NO is increasing. With the correct conditions (presence of sunlight and O₃) emissions in the form of NO, have the potential to be converted to NO₂.

Transport Infrastructure Ireland (TII) states the recommended method for the conversion of NO_x to NO₂ in "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes"(2011). The TII guidelines recommend the use of DEFRA's NO_x to NO₂ calculator (2017) which was originally published in 2009 and is currently on version 6.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O₃ and proportion of NO_x emitted as NO for each local authority across the UK. O₃ is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO₂ or PM₁₀.

The calculator includes Local Authorities in Northern Ireland and the TII guidance recommends the use of 'Armagh, Banbridge and Craigavon' as the choice for local authority when using the calculator. The choice of Craigavon provides the most suitable relationship between NO₂ and NO_x for Ireland. The "All other Non-Urban UK Traffic" traffic mix option was used.

10.2.4 Ecological Sites

For routes that pass within 2 km of a designated area of conservation (either Irish or European designation) the TII requires consultation with an Ecologist (2011). However, in practice the potential for impact to an ecological site is highest within 200 m of the proposed scheme and when significant changes in AADT (>5%) occur.

Transport Infrastructure Ireland's Guidelines for Assessment of Ecological Impacts of National Road Schemes (2009) and Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, 2010) provide details regarding the legal protection of designated conservation areas.

If both of the following assessment criteria are met, an assessment of the potential for impact due to nitrogen deposition should be conducted:

- A designated area of conservation is located within 200 m of the proposed development; and
- A significant change in AADT flows (>5%) will occur.

Cork Harbour SPA (site code 004030) and Douglas River Estuary pNHA (site code 001046) are within 2 km of the proposed development area, however, these designated areas are not within 200m of any road links impacted by the proposed development and therefore an assessment of nitrogen deposition levels is not required.

10.3 Baseline Environment

10.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM₁₀, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than PM_{2.5}) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles (PM_{2.5} - PM₁₀) will actually increase at higher wind speeds. Thus, measured levels of PM₁₀ will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Cork Airport, which is located approximately 4 km south-west of the site. Cork Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 10.1). For data collated during five representative years (2013 - 2017), the predominant wind direction is north-westerly to south-westerly, with generally moderate wind speeds.

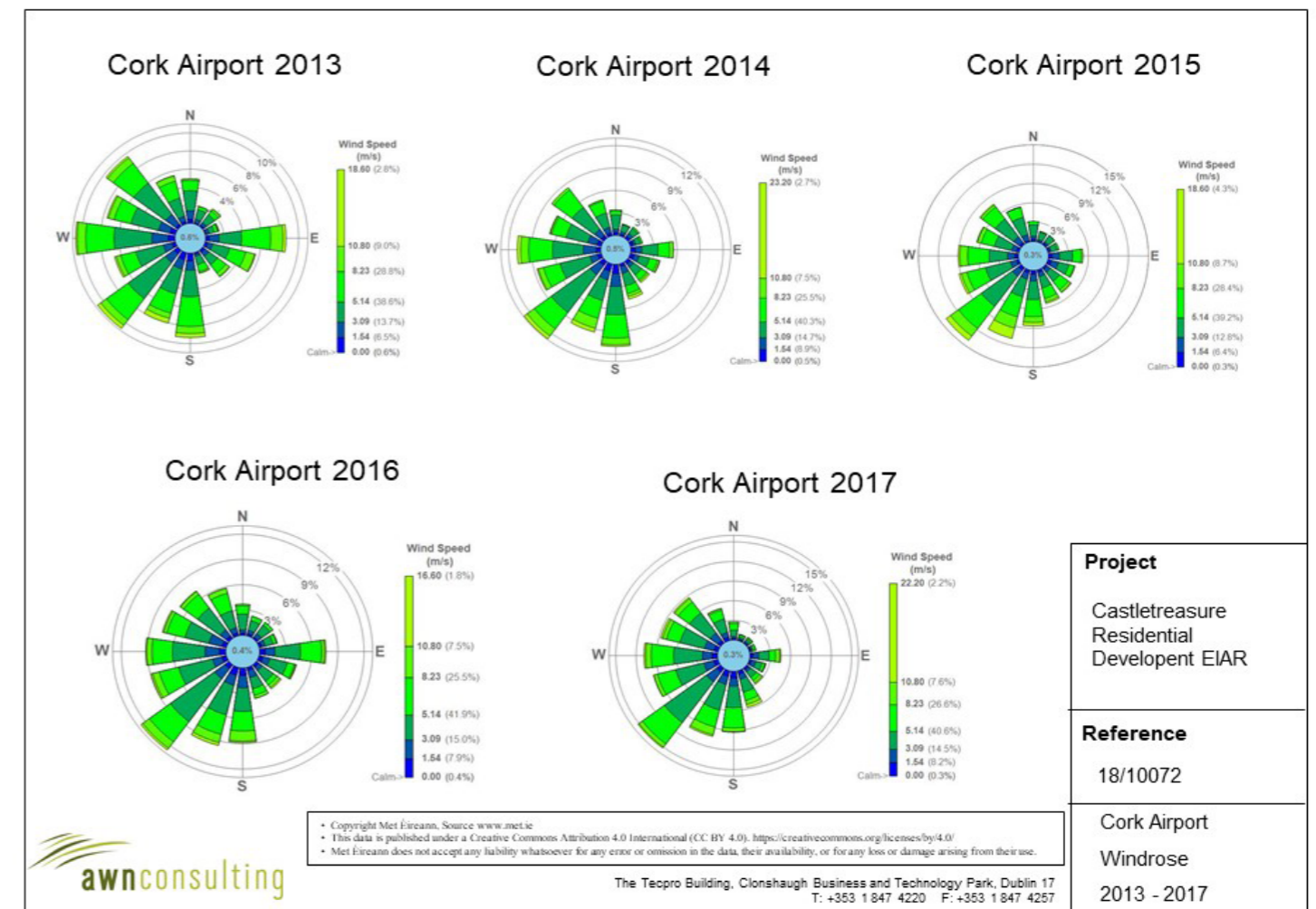


Figure 10.1 Cork Airport Windrose 2013 - 2017

10.3.2 Trends in Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources (WHO, 2006). Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction. In 2011 the UK DEFRA published research (2011) on the long term trends in NO₂ and NO_x for roadside monitoring sites in the UK. This study found a marked decrease in NO₂ concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this study is that there now exists a gap between projected NO₂ concentrations which UK DEFRA previously published and monitored concentrations. The impact of this 'gap' is that the DMRB screening model can under-predict NO₂ concentrations predicted for future years. Subsequently, the UK Highways Agency (HA) published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years.

10.3.3 Baseline Air Quality - Review of Available Background Data

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is "Air Quality In Ireland 2017 - Indicators of Air Quality" (EPA, 2018). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2019).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2018). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the Castletreasure site is within Zone B (EPA, 2019). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

With regard to NO₂, continuous monitoring data from the EPA (2018, 2019) at the Zone B location of South Link Road shows that levels of NO₂ are below both the annual and 1-hour limit values (see Table 10.2), with average long-term concentrations ranging from 22 - 27 µg/m³ for the period 2012 - 2017. There were no exceedances of the maximum 1 hour limit of 200 µg/m³ in any year (18 exceedances are allowed per year). Based on these results, a conservative estimate of the current background NO₂ concentration in the region of the proposed development is 25 µg/m³.

Table 10.2 Trends In Zone B Air Quality - Nitrogen Dioxide (NO₂)

Station	Averaging Period ^{Notes 1,2}	Year					
		2012	2013	2014	2015	2016	2017
South Link Road	Annual Mean NO ₂ (µg/m ³)	23	23	27	22	23	27
	Max 1-hr NO ₂ (µg/m ³)	121	124	148	128	157	138

Note 1 Annual average limit value - 40 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).
 Note 2 1-hour limit value - 200 µg/m³ as a 99.8th percentile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Continuous PM₁₀ monitoring carried out by the EPA at the locations of South Link Road and Heatherton Park showed 2017 annual mean concentrations of 17 µg/m³ and 10 µg/m³ respectively (Table 10.3). There were at most 7 exceedances in any one year (at South Link Road) of the 24-hour limit value of 50 µg/m³ (35 exceedances are permitted per year) (EPA, 2018). Long-term data for the period 2012 - 2017 show concentrations ranging from 11 - 19 µg/m³. Based on the EPA data (Table 10.3) a conservative estimate of the current background PM₁₀ concentration in the region of the proposed development is 18 µg/m³.

Table 10.3 Trends In Zone B Air Quality - PM₁₀

Station	Averaging Period ^{Notes 1,2}	Year					
		2012	2013	2014	2015	2016	2017
South Link Road	Annual Mean PM ₁₀ (µg/m ³)	17	19	19	17	18	17
	24-hr Mean > 50 µg/m ³ (days)	7	5	5	3	7	4
Heatherton Park	Annual Mean PM ₁₀ (µg/m ³)	13	15	16	11	12	10
	24-hr Mean > 50 µg/m ³ (days)	1	2	1	0	2	0

Note 1 Annual average limit value - 40 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).
 Note 2 24-hour limit value - 50 µg/m³ as a 90.4th percentile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Continuous PM_{2.5} monitoring carried out by the EPA at the Zone B locations of South Link Road and Heatherton Park showed average levels of 6 - 11 µg/m³ over the 2012 - 2017 period, with an average PM_{2.5}/PM₁₀ ratio ranging from 0.50 - 0.64. Based on this information, a conservative ratio of 0.65 was used to generate a current background PM_{2.5} concentration in the region of the proposed development of 11.7 µg/m³.

In terms of benzene, limited data is available for the Zone B location of South Link Road. Concentrations were 0.6 - 0.8 µg/m³ for the period 2012 - 2013. However monitoring for benzene at this location is no longer continued. As an alternative, data from the EPA Zone A monitoring station in Rathmines showed concentrations ranged from 0.94 - 1.01 µg/m³ for the period 2013 - 2017. This is well below the limit value of 5 µg/m³. Based on this EPA data a conservative estimate of the current background benzene concentration in the region of the proposed development is 1.0 µg/m³.

With regard to CO, annual averages at the Zone B, location of South Link Road over the 2012 - 2017 period are low, peaking at 4% of the limit value (10 mg/m³) (EPA, 2018). Based on this EPA data, a conservative estimate of the current background CO concentration in the region of the development is 0.4 mg/m³.

Background concentrations for Opening Year and Design Year have been calculated. These have used current estimated background concentrations and the year on year reduction factors provided by Transport Infrastructure Ireland in the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (2011) and the UK Department for Environment, Food and Rural Affairs LAQM.TG(16) (2016).

10.4 Characteristics of the Proposed Development

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

When considering a development of this nature, the potential air quality and climate impact on the surroundings must be considered for each of two distinct stages:

- A. construction phase, and;
- B. operational phase.

The primary sources of air and climatic emissions in the operational context are deemed long term and will involve the change in traffic flows or congestion in the local areas which are associated with the development. The following describes the primary sources of potential air quality and climate impacts which have been assessed as part of this EIAR.

10.5 Predicted Impacts

10.5.1 Do Nothing Scenario

The Do Nothing scenario includes retention of the current site without the proposed residential development. In this scenario, ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc).

10.5.2 Construction Phase

10.5.2.1 Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust and PM₁₀/PM_{2.5} emissions. This can be considered a moderate scale development, however there will be limited use of haul routes, indicating that, as a worst case, there is the potential for significant dust soiling effects 50m from works areas (see Table 10.4). While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. There are a number of sensitive receptors, predominantly residential properties in close proximity to the site. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan. Provided the dust minimisation measures outlined in the plan (see Appendix 10.3) are adhered to, the air quality impacts during the construction phase will not be significant.

Table 10.4 Assessment Criteria for the Impact of Dust from Construction, with Standard Mitigation in Place (TII, 2011)

Source		Potential Distance for Significant Effects (Distance From Source)		
Scale	Description	Soiling	PM ₁₀	Vegetation Effects
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

10.5.2.2 Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO₂ and N₂O emissions. However, the impact on climate is considered to be imperceptible in the short and long term.

10.5.2.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be short-term and imperceptible with respect to human health.

10.5.3 Operational Phase

10.5.3.1 Local Air Quality

There is the potential for a number of emissions to the atmosphere during the operational phase of the proposed residential development. In particular, the additional traffic on the local road network has the potential to generate quantities of air pollutants such as NO₂, CO, benzene, PM₁₀ and PM_{2.5}.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA (2016). As part of the cumulative effects, the cumulative impact of the development under two scenarios were investigated as part of the operational phase air quality assessment. The first includes the cumulative impacts of the proposed residential development with the proposed Castletreasure Primary School on adjacent lands but does not include any public road improvements (i.e. M28). The second scenario accounts for the cumulative impact of the proposed residential development with the Castletreasure Primary School and the additional school adjacent to the proposed development site; it also includes the cumulative impact of the proposed road improvements (M28 and associated junctions).

Background concentrations (EPA, 2018) have been included in the modelling study. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern. Appropriate background levels were selected based on the available monitoring data provided by the EPA (EPA, 2018) (see Section 10.3.3).

Traffic flow information for the two scenarios was obtained from the consulting engineers on this project and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur.

The impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. The impact of CO, benzene, NO₂, PM₁₀ and PM_{2.5} for the baseline, opening and design years was predicted at the nearest sensitive receptors to the development. This assessment allows the significance of the development, with respect to both relative and absolute impact, to be determined.

Transport Infrastructure Ireland *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (TII, 2011) detail a methodology for determining air quality impact significance criteria for road schemes and has been adopted for this assessment, as is best practice. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' (DN) scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact.

Scenario 1

This scenario accounts for the cumulative impact of the proposed development and the Castletreasure Primary School but does not include any road improvement works such as the M28. The receptors modelled represent the worst-case locations close to the proposed development and were chosen due to their close proximity (within 200 m) to the road links impacted by the proposed development. The worst case traffic data which satisfied the assessment criteria detailed in Section 10.2.1 is shown in Table 10.5, with the percentage of HGV's shown in parenthesis below the AADT. In this scenario four road links satisfied the assessment criteria. Four sensitive residential receptors (R1 - R4) in the vicinity of the road links impacted by the proposed development have been assessed. Sensitive receptors have been chosen as they have the potential to be adversely impacted by the development, these receptors are shown in Figure 10.2.

Table 10.5 Traffic Data used in Modelling Assessment - Scenario 1

Road Name	Base Year	Do-Nothing (DN)		Do-Something (DS)		Speed (kph)
	2018	2024	2039	2024	2039	
1: R607	6,684 (1%)	7,384 (1%)	7,769 (1%)	8,883 (1%)	9,236 (1%)	50
2: R609	11,348 (1%)	12,149 (1%)	12,973 (1%)	14,642 (1%)	15,255 (1%)	50
3: R610 Douglas Relief Road	18,893 (2%)	18,007 (2%)	19,767 (2%)	19,258 (2%)	20,513 (2%)	30
5: Maryborough Hill	11,422 (2%)	11,433 (2%)	12,143 (2%)	12,488 (2%)	12,542 (2%)	50



Figure 10.2 Approximate Location of Sensitive Receptors used in Modelling Assessment

NO₂

The results of the assessment of the impact of the proposed development on NO₂ in the opening and design years are shown Table 10.7 for the Highways Agency IAN 170/12 and Table 10.8 using the UK Department for Environment, Food and Rural Affairs technique respectively. The annual average concentration is within the limit value at all worst-case receptors using both techniques. Levels of NO₂ are 70% of the annual limit value in the opening year and 67% in the design year using the more conservative IAN technique. In comparison, concentrations are 60% of the annual limit value in the opening year and 56% in the design year using the UK Department for Environment, Food and Rural Affairs technique. The hourly limit value for NO₂ is 200 µg/m³ and is expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO₂ concentration is not predicted to be exceeded using either technique (Table 10.9).

The impact of the proposed development on annual mean NO₂ levels can be assessed relative to "Do Nothing (DN)" levels in the opening and design years. Relative to baseline levels, some small increases in pollutant levels are predicted as a result of the proposed development. With regard to impacts at individual receptors, the greatest impact on NO₂ concentrations will be an increase of 2.4% of the annual limit value at Receptor 2. Thus, using the assessment criteria outlined in Appendix 10.2 Tables 1 - 2, the impact of the proposed development in terms of NO₂ is negligible. Therefore, the overall impact of NO₂ concentrations as a result of the proposed development is negative, long-term and imperceptible at all of the receptors assessed.

PM₁₀

The results of the modelled impact of the proposed development for PM₁₀ in the opening and design years are shown in Table 10.10. Predicted annual average concentrations at the worst-case receptor in the region of the development are at most 48% of the limit value in both the opening and design years. It is predicted that all worst case receptors will experience at most two exceedances of the 50 µg/m³ 24-hour mean value (35 exceedances are permitted per year) either with or without the proposed development in place (Table 10.11).

Relative to baseline levels, some imperceptible increases in PM₁₀ levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on PM₁₀ concentrations in the region of the proposed development will be an increase of 0.5% of the annual limit value at Receptor 2. Thus, the magnitude of the changes in air quality are negligible at all receptors based on the criteria outlined in Appendix 10.2, Tables 1 - 3. Therefore, the overall impact of PM₁₀ concentrations as a result of the proposed development is negative, long-term and imperceptible.

PM_{2.5}

The results of the modelled impact of the proposed development for PM_{2.5} are shown in Table 10.12. Predicted annual average concentrations in the region of the proposed development are 50% of the limit value in the opening and design years at the worst-case receptor.

Relative to baseline levels, imperceptible increases in PM_{2.5} levels at the worst-case receptors are predicted as a result of the proposed development. None of the receptors assessed will experience an increase in concentrations of over 0.6% of the limit value. Therefore, using the assessment criteria outlined in Appendix 10.2, Tables 1 - 2, the impact of the proposed development with regard to PM_{2.5} is negligible at all of the receptors assessed. Overall, the impact of increased PM_{2.5} concentrations as a result of the proposed development is negative, long-term and imperceptible.

CO and Benzene

The results of the modelled impact of CO and benzene are shown in Table 10.13 and Table 10.14 respectively. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Levels of CO are 25% of the limit value in the opening and design years; with levels of benzene reaching 22% of the limit value in the opening year and 23% in the design year.

Relative to baseline levels, some imperceptible increases in pollutant levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on CO and benzene concentrations in either the opening or design years will be an increase of 0.66% of the annual mean CO limit value and 0.3% of the annual mean benzene limit value at Receptor 2. Thus, using the assessment criteria for NO₂ and PM₁₀ in Appendix 10.2 and applying these criteria to CO and benzene, the impact of the proposed development in terms of CO and benzene is negligible. Overall, the impact of increased CO and Benzene concentrations of the proposed development is negative, long-term and imperceptible.

Scenario 2

This scenario accounts for the cumulative impact of the proposed M28 scheme and 2 no. schools in the vicinity of the proposed development including associated junctions. In this scenario, only three road links satisfied the criteria to require an assessment as detailed in Section 10.2.1. Details of each road link are shown in Table 10.6, with the percentage of HGV's shown in parenthesis below the AADT. Receptor 1 (R1) and Receptor 2 (R2) remain the same as the Scenario 1 assessment and there is an additional receptor, R5 (Figure 10.2).

Table 10.6 Traffic Data used in Modelling Assessment - Scenario 2

Road Name	Base Year	Do-Nothing (DN)		Do-Something (DS)		Speed (kph)
	2018	2024	2039	2024	2039	
1: R607	9,563 (1%)	11,011 (1%)	13,497 (1%)	13,079 (1%)	15,584 (1%)	50
2: R609	13,780 (1%)	14,018 (1%)	16,549 (1%)	15,947 (1%)	18,478 (1%)	50
8: Carrs Hill Underbridge	10,252 (1%)	11,453 (1%)	13,298 (1%)	12,514 (1%)	14,559 (1%)	30

NO₂

The results of the assessment of the impact of the proposed development on NO₂ in the opening and design years are shown Table 10.7 for the Highways Agency IAN 170/12 and Table 10.8 using the UK Department for Environment, Food and Rural Affairs technique respectively. The annual average concentration is within the limit value at all worst-case receptors using both techniques. Levels of NO₂ are 72% of the annual limit value in the opening year and 71% in the design year using the more conservative IAN technique. In comparison, concentrations are 63% of the annual limit value in the opening year and 60% in the design year using the UK Department for Environment, Food and Rural Affairs technique. In addition, the maximum 1-hour NO₂ concentration is not predicted to be exceeded using either technique for Scenario 2 (Table 10.9).

As with Scenario 1, the impact of the proposed development on annual mean NO₂ levels can be assessed relative to "Do Nothing (DN)" levels in the opening and design years. Relative to baseline levels, some small increases in pollutant levels are predicted as a result of the proposed development. With regard to impacts at individual receptors, the greatest impact on NO₂ concentrations will be an increase of 2.1% of the annual limit value at Receptor 2. Thus, using the assessment criteria outlined in Appendix 10.2 Tables 1 - 2, the impact of the proposed development in terms of NO₂ is negligible. Therefore, the overall impact of NO₂ concentrations as a result of the proposed development is negative, long-term and imperceptible at all of the receptors assessed.

PM₁₀

The results of the modelled impact of the proposed development for PM₁₀ in the opening and design years are shown in Table 10.10. Predicted annual average concentrations at the worst-case receptor in the region of the development are at most 48% of the limit value in the opening year and 49% of the limit value in the design year. It is predicted that Receptor 2 will experience 3 exceedances of the 50 µg/m³ 24-hour mean value (35 exceedances are permitted per year). This is an increase of one per year exceedance for do nothing conditions in the opening year (Table 10.11).

Relative to baseline levels, some imperceptible increases in PM₁₀ levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on PM₁₀ concentrations in the region of the proposed development will be an increase of 0.5% of the annual limit value at Receptor 2. Thus, the magnitude of the changes in air quality are negligible at all receptors based on the criteria outlined in Appendix 10.2, Tables 1 - 3. Therefore, the overall impact of PM₁₀ concentrations as a result of the proposed development is negative, long-term and imperceptible.

PM_{2.5}

The results of the modelled impact of the proposed development for PM_{2.5} are shown in Table 10.12. Predicted annual average concentrations in the region of the proposed development are 50% of the limit value in the opening year and 50.5% of the limit value in the design year at the worst-case receptor.

Relative to baseline levels, imperceptible increases in PM_{2.5} levels at the worst-case receptors are predicted as a result of the proposed development. None of the receptors assessed will experience an increase in concentrations of over 0.5% of the limit value. Therefore, using the assessment criteria outlined in Appendix 10.2, Tables 1 - 2, the impact of the proposed development with regard to PM_{2.5} is negligible at all of the receptors assessed. Overall, the impact of increased PM_{2.5} concentrations as a result of the proposed development is negative, long-term and imperceptible.

CO and Benzene

The results of the modelled impact of CO and benzene are shown in Table 10.13 and Table 10.14 respectively. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Levels of CO are 25% of the limit value in the opening and design years; with levels of benzene reaching 22% of the limit value in the opening year and 23% in the design year.

Relative to baseline levels, some imperceptible increases in pollutant levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on CO and benzene concentrations in either the opening or design years will be an increase of 0.6% of the annual mean CO limit value and 0.3% of the annual mean benzene limit value at Receptor 2. Thus, using the assessment criteria for NO₂ and PM₁₀ in Appendix 10.2 and applying these criteria to CO and benzene, the impact of the proposed development in terms of CO and benzene is negligible. Overall, the impact of increased CO and Benzene concentrations of the proposed development is negative, long-term and imperceptible.

Summary of Local Air Quality Modelling

Levels of traffic-derived air pollutants for the development will not exceed the ambient air quality standards either with or without the proposed development in place in either Scenario 1 or Scenario 2. The addition of the road improvements associated with the proposed M28 causes a redistribution of traffic away from previously congested areas resulting in lower traffic flows on the majority of the road links in the vicinity of the proposed development. Using the assessment criteria outlined in Appendix 10.2, Table 1 - 3, the impact of the development in terms of PM₁₀, PM_{2.5}, NO₂, CO and benzene is negligible, long-term, negative and imperceptible.

10.5.3.2 Regional Air Quality Impact

The regional impact of the proposed development on emissions of NO_x and VOCs has been assessed using the procedures of Transport Infrastructure Ireland (TII, 2011) and the UK Department for Environment, Food and Rural Affairs (2016). The results for Scenario 1 (see Table 10.15) show that the likely impact of the proposed development in Scenario 1 on Ireland's obligations under the Targets set out by Directive EU 2016/2284 "On the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC" are imperceptible and long-term. For the opening year 2024, the predicted impact of the changes in AADT is to increase NO_x levels by 0.00101% of the NO_x emissions ceiling and increase VOC levels by 0.00044% of the VOC emissions ceiling to be complied with in 2020. For the design year of 2039 NO_x levels are predicted to increase by 0.00132% of the NO_x emissions ceiling and VOC levels are predicted to increase by 0.00038% of the VOC emissions ceiling to be complied with in 2035.

The impact of the proposed development in Scenario 2 (Table 10.16) is also predicted to be long-term and imperceptible with regards to regional air quality. NO_x levels are predicted to increase by 0.00078% in 2024 and VOC levels will increase by 0.00035% of the emissions ceilings to be complied with in 2020. For the design year of 2039 NO_x levels will increase by 0.00129% and VOC levels will increase by 0.00038% of the emission ceilings to be complied with in 2035.

Therefore, the likely overall magnitude of the changes on regional air quality in the operational stage is negative, imperceptible, long-term and not significant.

10.5.3.3 Climate

The impact of the proposed development on emissions of CO₂ impacting climate were also assessed using the Design Manual for Roads and Bridges screening model (see Table 10.15 for Scenario 1). The results show that the impact of the proposed development for Scenario 1 in the opening year 2024 will be to increase CO₂ emissions by 0.00112% of Ireland's EU 2020 Target. In the design year the proposed development is predicted to increase CO₂ emissions by 0.00089% of Ireland's EU 2020 Target. Thus, the impact of the proposed development on national greenhouse gas emissions will be insignificant in terms of Ireland's obligations under the EU 2020 Target (EU, 2014).

The impact of the proposed development on climate in Scenario 2 are also predicted to be imperceptible. The results (see Table 10.16) show that in the opening and design years CO₂ emissions are predicted to increase by 0.00088% of Ireland's EU 2020 Target.

Climate change also has the potential to alter rainfall patterns leading to potential flooding events in future years. A flood risk assessment has been undertaken and any measures to avoid potential flooding impacts have been incorporated into the design of the proposed development.

Therefore, the likely overall magnitude of the changes on climate in the operational stage of the proposed development in either scenario is negative, imperceptible, long-term and not significant.

10.5.3.4 Human Health

Air dispersion modelling of operational traffic emissions was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results, emissions as a result of the proposed development are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health.

10.5.3.5 Cumulative Impacts

Should the construction phase of the proposed development coincide with the construction of any other permitted developments within 350m of the site then there is the potential for cumulative dust impacts to the nearby sensitive receptors. The dust mitigation measures outlined in Appendix 10.3 should be applied throughout the construction phase of the proposed development, with similar mitigation measures applied for other permitted developments which will avoid significant cumulative impacts on air quality. With appropriate mitigation measures in place, the predicted cumulative impacts on air quality and climate associated with the construction phase of the proposed development are deemed short-term and not significant.

If additional residential or commercial developments are proposed in the future, in the vicinity of the proposed development, this has the potential to add further additional vehicles to the local road network. However, it is unlikely that other future developments of similar scale would give rise to a significant impact during the construction and operational stages of those projects. Cumulative impacts associated with the 2 no. proposed schools (Castletreasure Primary School and school adjacent to proposed development) and road improvement schemes (M28) have been taken into account in the operational phase air quality and climate modelling assessment and do not result in any significant impacts on sensitive receptors. Future projects of a large scale would need to conduct an EIA to ensure that no significant impacts on air quality or climate will occur as a result of those developments.

Chapter 2 provides details of potential cumulative projects in the environs. Other, than the 2 proposed schools and road improvement scheme (M28) these projects are not considered to have any potential cumulative impacts in terms of air quality and climate, due to the scale of the developments proposed and distance from the Castletreasure site.

Table 10.7 Annual Mean NO₂ Concentrations (µg/m³) (using Interim advice note 170/12 V3 Long Term NO₂ Trend Projections)

Receptor	Impact Opening Year (2024)					Impact Design Year (2039)				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
Scenario 1										
1	24.7	25.2	0.46	Small	Small Increase	23.8	24.2	0.45	Small	Small Increase
2	27.0	27.9	0.97	Small	Small Increase	26.1	26.9	0.89	Small	Small Increase
3	27.5	27.6	0.15	Imperceptible	Negligible Increase	26.4	26.5	0.08	Imperceptible	Negligible Increase
4	26.0	26.3	0.35	Imperceptible	Negligible Increase	25.0	25.2	0.13	Imperceptible	Negligible Increase
Scenario 2										
1	25.7	26.3	0.62	Small	Small Increase	25.3	25.8	0.52	Small	Small Increase
2	28.1	29.0	0.84	Small	Small Increase	27.9	28.5	0.61	Small	Small Increase
5	23.2	23.2	0.04	Imperceptible	Negligible Increase	22.2	22.2	0.05	Imperceptible	Negligible Increase

Table 10.8 Annual Mean NO₂ Concentrations (µg/m³) (using UK Department for Environment, Food and Rural Affairs Technical Guidance)

Receptor	Impact Opening Year (2024)					Impact Design Year (2039)				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
Scenario 1										
1	21.0	21.4	0.39	Imperceptible	Negligible Increase	19.3	19.7	0.37	Imperceptible	Negligible Increase
2	23.2	24.1	0.84	Small	Small Increase	21.7	22.4	0.74	Small	Small Increase
3	23.8	24.0	0.13	Imperceptible	Negligible Increase	22.2	22.3	0.07	Imperceptible	Negligible Increase
4	22.3	22.6	0.30	Imperceptible	Negligible Increase	20.7	20.8	0.11	Imperceptible	Negligible Increase
Scenario 2										
1	21.9	22.5	0.53	Small	Small Increase	20.8	21.2	0.43	Small	Small Increase
2	24.5	25.2	0.73	Small	Small Increase	23.5	24.0	0.51	Small	Small Increase
5	19.4	19.4	0.03	Imperceptible	Negligible Increase	17.7	17.7	0.04	Imperceptible	Negligible Increase

Table 10.9 99.8th Percentile of Daily Maximum 1-hour NO₂ Concentrations (µg/m³)

Receptor	IAN 170/12 V3 Long Term NO ₂ Trend Projections Technique				Defra's Technical Guidance Technique			
	Impact Opening Year (2024)		Impact Design Year (2039)		Impact Opening Year (2024)		Impact Design Year (2039)	
	DN	DS	DN	DS	DN	DS	DN	DS
Scenario 1								
1	86.6	88.2	83.2	84.7	86.6	88.2	83.2	84.7
2	94.3	97.7	91.2	94.3	94.3	97.7	91.2	94.3
3	96.1	96.6	92.4	92.7	96.1	96.6	92.4	92.7
4	91	92.2	87.6	88.1	91	92.2	87.6	88.1
Scenario 2								
1	89.9	92.1	88.6	90.4	89.9	92.1	88.6	90.4
2	98.4	101.4	97.6	99.7	98.4	101.4	97.6	99.7
5	81.1	81.2	77.6	77.8	81.1	81.2	77.6	77.8

Table 10.10 Annual Mean PM₁₀ Concentrations (µg/m³)

Receptor	Impact Opening Year (2024)					Impact Design Year (2039)				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
Scenario 1										
1	18.2	18.3	0.10	Imperceptible	Negligible Increase	18.2	18.3	0.10	Imperceptible	Negligible Increase
2	18.7	19.0	0.22	Imperceptible	Negligible Increase	18.8	19.0	0.20	Imperceptible	Negligible Increase
3	19.0	19.1	0.04	Imperceptible	Negligible Increase	19.1	19.1	0.02	Imperceptible	Negligible Increase
4	18.4	18.5	0.07	Imperceptible	Negligible Increase	18.5	18.5	0.03	Imperceptible	Negligible Increase
Scenario 2										
1	18.4	18.5	0.13	Imperceptible	Negligible Increase	18.6	18.7	0.11	Imperceptible	Negligible Increase
2	19.0	19.2	0.19	Imperceptible	Negligible Increase	19.3	19.4	0.14	Imperceptible	Negligible Increase
5	17.8	17.8	0.01	Imperceptible	Negligible Increase	17.8	17.8	0.01	Imperceptible	Negligible Increase

Table 10.11 Number of days with PM₁₀ concentration > 50 µg/m³

Receptor	Impact Opening Year (2024)		Impact Design Year (2039)	
	DN	DS	DN	DS
Scenario 1				
1	2	2	2	2
2	2	2	2	2
3	2	2	2	2
4	2	2	2	2
Scenario 2				
1	2	2	2	2
2	2	3	3	3
5	1	1	1	1

Table 10.12 Annual Mean PM_{2.5} Concentrations (µg/m³)

Receptor	Impact Opening Year (2024)					Impact Design Year (2039)				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
Scenario 1										
1	11.8	11.9	0.06	Imperceptible	Negligible Increase	11.8	11.9	0.06	Imperceptible	Negligible Increase
2	12.2	12.3	0.14	Imperceptible	Negligible Increase	12.2	12.4	0.13	Imperceptible	Negligible Increase
3	12.4	12.4	0.02	Imperceptible	Negligible Increase	12.4	12.4	0.01	Imperceptible	Negligible Increase
4	12.0	12.0	0.05	Imperceptible	Negligible Increase	12.0	12.0	0.02	Imperceptible	Negligible Increase
Scenario 2										
1	12.0	12.0	0.09	Imperceptible	Negligible Increase	12.1	12.1	0.07	Imperceptible	Negligible Increase
2	12.4	12.5	0.12	Imperceptible	Negligible Increase	12.5	12.6	0.09	Imperceptible	Negligible Increase
5	11.6	11.6	0.01	Imperceptible	Negligible Increase	11.6	11.6	0.01	Imperceptible	Negligible Increase

Table 10.13 Maximum 8-hour CO Concentrations (mg/m³)

Receptor	Impact Opening Year (2024)					Impact Design Year (2039)				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
Scenario 1										
1	2.15	2.18	0.030	Imperceptible	Negligible Increase	2.16	2.19	0.029	Imperceptible	Negligible Increase
2	2.32	2.39	0.066	Imperceptible	Negligible Increase	2.34	2.40	0.060	Imperceptible	Negligible Increase
3	2.45	2.47	0.012	Imperceptible	Negligible Increase	2.47	2.48	0.007	Imperceptible	Negligible Increase
4	2.23	2.25	0.021	Imperceptible	Negligible Increase	2.24	2.25	0.008	Imperceptible	Negligible Increase
Scenario 2										
1	2.22	2.26	0.042	Imperceptible	Negligible Increase	2.27	2.31	0.035	Imperceptible	Negligible Increase
2	2.42	2.48	0.059	Imperceptible	Negligible Increase	2.49	2.53	0.043	Imperceptible	Negligible Increase
5	2.03	2.04	0.003	Imperceptible	Negligible Increase	2.04	2.04	0.004	Imperceptible	Negligible Increase

Table 10.14 Annual Mean Benzene Concentrations (µg/m³)

Receptor	Impact Opening Year (2024)					Impact Design Year (2039)				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
Scenario 1										
1	1.03	1.04	0.007	Imperceptible	Negligible Increase	1.04	1.04	0.007	Imperceptible	Negligible Increase
2	1.08	1.09	0.016	Imperceptible	Negligible Increase	1.08	1.10	0.015	Imperceptible	Negligible Increase
3	1.11	1.12	0.008	Imperceptible	Negligible Increase	1.12	1.13	0.005	Imperceptible	Negligible Increase
4	1.05	1.06	0.005	Imperceptible	Negligible Increase	1.06	1.06	0.002	Imperceptible	Negligible Increase
Scenario 2										
1	1.05	1.06	0.010	Imperceptible	Negligible Increase	1.06	1.07	0.010	Imperceptible	Negligible Increase
2	1.10	1.11	0.016	Imperceptible	Negligible Increase	1.12	1.13	0.016	Imperceptible	Negligible Increase
5	1.01	1.01	0.001	Imperceptible	Negligible Increase	1.01	1.01	0.001	Imperceptible	Negligible Increase

Table 10.15 Regional Air Quality & Climate Assessment - Scenario 1

Year	Scenario	VOC	NO _x	CO ₂
		(kg/annum)	(kg/annum)	(tonnes/annum)
2024	Do Nothing	2,024	5,395	3,412
	Do Something	2,276	6,063	3,839
2039	Do Nothing	2,164	5,764	3,647
	Do Something	2,362	6,293	3,983
Increment in 2020		251.8 kg	667.6 kg	426.4 Tonnes
Increment in 2035		197.6 kg	529.2 kg	336.2 Tonnes
Emission Ceiling (kilo Tonnes) 2020		56.8 Note 1	66.2 Note 1	37,943 Note 2
Emission Ceiling (kilo Tonnes) 2035		51.5 Note 1	40.2 Note 1	37,943 Note 2
Impact in 2020 (%)		0.00044 %	0.00101 %	0.00112 %
Impact in 2035 (%)		0.00038 %	0.00132 %	0.00089 %

Note 1 Targets under Directive EU 2016/2284 "On the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC"

Note 2 20-20-20 Climate and Energy Package

Table 10.16 Regional Air Quality & Climate Assessment - Scenario 2

Year	Scenario	VOC	NO _x	CO ₂
		(kg/annum)	(kg/annum)	(tonnes/annum)
2024	Do Nothing	2,744	7,330	4,635
	Do Something	2,941	7,848	4,969
2039	Do Nothing	3,159	8,421	5,334
	Do Something	3,356	8,940	5,668
Increment in 2020		196.6 kg	518.1 kg	333.3 Tonnes
Increment in 2035		196.9 kg	518.9 kg	333.8 Tonnes
Emission Ceiling (kilo Tonnes) 2020		56.8 Note 1	66.2 Note 1	37,943 Note 2
Emission Ceiling (kilo Tonnes) 2035		51.5 Note 1	40.2 Note 1	37,943 Note 2
Impact in 2020 (%)		0.00035 %	0.00078 %	0.00088 %
Impact in 2035 (%)		0.00038 %	0.00129 %	0.00088 %

Note 1 Targets under Directive EU 2016/2284 "On the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC"

Note 2 20-20-20 Climate and Energy Package

10.6 Ameliorative, Remedial or Reductive Measures

10.6.1 Construction Stage

10.6.1.1 Air Quality

The pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the dust management plan. The key aspects of controlling dust are listed below. Full details of the dust management plan can be found in Appendix 10.3.

- The specification and circulation of a dust management plan for the site and the identification of persons responsible for managing dust control and any potential issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust management plan can be monitored and assessed;
- The specification of effective measures to deal with any complaints received.

At all times, the procedures within the plan will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

10.6.1.2 Climate

Construction traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO₂ and N₂O emissions. However, due to short-term and temporary nature of these works, the impact on climate will not be significant.

Nevertheless, some site-specific mitigation measures can be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

10.6.2 Operational Stage

No additional mitigation measures are required as the operational phase of the proposed cumulative development as it is predicted to have an imperceptible impact on ambient air quality and climate.

10.7 Residual Impact of the Proposed Development

10.7.1 Construction Stage

10.7.1.1 Air Quality

When the dust minimisation measures detailed in the mitigation section of this Chapter (Section 10.6) are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

10.7.2 Climate

Impacts to climate during the construction phase are considered imperceptible and therefore residual impacts are not predicted.

10.7.3 Operational Stage

The results of the air dispersion modelling study indicate that the impact of the proposed development on air quality and climate is predicted to be imperceptible with respect to the operational phase.

10.8 Monitoring

10.8.1 Construction Stage

Monitoring of construction dust deposition at nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m²*day) during the monitoring period between 28 - 32 days.

10.8.2 Operational Stage

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

10.9 Difficulties Encountered

There were no difficulties encountered while carrying out this assessment.



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Chapter 11

Cultural Heritage

11

Environmental Impact Assessment Report (EIAR)

CAIRN
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CHAPTER 11 CULTURAL HERITAGE

11.1 Introduction

This chapter assesses the impacts of the proposed development on the known and potential cultural heritage resource. The term 'Cultural Heritage' encompasses heritage assets relevant to both the tangible resource (archaeology, architecture heritage); and non-tangible resources (history, folklore, tradition, language, placenames etc.). The recorded and potential cultural heritage resource within lands encompassing both the proposed development site (hereafter referred to as the 'study area') and the lands extending for 500m from its boundary, was assessed in order to compile a comprehensive cultural heritage baseline and context.

This chapter was prepared by John Cronin and Colm Chambers of John Cronin and Associates. Mr Cronin holds qualifications in archaeology (B.A. (University College Cork (UCC), 1991), regional and urban planning (MRUP (University College Dublin (UCD) 1993) and post-graduate qualifications in urban and building conservation (MUBC (UCD), 1999). Mr Chambers holds a primary degree in archaeology (B.A. (UCC) 2008) and a post graduate master's degree in maritime archaeology (University College London (UCL), 2009), and archaeological excavation (UCC, 2011). Both individuals have extensive experience in the compilation of archaeological, architectural and cultural heritage impact assessments: Mr Cronin has over twenty-five years industry experience in both the public and private sectors, whilst Mr Chambers has amassed over ten years industry experience in the commercial archaeological sector.

11.2 Proposed Development

The proposed development consists of circa 475 no. dwelling units, a creche and all associated ancillary site development works. A detailed description of the development is provided in Chapter 2 (Project Description).

11.3 Methodology

The methodology used for this assessment is based on the EPA (2017) *Draft Guidelines for Information to be Contained in EIAR* as well as guidelines for the assessment of impacts on the cultural heritage resource published by the International Council on Monuments and Sites (ICOMOS 2011). The assessment was based on a programme of desk-based research combined with a number of site inspections and these studies were undertaken to identify any features of archaeological, architectural or cultural heritage significance likely to be effected by the proposed development.

11.3.1 Desktop Study

Documentary research on the recorded and potential cultural heritage resource within the study area and its environs was carried out in order to identify any recorded archaeological, architectural and other cultural heritage sites and features. This information has provided an insight into the development of the study area over time and also assisted in an evaluation of the potential presence of unrecorded cultural heritage sites or features.

The principal sources reviewed for the assessment of the recorded archaeological resource were the Sites and Monuments Record (SMR) and the Record of Monuments and Places (RMP) maintained by the Department of Culture, Heritage and the Gaeltacht (DoCHG). Cork County Council's Record of Protected Structures (RPS) and the DoCHG's National Inventory of Architectural Heritage (NIAH) were consulted to assess the designated architectural heritage resource. Summaries of the legal and planning frameworks designed to protect these elements of the cultural heritage resource are also provided within the chapter.

Other sources consulted as part of the assessment included the following:

Development Plan

The current Cork County Development Plan (2014-2020) was consulted as part of this assessment. This publication outlines the Council's policies for the protection of the archaeological and architectural heritage resource and includes the list of Record of Protected Structures (RPS) within the county.

Database of Irish Excavation Reports

The Database of Irish Excavation Reports contains summary accounts of all archaeological excavations carried out in Ireland (North and South) from 1970 to 2018. Current data was accessed via www.excavations.ie

Literary Sources

Various published literary sources were consulted in order to assess the archaeological, historical, architectural heritage and folklore record of the study area and these are listed in Section 11.8 of this chapter.

Archaeological Inventory of County Cork Vol. 2: South and East Cork:

This publication presents summary descriptions of the recorded archaeological sites within this area of the county and the relevant entries are included within the chapter. In addition, the current national online database resources pertaining to same were accessed: Historical Map Viewer at www.archaeology.ie

Historical Maps

The detail on historic cartographic sources can indicate the presence of past settlement patterns, including features of archaeological and architectural heritage significance that no longer have any surface expression.

Aerial Imagery

A review of available online aerial imagery of the study area was undertaken in order to ascertain if any traces of unrecorded archaeological sites were visible.

Irish Heritage Council: Heritage Map Viewer

This online mapping source (www.heritagemaps.ie) is a spatial data viewer which collates various cultural heritage datasets and includes the National Museum of Ireland's records of artefact discovery locations as well as datasets provided by, among others, the National Monuments Service, local authorities, the Royal Academy of Ireland and the Office of Public Works.

Irish National Folklore Collection

Transcribed material from the National Folklore Collection archive has been digitised and published online at www.duchas.ie.

Placenames Database of Ireland

This online database (www.logainm.ie) provides a comprehensive management system for data, archival records and place names research conducted by the State.

Open Topographic Data Viewer

This online resource publishes a range of LiDAR images collated from a number of State bodies and the coverage extends into the northeast end of the study area.

UNESCO designated World Heritage Sites and Tentative List

There are two world heritage sites in Ireland and a number of other significant sites included in a Tentative List (2010) that has been put forward by Ireland for inclusion.

11.3.2 Field Survey

The study area was inspected on a number of occasions during 2018. The lands were assessed in terms of modern land use, remnants of historic landscape features, vegetation cover and the potential for the presence of previously unrecorded archaeological and architectural heritage sites/features. The survey results are described within the chapter and extracts from the photographic record compiled during the field survey are presented in Appendix 11.1.

11.3.3 Impact Assessment

Guiding principles in relation to the assessment of impacts of Cultural Heritage, including current legislation, and EPA Guidelines and Advice Notes pertaining to EIA (2002; 2003; 2015 Draft and 2017 Draft) have been adhered to as part of the methodological approach, with a view to identifying likely and significant impacts on the resource.

The methodology used for this assessment is based on the EPA (2015) *Draft Advice Notes for Preparing an EIS* (2015) and the EPA *Draft Guidelines for Information to be Contained in EIA* (2017), in accordance with EU Directive 2014/52/EU concerning EIA assessment.

The *Significance of the Effect* is based on an assessment largely of the Magnitude of the Impact (graded from High to Negligible, based on a consideration of character, duration, probability and consequences) and the Value (graded from High to Negligible, based on a consideration of significance/sensitivity) of the heritage asset.

Magnitude of Impact (degree of change, incorporating any mitigation measures) can be negative or positive, and should be ranked without regard to the value of the asset.

The *Duration of impacts* is assessed based on the following criteria: Momentary (seconds to minutes); Brief < 1 day; Temporary <1 year; Short-term 1-7 years; Medium Term 7-15years; Long Term 15-60 years; Permanent > 60 years.

The evaluation of the Value of a heritage asset is largely based on its significance criteria, and should not be considered definitive, but rather an indicator which contributes to a wider judgment based on the individual circumstances of each feature. Generally, the more criteria that are evident for a given asset, the higher in scale its respective Value shall be. Criteria to be considered in addition to any legal designations include a consideration of the condition/preservation; documentary/historical significance; group value; rarity; visibility in the landscape; fragility/vulnerability and amenity value.

The Value of all known or potential assets that may be affected by the proposed project are ranked according to the following scale: High; Medium; Low and Negligible.

Tables 11.1, 11.2 illustrate the various factors and criteria which inform the assessment. A Significance of Effects Matrix is shown in Table 11.3.

Table 11.1: Factors for assessing the Value of the Cultural Heritage Asset

High	<ul style="list-style-type: none"> World Heritage Sites (including nominated sites) and including Structures of universal importance Assets of acknowledged international importance, including buildings Assets that can contribute significantly to acknowledged international research objectives Designated National Monuments (archaeological) Assets of significant quality and importance, including RMP sites Protected Structures/National Grade Buildings Conservation Areas containing significant buildings of importance, including group value Archaeological Landscapes with significant inter-group value
Medium	<ul style="list-style-type: none"> Assets of good quality and importance, including designated RMP sites Assets that can contribute significantly to acknowledged national and regional research objectives Regional Grade Buildings Other undesignated buildings that can be shown to have exceptional qualities in their fabric or historical associations Undesignated structures of potential national importance (archaeological, potential 'new sites') Conservation Areas containing buildings that contribute significantly to its historic character Historic townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures)
Low	<ul style="list-style-type: none"> Designated and undesignated assets of local importance, including buildings Assets compromised by poor preservation and/or poor survival of contextual associations Assets of limited value, but with potential to contribute to local research objectives Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures)
Negligible	<ul style="list-style-type: none"> Assets with very little or no surviving archaeological interest Buildings of no architectural or historical note; buildings of an intrusive character

The *Significance of Effect* can be described as Profound, Very Significant, Significant, Moderate, Slight, Not Significant or Imperceptible.

Table 11.2: Criteria for assessment Significance of Effects

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

Table 11.3: Significance of Effects Matrix (after EPA Draft Guidelines 2017, p. 53)

Significance of Effects Matrix					
Description of Impact Character / Magnitude / Duration / Probability / Consequences	High	Not Significant/ Slight	Moderate/ Significant	Significant/ Very Significant	Very Significant/ Profound
	Medium	Not Significant	Slight	Moderate/ Significant	Significant/ Very significant
	Low	Not Significant/ Imperceptible	Slight/ Not Significant	Slight	Moderate
	Negligible	Imperceptible	Not Significant/ Imperceptible	Not Significant/ Slight	Slight
		Negligible	Low	Medium	High
Value/Sensitivity of the Asset					

11.4 Description of Existing Environment

11.4.1 General Context

The site is located at Carr’s Hill, Douglas and the general site context is described in Chapter 1. It comprises an area of vacant farmland in Castletreasure and Maryborough townlands and contains a mixture of grassland with areas under gorse, scrub and woodland. The ground surface within areas of the west end have been disturbed by what appears to have been ancillary activity carried out during the construction of modern residential developments to the north. Further details on the internal layout of the study area are provided in Section 11.4.4 of this chapter.

11.4.2 Legal and Planning Context

The management and protection of cultural heritage in Ireland is achieved through a framework of international conventions and national laws and policies. This framework was established in accordance with the provisions of the ‘European Convention on the Protection of the Archaeological Heritage’ (the Valletta Convention) and the ‘European Convention on the Protection of Architectural Heritage’ (Grenada Convention). Both of these conventions were ratified by the Republic of Ireland in 1997.

The relevant legislation and guidelines that are relevant to this assessment include the following:

- National Monuments Act 1930 (and amendments in 1954, 1987, 1994 and 2004);
- Heritage Act (1995);
- National Cultural Institutions Act (1997);
- The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous) Provisions Act (1999);
- Planning and Development Act (2000);
- Architectural Heritage Protection: Guidelines for Planning Authorities (Dept. of Arts, Heritage and Gaeltacht, 2011).
- Framework and Principles for the Protection of Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and the Islands (1999);

11.4.2.1 Relevant Archaeological Legislation and Planning Policies

The National Monuments Act 1930 and its amendments, the Heritage Act 1995 and relevant provisions of the National Cultural Institutions Act 1997 are the primary means of ensuring the satisfactory protection of archaeological remains. These provide a number of mechanisms that are applied to secure the protection of archaeological monuments including the designation of National Monument status, the Register of Historic Monuments (RHM), the Record of

Monuments and Places (RMP), the Sites and Monuments Record (SMR), and the placing of Preservation Orders and Temporary Preservation Orders on endangered sites.

The locations of World Heritage Sites (Ireland) and the Tentative List of World Heritage Sites submitted by the Irish State to UNESCO were reviewed as part of the assessment and none are located in the vicinity of the proposed development.

Section 2 of the National Monuments Act, 1930 defines a National Monument as 'a monument or the remains of a monument, the preservation of which is a matter of national importance'. The State may acquire or assume guardianship of examples through agreement with landowners or under compulsory orders. Archaeological sites within the ownership of local authorities are also deemed to be National Monuments. There are no National Monuments, or recorded archaeological sites subject to Preservation Orders, located within the study area or within 500m of its boundary.

The RMP was established under Section 12 (1) of the National Monuments (Amendment) Act, 1994 and was based on the earlier SMR and RHM records. The RMP comprises lists and maps of all known archaeological monuments and places for each county in the State. All archaeological sites listed in the RMP receive statutory protection under the 1994 Act and no works can be undertaken at their locations, without providing two months advance notice to the National Monuments Service (NMS). There are no recorded archaeological sites of any designation located within the interior of the study area. The Archaeological Survey of Ireland lists four recorded archaeological sites within 500m of the study area and the nearest example to the proposed development is a ringfort (CO086-014----) located approx. 320m to the north. Details on these recorded archaeological sites are presented in Section 11.4.3.1 of this chapter which includes their published inventory entries. The study area is located in the townlands of Castletreasure and Moneygurney and the SMR does not record any unlocated archaeological sites within either of these townlands.

The Cork County Council Development Plan (2014) outlines a number of objectives in relation to the protection and promotion of the archaeological resource within the County. Of particular relevance to the present study are the following objectives relating to the protection of archaeological sites and materials:

Objective HE 3-1: Protection of Archaeological Sites

- a) Safeguard sites and settings, features and objects of archaeological interest generally.
- b) Secure the preservation (i.e. preservation in situ or in exceptional cases preservation by record) of all archaeological monuments including the Sites and Monuments Record (SMR) (see www.archeology.ie) and the Record or Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act, 1994, as amended and of sites, features and objects of archaeological and historical interest generally. In securing such preservation, the planning authority will have regard to the advice and recommendations of the Department of Arts, Heritage and Gaeltacht as outlined in the Frameworks and Principles for the Protection of the Archaeological Heritage.

12.3.16: Where archaeological materials are found appropriate mitigation measures shall be put in place. Preservation in situ should generally be the presumed option and only compelling reasons can justify preservation by record.

11.4.2.2 Relevant Architectural Heritage Legislation and Planning Policies

Protection of architectural or built heritage is provided for through a range of legal instruments that include the Heritage Act 1995, the Architectural Heritage (National Inventory) and National Monuments (Misc. Provisions) Act 1999, and the Planning and Development Act 2000. The Planning and Development Act 2000 requires all Planning Authorities to keep a 'Record of Protected Structures' (RPS) of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. As of the 1st January 2000, all structures listed for protection in current Development Plans, have become 'protected structures'. Since the introduction of this legislation, planning permission is required for any works to a protected structure that would affect its character. There are no Protected Structures within the study area or within 500m of its boundary.

The Architectural Heritage Act of 1999 established the National Inventory of Architectural Heritage (NIAH) to create a record of built heritage structures within the State. While inclusion in a NIAH inventory does not provide statutory protection to a structure, the inventory is used to advise local authorities on compilation of their Records of Protected Structures. There are no NIAH listed structures within the study area or within 500m of its boundary.

The Cork County Council's County Development Plan (2014) presents the following objectives in relation to the protection and promotion of the architectural heritage resource within the County:

HE 4-1: Record of Protected Structures

d) Ensure the protection of all structures (or parts of structures) contained in the Record of Protected Structures.

e) Protect the curtilage and attendant grounds of all structures included in the Record of Protected Structures.

HE 4-2: Protection of Structures on the NIAH

Give regard to and consideration of all structures which are included in the NIAH for County Cork, which are not currently included in the Record of Protected Structures, in development management functions.

HE 4-3: Protection of Non- Structural Elements of Built Heritage

Protect important non-structural elements of the built heritage. These can include designed gardens/garden features, masonry walls, railings, follies, gates, bridges, and street furniture. The Council will promote awareness and best practice in relation to these elements.

11.4.3 Desktop Study

11.4.3.1 Archaeological and Historical Context

The following section presents summary details of the main periods within the Irish archaeological record with references to the recorded archaeological sites located within 500m of the study area. They are listed in Table 11.4 and their location is shown in Figure 11.1. Datasets have been interrogated and retrieved from State and Local authorities and are considered accurate and current per publicly available sources (Archaeological datasets Historic Map Viewer: Dept. of Culture, Heritage and the Gaeltacht www.archaeology.ie; archaeological excavation summaries www.excavations.ie, NIAH datasets www.buildingsofireland.ie and the Cork County Development Plan 2014). The dating framework used for each period is based on *Guidelines for Authors of Reports on Archaeological Excavations* as published by the National Monuments Service.

As noted above, while there are no recorded archaeological sites located within the study area while there are four recorded examples within 500m of its boundary. The nearest of these is a ringfort (CO086-014----) located c. 320m to the north, which has been incorporated into a green area within a modern housing estate. It is noted that the potential also exists for the presence of unrecorded sub-surface archaeological features and artefacts within the study area.

Table 11.4: Recorded archaeological sites within 500m of study area

Monument No	Class	Townland	ITM Ref (E,N)	Distance
CO086-012001-	Ringfort - rath	CASTLETREASURE	570252,567452	500m to south
CO086-012002-	Souterrain	CASTLETREASURE	570252,567452	500m to south
CO086-013----	Castle - unclassified	CASTLETREASURE	570494,567445	500m to south
CO086-014----	Ringfort - rath	DOUGLAS	570476,568741	320m to north



Figure 11.1: Modern OSI aerial image showing recorded archaeological sites (yellow dots) within 500m of study area (approx. extent indicated with blue line)

Early Prehistoric Periods

Until the recent identification of Palaeolithic human butchery marks on a bear bone recovered from a cave site in County Clare, the earliest recorded evidence for human activity in Ireland dated to the Mesolithic period (7000-4000 BC) when groups of hunter-gatherers lived on the heavily wooded island. The archaeological record indicates that these mobile groups tended to favour coastal, lake and river shores which provided a transport resource and also provided elements of their varied diet. These groups did not construct any settlements or monuments that have left any above ground traces although their presence in an area can often be identified by scatters of worked flints in ploughed fields or during earth-moving undertaken as part of development works. The Neolithic period (4000-2400 BC) began with the arrival and establishment of agriculture as the principal form of economic subsistence, which resulted in more permanent settlement patterns in farmlands within areas of cleared forestry. As a consequence of the more settled nature of agrarian life, new site-types, such as more substantial rectangular timber houses and various types of megalithic tombs, begin to appear in the archaeological record during this period. While there are no recorded Mesolithic or Neolithic sites located within the study area, examples from both periods have been identified elsewhere in south County Cork.

Late Prehistoric Periods

Metalworking arrived in Ireland with the advent of the Bronze Age period (c. 2400-500 BC) and saw the introduction of a new artefactual assemblage, including metal and ceramic objects, to the island. This period was also associated with the construction of new monument types such as standing stones, stone rows, stone circles and burnt mounds and/or fulachta fia. The development of new burial practices during this period also saw the construction of funerary monuments such as cairns, barrows, boulder burials and cists. The arrival of iron-working technology in Ireland saw the advent of the Iron Age (600 BC - 400 AD). This period has traditionally been associated with a Celtic 'invasion' but this view is no longer widely accepted as recent archaeological evidence points instead to a gradual acculturation of the Irish Bronze Age communities following centuries of contacts with Celtic-type cultures in Europe. Relatively little was known about Iron Age settlement and ritual practices in Ireland until recent decades when the corpus of evidence has been greatly increased by the discovery of sub-surface sites dating to this period during archaeological investigations in advance of development projects. While there are no recorded sites dating to these periods located within the study area there are known examples dating to the Bronze Age within the wider landscape. There are references to the discovery of artefacts of potential Bronze Age date within the Castletreasure area during the 19th century and these comprised a 'rudely-formed clay urn and two or three brazen implements' and 'a circular gold plate embossed with a cross' (Day 1901). Based on these descriptions, the clay urn and associated objects may potentially date to the Bronze Age period while the plate may conceivably be later in date.

The Early Medieval Period

The early medieval (c. 400-1169 AD) period in Ireland broadly commences with the arrival of Christianity to Ireland. While this period saw the emergence of the first phases of urbanisation around the large monasteries and the Hiberno-Norse ports, the dominant settlement pattern of the period continued to be rural-based centred on enclosed farmsteads known as ringforts. These comprise roughly circular enclosures delimited by roughly circular earthen banks formed of material thrown up from a concentric external ditch while stone-built variants known as cashels are concentrated within western counties. The ubiquity of these enclosures within the Irish landscape is attested to by the fact that their original Gaelic names (rath, lios and dun) still form some of the most common place-name elements in the country. Archaeological excavations have demonstrated that the majority comprised enclosed farmsteads containing the foundations of domestic and agricultural buildings. While not forts in the military sense, the enclosures did act as a defence against natural predators, such as wolves, and may also have afforded some protection against the cattle raids that appear to have been a common event during this period. Ringforts form the visible element of much wider external agricultural landscapes (known as *airlise*) that may contain unrecorded, sub-surface archaeological features such as associated field systems, stockades, barns, mills and drying kilns. Ringforts may also contain artificial sub-surface features known as souterrains, which derives from the French term '*sous terrain*' (underground), although isolated examples of these sites also exist. There are two ringforts located within 500m of the site boundary. One of these is located 320m to the north and is within a green area in a modern housing estate (CO086-014----). The second example comprises a levelled site (CO086-012001-) within a house garden located 500m to the south and contains the recorded site of a souterrain (CO086-012002-). The

following descriptions of these sites have been published in the *Archaeological Inventory of County Cork: Vol. 2* (Power 1994):

Ringfort CO086-014----

In pasture, on W-facing slope. Circular area (43.2m E-W; 41.6m N-S) enclosed by earthen bank (H 1.35m) with shallow fosse. Interior level; circular depression (diam. 1.6m) in centre.

Ringfort CO086-012001-

In garden, on N-facing slope, overlooking Donnybrook and Douglas villages. Shown on 1842 OS 6-inch map as semicircular arc abutted to S by NE-SW trackway. Levelled; no visible surface trace. Souterrain (CO086-01202-) in interior.

Souterrain CO086-012002-

In possible ringfort (CO086-01201-). Discovery recorded in topographical files, UCC; destroyed prior to investigation. No visible surface trace.

Late Medieval

The arrival and conquest of large parts of Ireland by the Anglo-Normans in the late 12th century marks the advent of the late medieval period. This period saw the continuing expansion of Irish urbanisation as many of the port cities developed into international trading centres and numerous villages and towns began to develop as local or regional market centres. By the 15th century the native Irish chieftains and lords began to construct tower houses as fortified residences within their landholdings. The site of a levelled castle (CO086-013----), which was recorded as in ruins during the 19th century, is located approx. 500m to the south of the boundary of the proposed development. The following description of this site has been published in the *Archaeological Inventory of County Cork: Vol. 2* (Power 1994):

Castle (site of) CO086-013----

In pasture, on N-facing slope of E-W ridge; no visible surface trace. Marked 'site of' on all editions of OS 6-inch map, but 1842 map also indicates three walls of rectangular structure (c. 20m E-W; c. 10m N-S). Probably built by Goulds (Healy 1988, 40).

Post-Medieval and Early Modern Periods

The centuries following AD 1550 are referred to as the post-medieval period, which is generally considered to continue until the development of the

Industrial Revolution during the 18th century. The early part of this period was a turbulent time in Irish history and in the later decades of the 16th century the Tudors, particularly Elizabeth I, began to re-assert English control. The resultant wars between the 1560s and 1603 brought this unsettled period to an end and the following centuries were a time of prosperity for the newly established Protestant gentry and landowners. The Down Survey was compiled during the 17th century as part of the Cromwellian Plantation and records that Castletreasure townland comprised 456 plantation acres at that time and it was in the ownership of Stephen Coppinger in 1641 and William Finch in 1671. This period saw the development of high and low status stone houses throughout the Irish countryside and rural settlement clusters at this time typically consisted of single-storey thatched cottages with associated farm buildings while two-storey farm houses became more common in the 19th century. An agricultural boom in the late 18th and early 19th centuries saw a rise in prices for both tillage and dairy produce and resulted in Irish landlords investing in extensive land improvement works within their holdings. The *Griffith's Valuation of 1852* lists Walter Atkins as the landlord of the lands containing the study area and the fields within its boundary were leased by William Noonan and John Baggolt at that time.

The study area is located within Carrigaline parish and in recent centuries it comprised agricultural land on the southern outskirts of Douglas village which had developed as an industrial settlement by the 18th century. The following extracts from a 19th century description of both of these areas describe the settlements, early industrial developments and agricultural practices at that time (Lewis 1837):

CARRIGALINE, a parish, partly in the county of the city of CORK, and partly in the barony of KINNALEA, but chiefly in that of KERRICURRIHY, county of CORK, and province of MUNSTER 7 miles (S. E.) from Cork; containing 7375 inhabitants. This place was in early times called Beavor, or Bebhor, and derived its name from the abrupt rocky cliff on which are the remains of the ancient castle, built by Mile de Cogan in the reign of King John, and for nearly two centuries occupied by the Earls of Desmond, by whom it was forfeited, in the reign of Queen Elizabeth. The castle, together with the lands of Carrigaline and Ballinrea, was then granted by the queen to Sir Anthony St. Leger, who demised them to Stephen Golding, from whom they were purchased by Sir Richard Boyle, afterwards Earl of Cork, and from him descended to the present proprietor, the Earl of Shannon.... The parish is situated on the road from Cork to Tracton, and contains 14,254 statute acres, as apportioned under the tithe act, and valued at £16,606 per annum; the surface is pleasingly undulated, and the soil is fertile; a considerable part is under an improved system of tillage, and the remainder is in demesne, meadow, or pasture land. There is neither waste land nor bog; coal, which is landed at several small quays here, is the chief fuel. A light brown and purplish clay-slate is found; and limestone of very superior quality is raised at Shanbally, in large blocks, and after being hewn into columns, tombstones, etc. The appearance of the country is beautifully varied: the views from the high grounds are extensive and picturesque, commanding the course of the Awenbwuy, with its capacious estuary, called Crosshaven, and embellished with numerous gentlemen's seats. The principal are Maryborough, the residence of W. H. Worth Newenham, Esq., situated in a beautiful demesne of 545 acres, with a lofty square tower a little to the east of the house, which commands a magnificent prospect of the town and harbour of Cove, and the rich scenery of the river; Mount-Rivers, of M. Roberts, Esq.; and Ballybricken, of D.

Conner, Esq...A creek runs up to Shanbally, and another forms the channel of Douglas, both of which are navigable for vessels of 70 tons' burden, which bring up lime, sand, and manure, and take away limestone and bricks, the latter of which are made near Douglas. Salmon, white trout, sole, plaice, and oysters of superior quality, are obtained in these inlets, and, in the latter part of the summer, herrings are occasionally taken in great quantities.

DOUGLAS, a chapelry, comprising that portion of the parish of CARRIGALINE which is in the county of the city of CORK, and in the province of MUNSTER, 1 mile (S. E.) from Cork, on the road to Carrigaline; containing 816 inhabitants. This village, which is situated at the head of a small bay called Douglas channel, on the eastern side of Cork harbour, is irregularly built in two detached portions respectively on the upper and lower roads from Cork. Its origin is attributed to the settlement of a colony of linen weavers from Fermanagh, who in 1726 commenced here the manufacture of sail-cloth... This establishment continued to flourish till after the introduction of machinery into the English factories, which enabled the English manufacturers to undersell those of Ireland, and the trade consequently declined greatly, though the manufacture is still carried on. A very extensive rope-yard has long been established, and the patent cordage made here is in very great repute. There is a large boulting-mill belonging to Mr. G. White, capable of manufacturing 6000 barrels of flour annually, and which might be easily made to produce twice that quantity; there is also a mill on the road to Monkstown belonging to Mr. Power, of equal capability. A large quantity of bricks, of a bright ash colour, is made in the immediate vicinity of the village, and sent to a considerable distance inland; and great numbers are conveyed by small craft to the port of Cork.... The environs of Douglas are exceedingly pleasant and the scenery richly diversified and embellished with numerous elegant seats and tasteful villas; the surface is undulated, rising in some places into considerable eminences and commanding extensive and interesting views. To the north and west are seen the course of the river Lee, the peninsula of Blackrock, the hills of Glanmire and Rathcooney, with others in the distance, the city of Cork, and the beautiful country towards Inniscarra. The principal seats [include]... Castle Treasure, of C. Lloyd, Esq....There are raths at Old Court and Moneas, and some slight remains of Treasure castle.

Excavations Database

The Excavations Database does not contain any entries for archaeological investigations within the study area or associated with any of the modern residential developments located adjacent to its boundary. The Database does contain three entries for archaeological investigations undertaken within the vicinity of a recorded ringfort (CO086-015----) located in an area of Moneygurney townland located 1km to the east of the study area. One of these investigations revealed an external corn-drying kiln located adjacent to the ringfort (Lane 2004).

11.4.3.2 Architectural Heritage

There are no Protected Structures or NIAH structures located within the study area or within 500m of its boundary. There are no extant structures of any date within the interior of the study area and the built environment within its environs is uniformly modern in date.

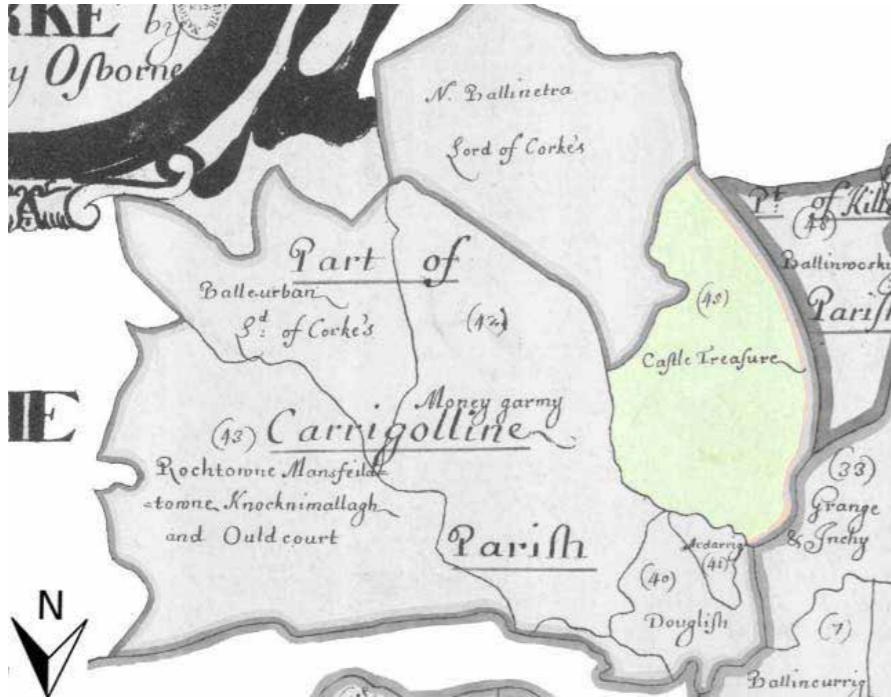


Figure 11.2: Extract from 17th-century Down Survey map

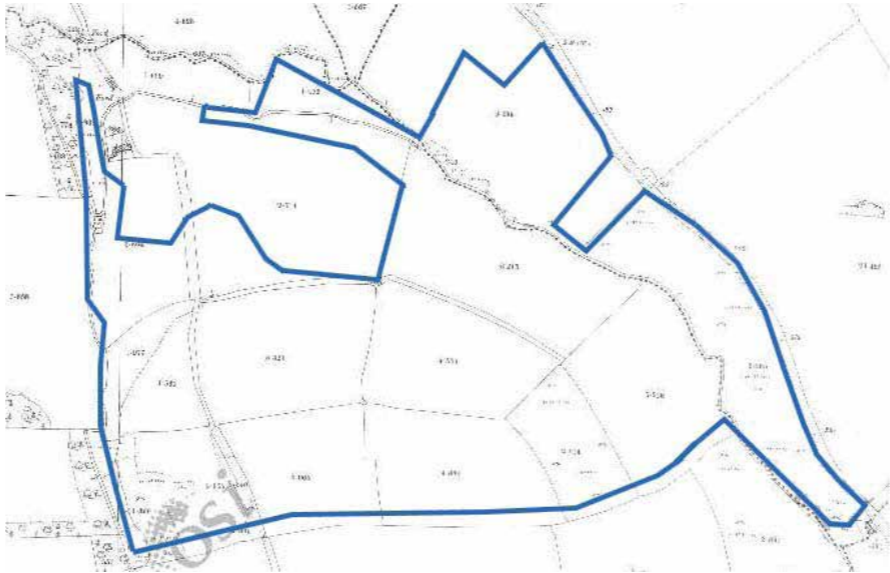


Figure 11.4: Extract from 25-inch O.S. map (surveyed 1897-98) showing approximate study area boundary (OSI licence ref. 0003318)



Figure 11.6: TII LiDAR imagery in east end of study area showing adjacent section of boundary

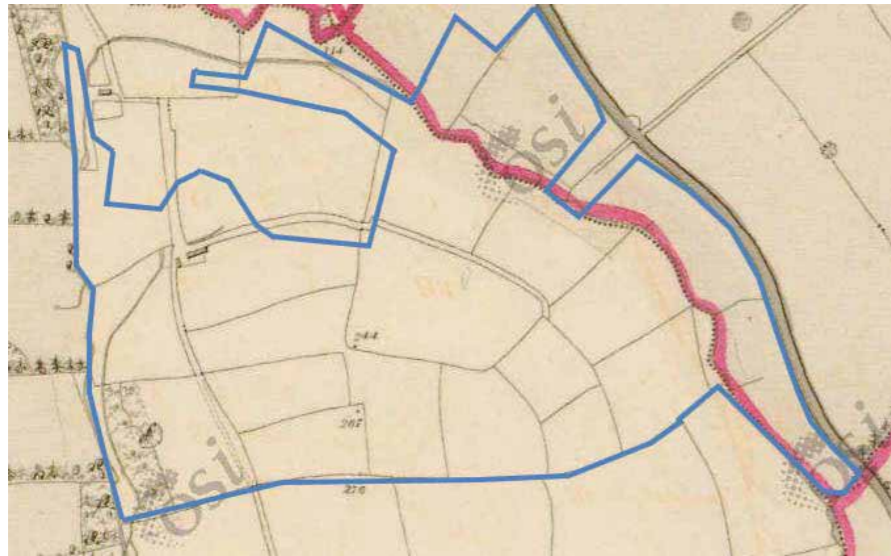


Figure 11.3: Extract from 6-inch O.S. map (surveyed 1842) showing approximate study area boundary (OSI licence ref. 0003318)



Figure 11.5: Extract from Air Corp vertical image (1951) showing approximate study area boundary with ringfort (CO086-014) and potential enclosure (red arrow) to north indicated

11.4.3.3 Review of Cartographic and Aerial Sources

The cartographic sources examined for the study areas include the 17th-century Down Survey mapping (Figure 11.2), the 1st edition of 6-inch OS map (Figure 11.3: surveyed in 1842) and the 25-inch OS maps (Figure 11.4: surveyed in 1897-98). While the townlands of Castletreasure and Moneygurney are shown on the Down Survey mapping there are no cultural heritage features, such as large buildings, settlements or routeways indicated within either area. The study area is depicted on both editions of the 19th-century OS maps as enclosed fields accessed by farm tracks and no potential unrecorded archaeological features are depicted within the proposed development site. The only internal structure shown is a small building close to the north boundary which is present on the 6-inch map but is no longer present on the 25-inch edition. This appears to have been a small agricultural structure demolished in the late 19th century and no surface traces were noted during the field survey of this area. A number of field boundaries shown on the 6-inch map are absent on the 25-inch edition which is suggestive of land improvement works in the second half of the 19th century. More detailed information on modern changes to the layout of the field boundaries in comparison to the detail shown on the historic OS maps is incorporated into the descriptions of the field surveys undertaken as part of this assessment (Table 11.6). The townland boundary between Castletreasure and Moneygurney is shown extending through the north end of the study area on both editions and is formed by an unnamed stream which is described within the field survey section of this chapter (Section 11.4.4).

A review of modern aerial images demonstrates that the study area and the lands to the south have retained their agricultural character while extensive modern residential developments are located to the north and west. The review included an examination of Transport Infrastructure Ireland (TII) LiDAR imagery which has been published online and includes a section extending into the northeast corner of the study area¹. While no potential unrecorded archaeological sites were noted within the study area boundary during this review, a previously unrecorded circular feature, of possible archaeological origin, was noted on a 1950s aerial image (Figure 11.5) within an area located c.60m outside the northern boundary. This location has since been landscaped during the construction of a pitch and putt course and no traces of this potential archaeological feature are visible on later aerial images.

11.4.3.4 Undesignated Cultural Heritage Assets

While encompassing the archaeological and designated architectural heritage resources, cultural heritage also includes various undesignated assets such as settlements, demesne landscapes, vernacular structures, folklore, placenames and historical events. There are no historic settlements, vernacular structures or associations with historical events located within, or in close proximity to, the study area. While the historical OS maps show a number of 18th and 19th century country houses, with associated formal demesne lands, within the surrounding landscape none of these are located within, or in close proximity to, the study area boundary.

Placenames

The majority of the study area is located within Castletreasure townland, with a section at the east end extending into Maryborough, while the surrounding 500m area extends into a total of five townlands (see Table 11.5). Townlands are the smallest unit of land division in the Irish landscape and many may preserve early Gaelic territorial boundaries that pre-date the Anglo-Norman conquest. The boundaries and nomenclature of the Irish townlands were recorded and standardised by the Ordnance Survey in the 19th century. The Irish roots of townland names often refer to natural topographical features but some name elements may also give an indication of the presence of past human activity within the townland, e.g. *dun*, *lios* or *rath* may indicate the presence of a ringfort while *temple*, *saggart*, *termon* or *kill* record associations with a church site. Castletreasure was recorded as ‘Castell Trestrige’ in a 16th-century Inquisition document² while the name Castletreasure is used from the 17th century onwards. It is likely that the ‘treasure’ element of the modern name is an anglicisation of the name *Trestrige* rather than a direct translation. The 6-inch OS map shows the former location of the castle (CO086-013----) that gave the townland its name in a field located 500m to the south of the study area boundary. Table 11.5 provides the translations of the Irish origins of the townland names within the study area and its environs which were sourced from www.logainm.ie.

Table 11.5: Translation of townland names within environs of study area (Source: www.logainm.ie)

Townland	Irish root	Translations and Logainm Notes
Ardarrig	Ard Dearg	‘red height or hill’
Castletreasure	-	‘The meaning of the second element of the name is unclear, but it is clear from the historical evidence (e.g., ‘C.Trestrige’, Inq.) that it is not the English word ‘treasure’
Douglas	Dúglas	‘black stream’
Maryborough	-	-
Moneygurney	Muine Guairne	muine thicket



Figure 11.7: Field Numbers assigned during site inspection

¹ <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b7c4b0e763964070ad69bf8c1572c9f5>
² <https://www.logainm.ie/en/9418?s=Castletreasure>

Folklore

The National Folklore Collection UCD Digitization Project (www.duchas.ie) records the following local tradition associated with Castletreasure townland, which may have been inspired by the 'treasure' element of the placename which, as noted above, was adopted in recent centuries:

Treasure is supposed to be hidden in Castletreasure which is in the south of Douglas. It consists of a large sum of gold which is hidden in a golden box. Often people have made a search for it, but alas, a big black bull and a fairy woman hunted them and often they were killed by the bull or by the fairy woman. It is supposed to be hidden by the Danes who stole it out of St Finbarr's College Cork and they hid it fearing that the Irish might take it away from them.

11.4.4 Field Survey

The field survey of the study area was undertaken in clear weather conditions that provided good landscape visibility of the internal area and the surrounding landscape. The site was separated into thirteen distinct fields/areas for the purpose of the survey (Figure 11.7 and Table 11.6). All accessible areas were inspected and the field-walking was augmented by the use of a drone in order to assess overhead views of the fields. The study area occupies a valley location with varying areas of gentle, moderate and steep slopes with an area of broadly level ground in the southwest quadrant which commands clear views of the landscape to the north. The lands have not been in agricultural use in recent years and areas have been colonised by gorse, weed and scrub growth while localised areas in the northern and western ends are occupied by trees with thick areas of undergrowth. The internal field boundaries are formed by overgrown earthen banks with sections lined with mature trees. There are two unnamed, narrow streams located within and adjacent to the study area; one along the west boundary and the other extending into the north end. Both of these are shown on their existing courses on the historic OS maps which do not depict any associated features, such as bridge, weirs or stepping stones within the sections located within the study area. A visual inspection of both streams was undertaken from their banks during the field survey and both were found to be contained within shallow, irregular channels created by water erosion. Further descriptions of both watercourses are provided in Table 11.6.

In summary, no potential unrecorded cultural heritage sites or features were identified during the inspection of the study area. The description of the field survey results are provided in Table 11.6 and extracts of the photographic record are presented in Appendix 11.1.

Table 11.6: Description of Field Survey Results

Field	Description
1	This low-lying, irregularly shaped, overgrown area is bounded at north by a narrow stream which forms the townland boundary between Castletreasure and Mayborough townlands. This narrow stream extends into the study area further to the southeast and is described separately below. This field is shown as the northern portion of a larger field on the OS historic maps. A modern access road to an adjacent housing development now forms the southern boundary of this area with a pitch and putt club to the north. The ground surface slopes gently down to the north and is heavily overgrown with scrub and some trees. Localised areas of the ground surface have been subject to recent disturbance.
2	The southeast end of this west-facing field will form an access road into the development from the public road to the northeast while the remainder will form part of a separate school development. The ground surface is under scrubby overgrowth and slopes moderately down to the northern stream. The field is bounded by a pitch and putt course at northwest and a modern detached house at southwest.
3	This area comprises a band of trees extending along the steep eastern side of the gully containing the stream that forms the west boundary of the study area. The historic OS maps do not show trees along this section of the stream and while some vegetation is visible on the 1950s aerial image the majority appear to have grown during the second half of the 20 th century. While tentative, it is possible that the availability of a public water supply, even for agricultural purposes, may have meant that access to the stream waters became less important and the area was allowed to overgrow. The undergrowth within this wooded area was sparse and was accessible during the field survey.
4	This small irregularly shaped field is adjacent to the south end of a modern residential development and aerial images indicate that it was stripped of topsoil and occupied by a construction compound during its construction. Moss and some grass and scrub cover have developed and traces of extensive disturbance in this area were apparent during inspection.
6	This low-lying sub-rectangular field is under gorse and scrub growth and slopes gently down towards the northern stream which is flanked by mature trees in this area. It is shown as two fields on the 6-inch map while its current layout is shown on the 25-inch map. A modern housing development is located to the west and localised surface deposits of building rubble and waste material were noted within the field.
7	This rectangular field slopes gently down to an area of trees that flank the west stream which forms the boundary of the study area. It is shown as two fields on the historic OS maps which show a now infilled area of quarrying activity in the southern end. Modern aerial images demonstrate that this area was extensively disturbed by ancillary activity during recent construction work to the north. The natural subsoil is visible in areas and topsoil has been pushed towards the western boundary where it is mounded over two metres above the ground level in places. A deep farm track has been cut into the subsoil and extends northwards through the centre of the field and leads to the modern residential development outside the north end of the study area. Building rubble and waste material was evident at the north end of the field.
8	This sub-rectangular field is depicted as two fields on the 6-inch OS map while its current layout is shown on the 25-inch map. There are no surface traces of a possible farm building shown on the 6-inch map (absent on 25-inch). Recent disturbance within the northwest corner of the field, as a result of development to the north, is evident on various aerial images and this area is now colonised by willow trees and is heavily overgrown. This pasture field slopes moderately down to the northwest and localised areas of scrubby growth have developed.
9	The current layout of this north-facing, sub-rectangular field is shown on the historic OS maps. The ground surface slopes steeply down in the north end with more moderate slopes at south. It appears to have been in used as pasture land until recent years and the grass levels were high at the time of inspection with tall weeds present.

Field	Description
10	This rectangular field is bound at northeast by the northern stream and is shown as two fields on the 6-inch map while the current layout is present on the 25-inch map. This field slopes moderately down to the north and is heavily overgrown with bramble, willow and scrub. This field is covered by the TII LiDAR imagery (Figure 11.6) and no potential unrecorded archaeological sites are visible.
11	This west-facing, overgrown field is flanked by the public road to the north and the northern stream to the south. It is shown as two vacant fields on the 6-inch edition map while its current layout is present on the 25-inch map. The 1950s aerial image appears to show this area as a grass field and, based on the extent of overgrowth; it appears to have been left untended in recent decades. While this area was inaccessible due to the overgrowth, nothing of an archaeological nature was noted during the drone inspection or during an inspection of the TII LiDAR coverage which extends into this field.
12	This level, square field is shown as two fields on the 6-inch map while its current layout is present on the 25-inch map. It appears to have been in used as pasture land until recent years and the grass levels were high at the time of inspection with tall weeds present.
13	This large, sub-rectangular field is sub-divided into four fields on the 6-inch map and two fields on the 25-inch map. A number of slight surface traces of the levelled field boundaries were noted during the survey. A quarry pit noted in the southeast corner is visible on the 1950s aerial image but is not present on the historic OS maps indicating a 20 th century date for this feature. The area of quarrying remains evident as an overgrown hollow. While the field is dominated by grass growth, areas of scrub and weeds have developed in recent years. The ground surface generally slopes down to north with an area of level ground near the centre which contains a wet area of low ground that was of natural appearance. The east end of this field is covered by the TII LiDAR imagery (Figure 11.6) and no potential unrecorded archaeological sites are visible.
West Stream	This narrow stream extends along a broadly linear course as it follows a slight slope down to the north through a wooded steep gully and it forms the western boundary of the study area. The undergrowth was sparse within the wooded area on both sides of the stream and all areas of the channel were accessible. The stream ranges between 1m-2m in width and the water level was shallow (0.05m-0.1m) at the time of inspection. The stream bed, which was clearly visible in all areas, was composed of small sub-rounded pebbles (> 5cms) with occasional silts and frequent areas of exposed bedrock. Localised deposits of fine gravels were also noted along slight bends within the stream, although in general there was little deposition noted within the channel. The only observed inclusions were modern objects which originating from tipped rubbish material deposited throughout the surrounding wooded area. In general the fast-flowing waters combined with the stony stream bed and exposed sections of bedrock indicated that the channel has a poor holding content. No traces of channel walls or weirs were observed. Given the narrow width of this section of the stream it is unlikely to have required fording or stepping stone features and none were noted during the inspection. This watercourse forms the western boundary of the landholding and no development works are proposed within its close environs.
North Stream	A section of this stream extends into the east end of the study area and is contained within a narrow erosion channel that extends along a meandering course towards the northwest through a low-lying area of overgrown woodland. This stream forms the townland boundary between Castletreasure and Moneygurney. The presence of thick undergrowth on both banks, which extends over much of the channel, meant that it was only possible to inspect the stream from a number of vantage points. The channel averages 1m in width and 0.1m in depth and the stream bed was composed of small stones and occasional silts, indicating a low holding content. There were occasional modern inclusions noted within the channel and no features, such as weirs or stepping stones, were identified. This east end of this stream and its environs is covered by the TII LiDAR imagery (Figure 11.6) and no potential unrecorded archaeological sites are visible. The proposed development will entail the creation of an access road bridge and a pedestrian bridge across the section of this watercourse located within the study area. The remainder of the stream will be located within undeveloped areas.

11.4.5 Summary

There are no recorded archaeological sites located within the study area or within 320m of its boundary. While no evidence for potential unrecorded archaeological sites within the study area boundary was identified during the desktop study and field surveys undertaken as part of this assessment, the potential does exist for the presence of sub-surface archaeological sites, features and artefacts within the study area.

There are no designated architectural heritage structures located within the study area or within 500m of its boundary. There are no extant structures of any date located within the study area and the built environment within its surrounds is modern in character.

A narrow stream extending through the north end of the study area forms the townland boundary between Castletreasure and Moneygurney townlands and is deemed to be of local cultural heritage significance and of archaeological potential. A stream forming the western boundary of the study area is also deemed to be of archaeological potential.

11.5 Impact Assessment

11.5.1 Do Nothing Scenario

A 'Do Nothing Scenario' will see to the continued preservation of recorded and potential cultural heritage features within the study area and its environs.

11.5.2 Construction Phase

Archaeology

There are no recorded archaeological sites within the study area, or within 320m of its boundary, and the construction phase of the proposed development will, therefore, have a likely **imperceptible impact** on the recorded archaeological resource during the construction phase.

While no evidence for unrecorded archaeological sites or features was identified within the study area during the assessment, the potential exists for the presence of unrecorded, sub-surface archaeological features in undisturbed green field areas and within, and in the environs of, the sections of two streams extending within its boundary. There are no proposed interventions to the stream extending along the western boundary of the study area during the construction phase. The majority of the section of the northern stream within the study area will be maintained within undeveloped areas although it will be crossed at two points: by an access road bridge and a pedestrian footbridge. As the existence, nature and extent of any unrecorded archaeological features within the study area are unknown; the level of potential impacts is indeterminable. However, ground works required for housing construction will have the likely potential to result in **negative, direct, significant, permanent impacts** on any sub-surface or in-channel archaeological features that may exist within the study area boundary.

Architectural Heritage

There are no designated architectural heritage sites located within the study area or within 500m of its boundary and the surrounding built environment is modern in character. The proposed development will, therefore, have an **imperceptible impact** on the architectural heritage resource during the construction phase.

Undesignated Cultural Heritage Assets

There is one feature of local cultural heritage significance located within the study area and this comprises the townland boundary between Castletreasure and Moneygurney formed by the northern stream. The proposed construction of an access road bridge and a pedestrian bridge over this feature will have a likely **negative, direct, not significant, permanent impact** on this feature.

11.5.3 Operational Phase

There are no designated architectural heritage structures located within 500m of the study area. There are no recorded archaeological sites within the study area, or within 320m of its boundary, and the implementation of the mitigation measures outlined in Section 11.6 will provide for either the avoidance or the proper and adequate recording of any currently unrecorded archaeological features with its boundary. As a result, there will be a likely **imperceptible impact** on the cultural heritage resource during the operational phase.

11.5.4 Cumulative Impacts

There are no recorded archaeological sites, designated architectural heritage structures or undesignated cultural heritage assets located within, or in the environs of, the proposed school site located adjacent to the north end of the proposed development (Table 11.6: Field 2).

The following presents a summary of potential cultural heritage impacts for a number of developments within the wider environs of the study area which is based on a review of online Cork County Council planning files and other online assessments.

A proposed solar farm development (Planning ref. 17/6784) located approx. 2.5km to the south of the study area has been assessed as resulting in no significant impacts on the cultural heritage resource (Hourihan, Sims and Bolger 2018).

A section of the proposed route of the M28 motorway extends to the east of the study area. The EIS compiled for this scheme identified no significant impacts to any recorded archaeological sites or designated architectural heritage structures within the environs of the study area³. It does identify four direct profound or significant negative impacts on recorded archaeological sites during the construction phase and these are all located within the environs of Carrigaline and Ringaskiddy at approx. distances of 4-5km from the study area. Indirect significant impacts were identified in relation to two protected structures located in the Ringaskiddy area. The road scheme will have a potentially direct moderate / significant negative on any unrecorded archaeological features that may exist within a section of the stream that also extends through the north end of the study area. The EIS concludes that,

³ <http://www.pleanala.ie/publicaccess/EIAR-NIS/HA0053/Volume%202%20Main%20Text%20of%20EIS/EIS%20-%20Combined%20Document.pdf>

following implementation of mitigation measures, no operational or residual impacts to the archaeological and architectural heritage resources will arise from the road scheme.

An impact assessment of a proposed school development at Carr's Hill, Douglas (Planning ref. 18/5369) concluded that it would have no impacts on the recorded and designated archaeological and architectural resources (Magnus Archaeology 2017).

An archaeological assessment, including test trenching, of a proposed Lidl Discount shop and five apartments (Planning ref. 18/5814) located 1.8 km to the north of the study area identified nothing of archaeological significance (Purcell 2018).

There is no archaeological assessment contained within the online planning files for a proposed 48 residential unit development at Clarendon Brook located c. 800m north of the study area (Planning ref. 18/6245). A review of this location was undertaken and there are no recorded archaeological or designated architectural heritage structures located within, or in close proximity to, the proposed development.

There is no archaeological assessment contained within the online planning files for a proposed school development located c. 1.5km north of the study area (Planning ref. 18/6246). A review of this location was undertaken and there are no recorded archaeological or designated architectural heritage structures located within the proposed development area.

An archaeological impact assessment of a proposed 200 unit residential development (Planning ref. 16/07271) located c.500m to the south east of the study area concluded that the development would have no impacts on the recorded archaeological resource (Purcell 2016).

Conclusion

Given the adoption of appropriate mitigation measures (Section 11.6) combined with the absence of any identified impacts on the recorded and designated archaeological and architectural heritage resources, it is concluded that the proposed development will not contribute to any significant cumulative impacts on the cultural heritage resource of the area.

11.5.5 'Worst Case Scenario'

If the proposed development were to proceed without the implementation of the archaeological mitigation measures outlined in Section 11.6 then construction works could result in permanent, direct, significant, negative impacts on any unrecorded, sub-surface archaeological features that exist within the site.

11.5.6 Human Health

There are no predicted risks to Human Health associated with potential impacts to the cultural heritage resource.

11.6 Mitigation and Monitoring of Process

Archaeology

Given the scale and extent of the proposed development within an undeveloped green field area, a programme of archaeological investigations, to comprise a geophysical survey of undisturbed greenfield areas followed by targeted archaeological test trenching, will be undertaken prior to the commencement of the construction phase. A wading survey and metal-detecting survey of the sections of the northern stream to be crossed by an access road bridge and a pedestrian bridge will be undertaken in conjunction with the test trench excavations. These archaeological investigations will be carried out under licences issued by the National Monuments Service.

There a number of obligatory processes to be undertaken as part of archaeological licence applications and these will allow for monitoring of the successful implementation of the archaeological mitigation measures. Method statements detailing the proposed strategy for all pre-construction site investigations will submitted for approval to the National Monuments Service as part of the licence applications. These will clearly outline the proposed extent of works and outline the consultation process to be enacted in the event that any unrecorded archaeological sites or features are identified. A report will be compiled on all site investigations which will clearly present the results in written, drawn and photographic formats. Copies of these reports will be submitted to the National Monuments Service, Cork County Council and the National Museum of Ireland. In the event that any sub-surface archaeological deposits, features or artefacts are identified during site investigations the Planning Authority and the National Monuments Service will be consulted to determine further appropriate mitigation measures.

Architectural Heritage

There are no Protected Structures or NIAH listed structures, or extant structures of any date, located within the study area. There are also no designated architectural heritage structures located within 500m of its boundary and the surrounding built environment is modern in date. It is, therefore, concluded that no mitigation measures, or monitoring measures thereof, for the architectural heritage resource are required.

Undesignated Cultural Heritage Features

A small stream extending through the northern end of the study area forms the townland boundary between Castletreasure and Moneygurney. The two sections of this watercourse to be impacted by the proposed access road bridge and pedestrian bridge will be investigated as part of the archaeological mitigation measures outlined above.

11.7 Residual Impacts

All potential impacts will be addressed by mitigation during the pre-construction phase of the proposed development which will provide for the recording and/or avoidance of any potential sub-surface archaeological features that may exist within the site. There are no designated structures of architectural heritage significance located within the study area or its environs. As a result, no residual impacts on the cultural heritage resource are predicted.

11.8 Project References

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Consulted online sources:

- <http://gis.teagasc.ie/soils/map.php> (Soils)
- <http://map.geohive.ie/mapviewer.html> (Geology)
- <http://maps.osi.ie/publicviewer/#V2,591271,743300,1,10> (Historic maps)
- <http://downsurvey.tcd.ie/down-survey-maps.php> (Down Survey)
- http://spatial.dcenr.gov.ie/imf/imf.jsp?site=GSL_Simple (Bedrock)
- www.archaeology.ie (SMR and NIAH)
- www.duchas.ie (Folklore)
- www.excavations.ie (Archaeological investigations)
- www.logainm.ie (Placenames)
- www.heritagemaps.ie/WebApps/HeritageMaps/index.html (Finds database and Protected Structures)
- <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b7c4b0e763964070ad69bf8c1572c9f5> (LiDAR imagery)

Chapter 12

Population and Human Health

12

CHAPTER 12 POPULATION & HUMAN HEALTH

12.1 Introduction

This chapter was prepared by Orla O'Sullivan (BSc Hons. Architectural Technology; MPlan Planning & Sustainable Development) of McCutcheon Halley Planning Consultancy. It assesses the potential impacts of the proposed development on population and human health. The proposed development has the potential to impact upon population and human health in several ways. The potential impacts on population and human health can arise from traffic, visual effects, built and natural heritage, air and noise emissions and climate change, all of which are dealt with in the specific chapters of this EIAR dedicated to those topics. This chapter considers those impacts which are not already covered by other chapters of the EIAR relating to issues such as health and safety, social considerations, economic activity, local amenity and land-use.

12.2 Methodology

This chapter has been prepared having regard to the following guidelines:

- Revised Guidelines on the Information to be Contained in Environmental Impact Statements (Environmental Protection Agency (EPA), draft August 2017);
- Advice Notes for Preparing Environmental Impact Statements (EPA, draft September 2015);
- Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, 2002);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003).

The appraisal of the likely significant effects of the proposed development on population and human health was conducted by reviewing the current socio-economic environment in the Castletreasure, Maryborough and Douglas environs. This comprised site visits and visual assessments of the proposed site and the surrounding area, as well as an analysis of aerial photography and Ordnance Survey (OS) mapping.

Information was also gathered with respect to the demographic and employment characteristics of the resident population within the relevant catchment area, sourced from the 2011 and 2016 Censuses. The data included information on population, structure, age profile and household size, number of persons at work and the unemployment profile. A desktop survey of the following documents and websites also informed this:

- Cork County Development Plan (CDP) 2014;
- Ballincollig Carrigaline Municipal District Local Area Plan (MD LAP) 2017;
- Central Statistics Office (CSO) website www.cso.ie;
- Department of Education and Sciences (DES) website www.education.ie.

Consultations with both the local authority and the public were also used to ensure that environmental issues, including socio-economic, recreational and amenity issues relating to the proposed development were addressed (see Chapter 1 Introduction for details).

12.3 Receiving Environment

The following provides a description of the receiving environment, with focus on demography, land use and local amenity.

12.3.1 Demography

The South Environs, is one of the key growth centres in Metropolitan Cork with the vision for the Metropolitan Area, as set out in the Cork County Development Plan 2014, being to facilitate its development as a main engine of population and employment growth in the South West region. As identified in the MD LAP the South Environs will be the focus of the majority of new housing units, to avoid any unnecessary incursions into the greenbelt.

The South Environs are the southern suburbs of Cork City, currently within Cork County Council's administrative area. It is formed of a group of suburbs including Rochestown, Douglas, Grange, Frankfield, Lehanagmore, Togher, Doughloyne, and areas of Curraheen/Bishopstown, Douglas, which includes residential areas of Maryborough, Rochestown and Castletreasure. It forms the heart of the South Environs and is an important suburban centre with good social infrastructure, making it attractive for new development. The MD LAP notes that the provision of an enhanced choice in housing is particularly important in Douglas, where there is a need to maintain a mixed demographic in order to create a sense of integration between established and new communities.

The site is located within the Douglas Electoral Division (ED), which incorporates the relevant residential areas mentioned above as well as part of the surrounding rural hinterland (see Figure 12.1). This ED has been used in the assessment of the Census and Population Statistics 2016 and includes a comparative analysis with 2011 and 2016 levels as well as National, County and City averages across a number of datasets.

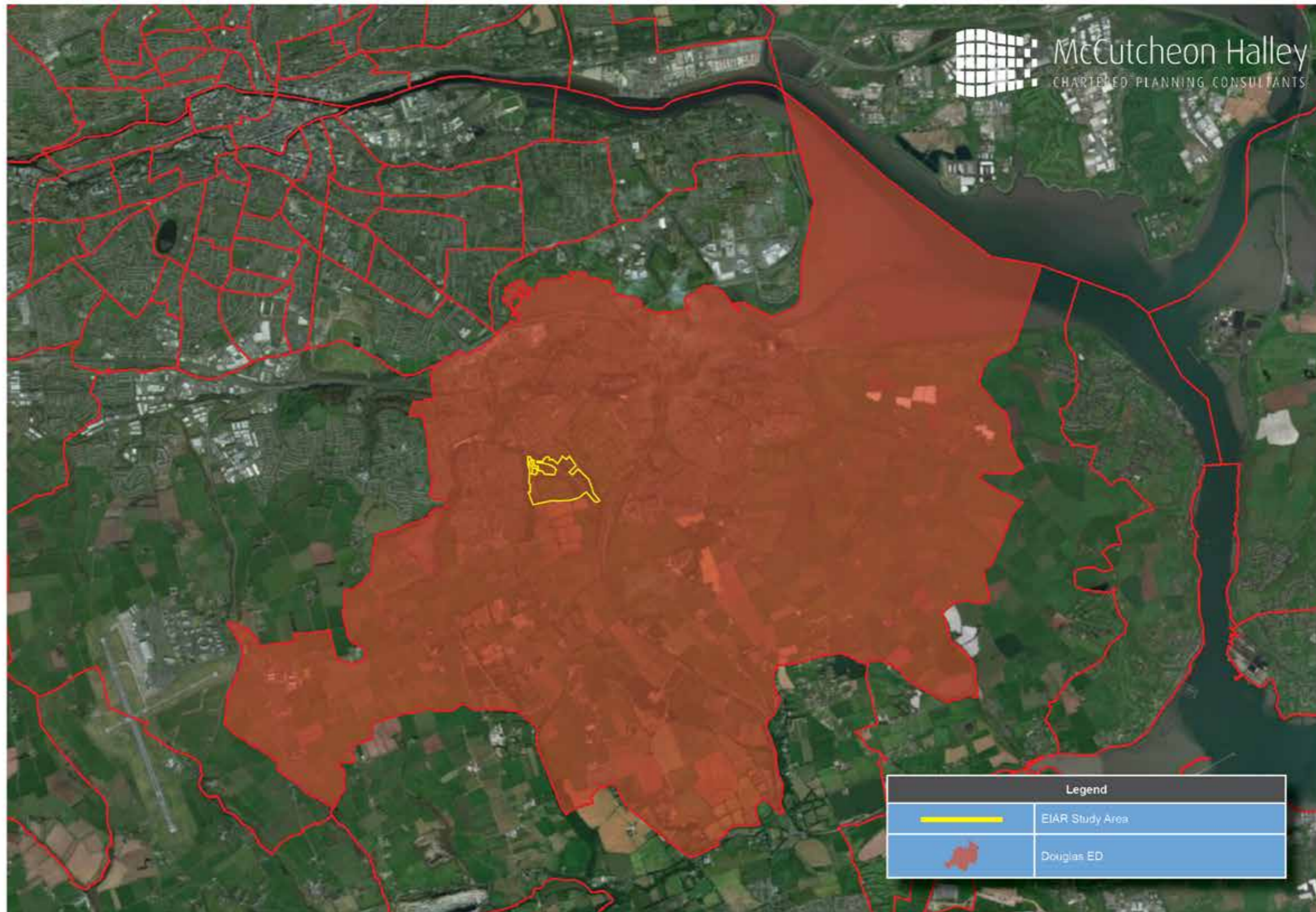


Figure 12.1: Location of EIA Study Area within Douglas Electoral District

Population

The Ballincollig-Carrigaline MD LAP notes that the CDP sets out a target of 31,808 people within the South Environs up to 2021. In order to take account of household formation trends arising from a drop in the average household size, a requirement of 1,284 housing units has been identified across the South Environs up to 2021 to meet this population projection (see Table 12.1). The subject site is the largest of thirteen sites zoned for residential development within the South Environs and therefore has the potential to accommodate a significant proportion of this new residential development.

Table 12.1 - Extract from Table 2.2 of the Ballincollig Carrigaline Municipal District Local Area Plan 2017 showing the settlements Population Growth and Housing Requirements

	Housing Requirement					Housing Supply	
	Census 2011	Population Target	Total New Households 2011-2022	New Housing Units Required	Net Housing Requirement (ha)	Net Residential Area Zoned in LAP	Estimated Housing Yield
South Environs	32,635	31,308	1,336	1,284	51	92.56	2,274
Total MD	71,946	80,446	7,685	9,144	347	416.19	10,162

Household Size

The Douglas ED, which is the most populous area in the South Environs, recorded a population of 21,041 in 2016 which represents a 3.2% increase on 2011 levels (i.e. 20,397 people) and a 15.7% increase on 2006 levels (i.e. 18,182 people). With regard to household size, an average size of 2.8 people per private household was identified in the ED in 2016, which is broadly in line with the average of 2.8 identified in the County and 2.7 nationally. It is however significantly higher than the average of 2.4 identified within Cork City, which suggests that the area is most popular for starter and family housing due to the suburban location and availability of larger homes (see Table 12.2).

Table 12.2 - Average Household Size in 2016

Area	Households	Persons	Average Household Size
Douglas ED	7,464	21,056	2.8
Cork County	146,442	414,062	2.8
Cork City	49,411	120,980	2.4
State	1,702,289	4,676,648	2.7

Household Type

In terms of demographic split, the Census 2016 found that 7.1% of the population in the ED were of pre-school going age (i.e. 0-4 years). This is broadly in line with the figures identified County-wide (7.5%) and across the State (6.9%) for persons within this age category. In terms of primary school aged children (i.e. 5-11 years), it was identified that 9.5% of the population were within this category. Similarly, 9% of the population were identified as being of post-primary age (i.e. 12-18 years). These figures are slightly lower than the same figures identified at State level with 10.2% of the population aged between 5-11 years and 9.2% aged 12-18 years. Across all groups, the figures were much greater than Cork City, which further illustrates the popularity of the city's suburbs as an area for starter and family housing, see Table 12.3.

Table 12.3 - Demographic Breakdown of School-Going Children, Census 2016

Area	Age 0-4	Age 5-11	Age 12-18	Age 19-34	Aged 65+	Total Population
State	331,515	484,368	435,913	990,618	637,567	4,761,865
As percentage of total population	6.9%	10.2%	9.2%	20.8%	13.4%	n/a
Cork County	31,337	46,583	39,969	74,664	54,116	417,211
As percentage of total population	7.5%	11.2%	9.6%	17.9%	12.9%	n/a
Cork City	6,305	8,270	8,661	37,932	19,727	125,657
As percentage of total population	5%	6.58%	6.8%	30.1%	15.7%	n/a
Douglas ED	1,494	2,016	1,912	5,054	2,213	21,041
As percentage of total population	7.1%	9.5%	9%	24%	10.5%	n/a

Douglas ED has a higher proportion of young adults (i.e. aged 19-34) at 24% than is noted comparatively across the State (20.8%) and County (17.9%) but less than the City at 30.1%. This disparity is as a result of the high student population that lives within the city.

Travel Trends

Demographic analysis of travel trends, as outlined in Table 12.4, within the Douglas ED indicate that the majority of people commute to Cork City and the surrounding Environs, and other employment centres in the immediate vicinity, such as Ringaskiddy, Little Island and Carrigtwohill daily. 65.2% of the population travel a distance of between 0 minutes and ½ hour, with a further 22.7% travelling between ½ hour and ¾ hour. The settlement's position as an important residential base for young people and families within the city environs is further reinforced when considering the level of retired population (i.e. those aged 65 and above) is just 10.5%, which is considerably lower than those for the County (12.9%), City (15.7%) and State (13.4%).

Table 12.4 - Journey Time to Work, School or College for the Douglas ED, Census 2016

Time Taken to Travel to work, school or college	Total Population Aged 5 years and over
Under 15 mins	2,747
1/4 hour - under 1/2 hour	6,863
1/2 hour - under 3/4 hour	3,344
3/4 hour - under 1 hour	637
1 hour - under 1 1/2 hours	385
1 1/2 hours and over	162
Not stated	593
Total	14,731

Tenure

With regard to tenure, the figures outlined for owner occupied households and those renting in the Douglas ED in Table 12.5 are most in line with State figures. In the Douglas ED 26.8% of households are in rental accommodation (either from a private landlord, local authority or voluntary body) while 70.7% are owner occupied (including those with and without a mortgage). At State level 27.6% of households are renting while 67.6% are owner occupied. There is a slight disparity when compared with Cork City (44% of households rent and 50.3% of households are owner occupied) and Cork County (22.7% of households rent and 72.9% are owner occupied). This highlights the location of the site at the outskirts of the city where average house prices are less expensive than in the city proper (where renting is more popular), but more expensive than the surrounding county. Table 12.6 suggests that the level of vacancy in the Douglas ED is also very low, at 6.2%. This is slightly lower than Cork City (7.6%) and significantly lower than County and State levels which are 9% and 9.1% respectively.

Table 12.5 - Demographic Breakdown of Household Tenures, Census 2016

	Total Households	Rented Accommodation ¹	Owner Occupied ²
State	1,697,665	469,671	1,147,522
As percentage of total households	100%	27.6%	67.6%
Cork County	146,052	33,180	106,559
As percentage of total households	100%	22.7%	72.9%
Cork City	49,370	21,736	24,840
As percentage of total households	100%	44%	50.3%
Douglas ED	7,460	2,002	5,276
As percentage of total households	100%	26.8%	70.7%

Table 12.6 - Vacancy Levels, Census 2016

	Total Permanent Dwellings	Vacant Dwellings ³	As percentage of Total Permanent Dwellings
State	2,003,645	183,312	9.1%
Cork County	173,735	15,645	9%
Cork City	55,760	4,292	7.6%
Douglas ED	8,314	512	6.2%

¹ Including those renting from a private landlord, local authority, voluntary body
² Including those with mortgage and no mortgage
³ Excluding Holiday Homes and those Temporarily Absent

12.3.2 Land Use

The landscape in which the EIAR study area is located is categorised in the Cork County Development Plan as 'Type 1 - City Harbour and Estuary' and is characterised by 'a mix of rural and intensely urban areas, combined with a large expansive harbour'.⁴ The vast majority of the study area is greenfield, used previously for pastoral agriculture, with a mix of scrub and woodland in parts, and is under the ownership of the applicant.

With regard to the land uses of the surrounding area, there are residential uses adjacent the study area, with the site sharing its boundary to the north west with the Vicarage and Temple Grove; as well as several 'one-off' dwellings located along a private laneway to the immediate north. There are also 2 no. detached dwellings and a nursing home to the north / north east adjacent to the R609. More established residential areas are located to the west, separated from the site by a belt of established trees and hedgerows. Other uses in the immediate vicinity include the Douglas Golf Club and the Douglas Pitch and Putt Club both located to the north.

Douglas, as part of the South Environs, is identified as an area for consolidated residential growth within the Cork Gateway area. The Douglas area benefits from a wide selection of important facilities and services including a library, doctor and dentist clinics, shopping centres, post office, sport and community playing pitches, gyms, community centre and park, banks, churches of various denominations and several hotels including the Rochestown Park Hotel and the Maryborough Hotel and Spa. There are five identified 'town centre' areas within Douglas, zoned SE-T-01 to SE-T-05 in the Ballincollig-Carrigaline MD LAP. The vast majority of the settlements facilities and services are located within these areas, located approximately 1.2km to the north (see Figure 12.2 and Figure 12.3).

There are also a number of educational facilities located in the area including creches, pre-schools, primary and secondary schools (see Figures 12.4 and 12.5, and Tables 12.7 and 12.8).

12.3.3 Local Amenity

Douglas has a strong network of community groups and clubs and includes the Douglas Community Association which is run by a group of local volunteers, and provides a range of community services out of the Douglas Community Centre, located within the Douglas Community Park at the heart of the village. This association is very active in the town and provides a range of services for the community, including Meals-on-Wheels, Tidy-Towns Committee, a pre-school and playgroup. They also help to maintain the 5-acre community park and playground.

The community library also assists and facilitates several other groups in the town including the 'Social Sketchers' art group, Douglas Reading Circle, Chess Club, Creative Writing Club, and the 'An Ciorcal Comhrá' conversational Irish group.

The settlement also has a network of amenity and cycle trails and heritage walks, including the Ballybrack Valley Walk / Cycle Track which extends from the town centre at the community park, up through the river valley and along the western boundary of the EIAR study area. The subject site does not currently form part of these walks, although there is evidence of the use of the site as a walking route. In lieu of this, the proposed layout will provide a long-term connection to the Ballybrack track, connecting into this valuable piece of social infrastructure and linking the proposed parkland to the amenity network of the town. A series of amenity trails will also be provided through the site, providing looped walks throughout the site.

⁴ P11 of the Cork County Draft Landscape Strategy 2007

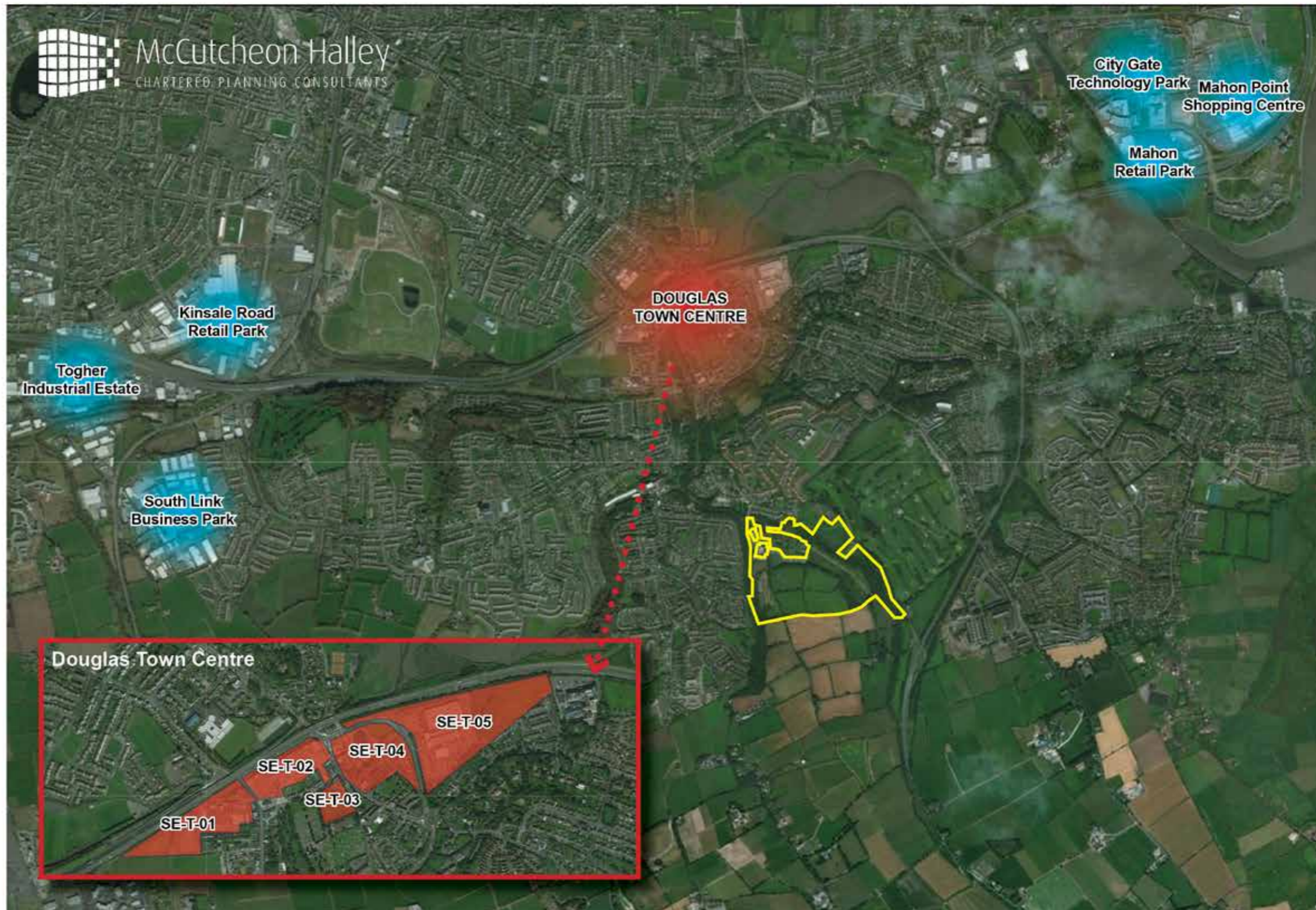


Figure 12.2: Location of areas zoned 'Town Centre' in Douglas as well as satellite retail/business/industrial centres]



Figure 12.3: Different 'Town Centre' areas in Douglas

12.4 Identification of Principal Potential Receptors

In identifying potential impacts and receptors, consideration was given to the proposed mixed use residential scheme and the identified receiving environment. The principal potential receptors that will be affected by the development proposals have been identified as follows:

12.4.1 Homes

There are several existing residents surrounding the proposed site which have the potential to be impacted by the development, specifically the residents of:

- The Vicarage and Temple Grove to the north east, which will be directly connected to the proposed development via a secondary vehicular access point to the west of the existing open space;
- 7 no. detached dwellings located along the private laneway to the immediate north;
- 2 no. detached dwellings located along the R609;
- Nursing home also located along the R609.
- Residents living in the wider vicinity of Douglas, Rochestown, Castletreasure and Maryborough.

12.4.2 Community Facilities and Services

As previously stated, Douglas benefits from a wide selection of important community facilities and services which are identified as potential receptors. These include the library, doctor and dentist clinics, pharmacies, post office, sport and community playing pitches, gyms, community centre and park, banks, churches of various denominations, 2 no. shopping centres as well as a selection of local convenience / comparison retail stores, and several hotels including the Rochestown Park Hotel and the Maryborough Hotel and Spa.

With regard to childcare facilities, a total number of 42 crèches were identified within a 15 to 20-minute drive time of the EIAR study area, with 22 no. of these located within a 10 to 12-minute drive time from the site (see Table 12.7). The closest existing childcare facility is Pathways Childcare located at Maryborough Woods, c. 600m to the north of the site (see Figure 12.4 for locations).

Table 12.7 - Crèches / Childcare Facilities located within 10 to 12-minute drivetime of the Site

As Identified on Figure 12.3	Name of Creche / Childcare Facility	Road Distance from EIAR Study Area	Drive Time
1	Canterbury Montessori School	3.8 km	9 mins
2	Springbrook Montessori Crèche	3.5 km	9 mins
3	BEL Childcare - Bilingual Early Learning Childcare	2.8 km	7 mins
4	The Treehouse Playschool	2.7 km	8 mins
5	Pathways Childcare Ltd	1.2 km	4 mins
6	Little Fingers Playgroup	2.6 km	7 mins
7	St. Columba's Montessori School	2.5 km	6 mins
8	Douglas Community Pre-School	1.7 km	4 mins
9	Mount Oval Childcare Limited	4.1 km	9 mins
10	Bright Beginnings	4.0 km	8 mins
11	ABC Childcare	4.4 km	9 mins
12	Little Stars Montessori	4.4 km	10 mins
13	Little Paradise Crèche	4.9 km	12 mins
14	Sunny Days Montessori	3.9 km	10 mins
15	Maryborough Montessori School	2.4 km	5 mins
16	Little Wonders Daycare Rochestown	4.8 km	6 min
17	Naoinra nc Dubhglaise	2.6 km	7 mins
18	Orchard Childcare	3.3 km	9 mins
19	Tir na nOg Montessori School AMI	2.4 km	8 mins
20	Lilliput Montessori School	3.6 km	6 mins

The Douglas area is also served by 8 primary schools and 2 post-primary schools⁵, the details of which are provided in Table 12.8⁶ and identified on Figure 12.5.

There are also 2 no. new schools proposed in close proximity to the site. A 24-classroom Educate Together primary school, which will offer 624 student places, has been permitted by Cork County Council within the EIAR study area. This school is proposed to provide permanent accommodation for the students currently attending the Rochestown Educate Together National School which has, since its foundation in 2013, been operating from temporary accommodation originally at Douglas Hall Sports Centre. In 2016 a second site at Garryduff Sports Centre was opened due to the rapid growth in demand for student spaces. This application is currently subject to a third-party appeal to An Bord Pleanala and is due for decision in March 2019 (refer to Cork County Council planning register ref. 18/5369 / ABP Ref. 302924-18).

A 600-pupil post-primary school is also proposed at Ardarrig, c. 850m north-west of the EIAR study area. This application is currently at Further Information stage as of October 2018, with a response currently awaited by the applicant (refer to Cork County Council planning application ref. 18/6246).

⁵ All located within a 3km radius of the study area.

⁶ Note that the distances calculated are the linear distances from the centre of the EIAR Study Area to the identified school.

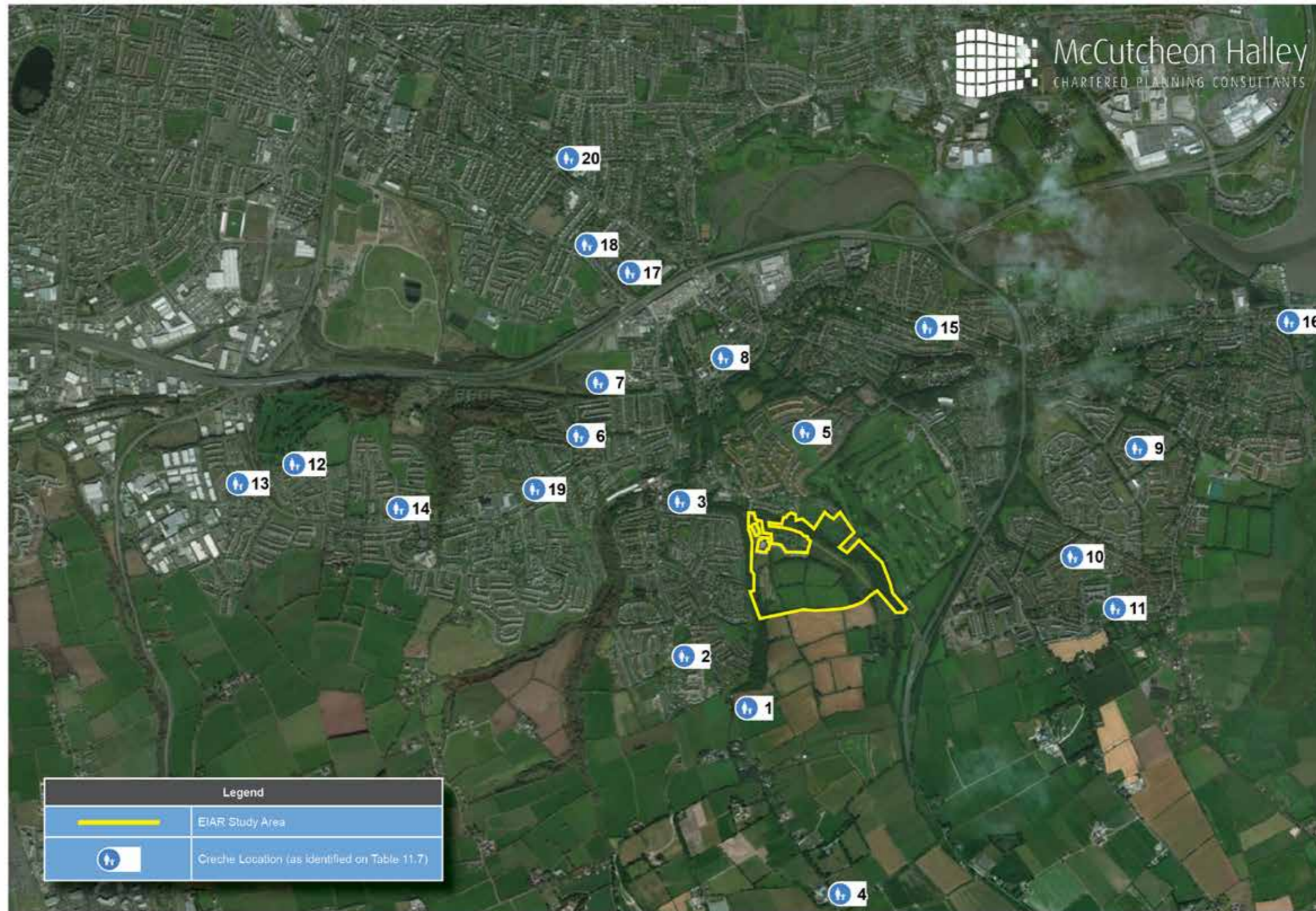


Figure 12.4: Location of Creches/Childcare Facilities within 10 to 12-minute drivetime of site

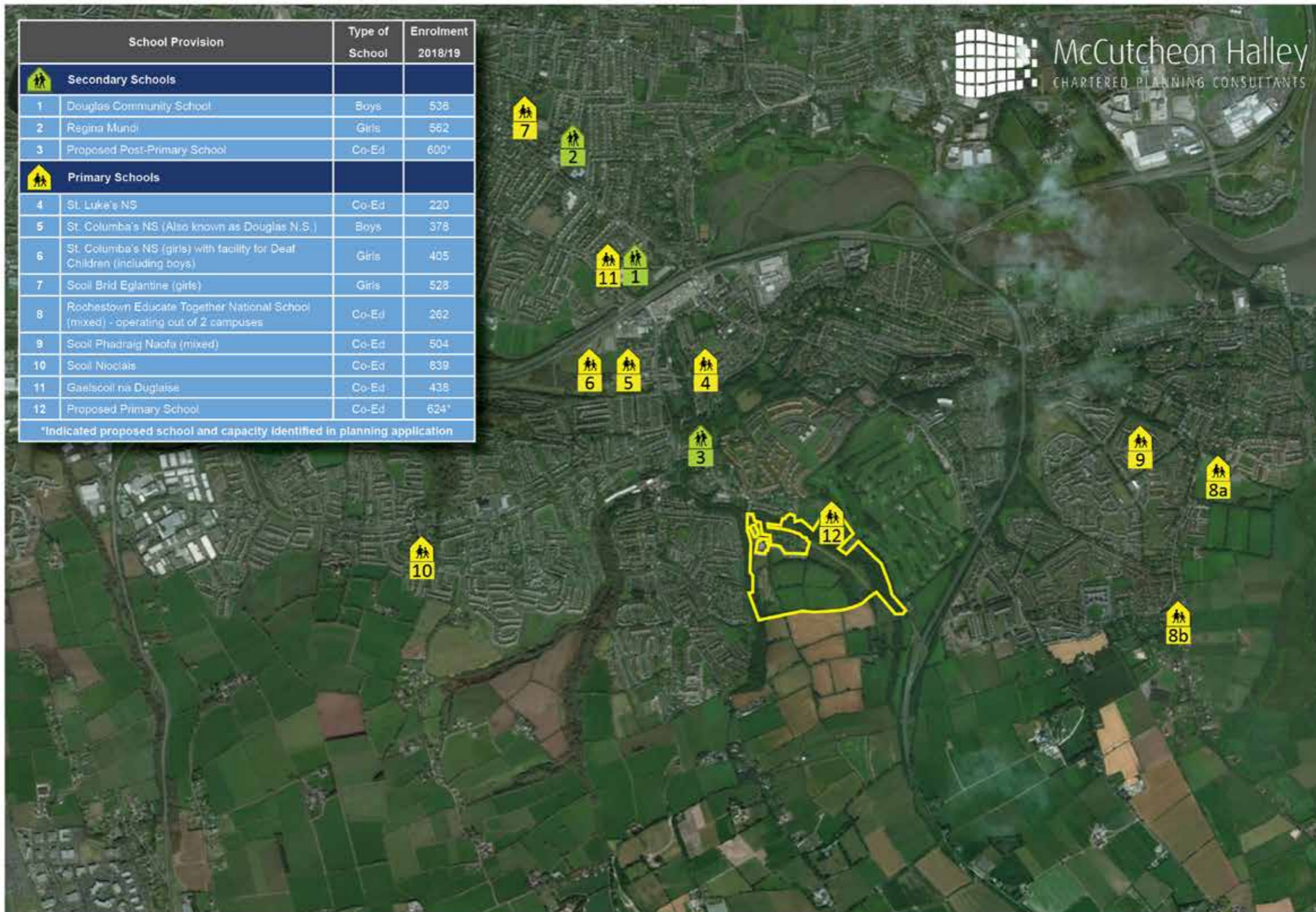


Figure 12.5: Location of Primary and Post-Primary Schools located within 3km radius of the site

Table 12.8 - Existing Primary and Secondary Schools Located within 3km of Site

School Type	Name	Location	Distance from Site	Enrolment Figures (2017/2018)	Enrolment Figures (2018/2019)
Primary	St. Luke's NS (mixed)	Churchyard Lane	1.2km	211	220
Primary	St. Columba's NS (boys) (Also known as Douglas N.S.)	Inchvale Drive	1.3km	378	378
Primary	St. Columba's NS (girls) with facility for Deaf Children (including boys)	Inchvale Drive	1.3km	412	405
Primary	Scoil Bríd Eglantine (girls)	Douglas Road	2.8km	552	528
Primary	Rochestown Educate Together National School (mixed)	Moneygourney	1.9km	208	262
Primary	Scoil Phadraig Naofa (mixed)	Rochestown	1.8km	504	504
Primary	Scoil Niocláis (mixed)	Carrigaline Road	2.2km	860	839
Primary	Gaelscoil na Duglaise (mixed)	South Douglas Road	2.5km	424	438
Post-Primary	Douglas Community School (boys)	Clermont Avenue	1.8km	541	536
Post-Primary	Regina Mundi College (girls)	Douglas Road	2.3km	551	562

12.4.3 Local Amenity

Section 12.3.3 identifies that the Douglas area benefits from a strong network of community groups, clubs and societies. Also, of note the Douglas Golf Club and the Douglas Pitch and Putt Club both located to the north in the immediate vicinity of the site. There are also several walking/cycling routes and heritage trails throughout the settlement, including the Ballybrack Valley Walk / Cycle Track which extends from the town centre at the community park, up through the river valley and along the western boundary of the EIAR study area. These have the potential to be impacted by the proposed development and are therefore identified as principal receptors.

12.4.4 Economic Activity

Owners and employees of other commercial activities may be impacted by the proposed development i.e. local business owners, industries, and adjacent farms. Consideration is given under economic activity to the potential impact on other commercial activities

12.4.5 Temporary Receptors

In relation to temporary receptors, the proposed development is adjacent to the R609 regional road and close to the N28 and Carr's Hill Interchange located to the east. Due to the topography of the EIAR study area as well as the notable vegetation and trees along its boundaries, much of the site is screened from view from these roads. The site is visible in

some long-distance views, including that from Maryborough Hill to the north. Where visible it is considered that there will be an impact on drivers passing the site. However, the impact on drivers are visual impacts of long-distance views, which are assessed in Chapter 4 Landscape and Visual.

12.5 Evaluation of Potential Impacts

Potential Impacts are considered under the following headings:

- Do-nothing impacts
- Human Health Impacts
- Population & Economic Activity Impacts
- Local Amenity Impacts

In each case construction and operational impacts are considered.

12.5.1 Do-Nothing Impacts

If the development were not to proceed there would be no immediate impact on the existing population, or economic activity for residents living in the area. However, due to the size of the site in relation to other areas of land zoned for residential development in the South Environs, it is considered that the housing targets for the settlement set out in the County Development Plan and the MD LAP could not be achieved. This is specifically because the remaining zoned land in the settlement could not facilitate the required level of growth without development of the subject site. This would have a very significant negative long-term impact on both the South Environs and the wider metropolitan area of Cork as the critical mass of population growth would not be achievable, undermining the Core Strategy of the Cork County Development Plan.

The MD LAP identifies that the South Environs will be important to address concerns regarding housing yield and the level of headroom in the County Metropolitan Cork Strategic Planning Area. As previously outlined, the site is zoned primarily under the SE-R-06 zoning objective and is the largest site zoned for residential development in the South Environs. Therefore, much of the planned growth of the South Environs will be accommodated through development within the EIAR study area. The proposed development is in line with the site-specific zoning objective and will consist principally of residential units, a creche, and large parkland area. This development will facilitate an appropriate, sustainable settlement pattern which will accommodate residential, community, leisure and recreational facilities to satisfactorily match the level of population growth / household generation. In the absence of the relevant policy documents and the specific zoning designation of the site there would be no framework directing developments to appropriate locations and this would have the potential to result in adverse impacts on environmental components, which could negatively affect human health.

The land would likely remain used for agricultural/informal leisure use and it is unlikely that this would result in an increase in any employment opportunities in the area. As the land is not currently actively farmed it is likely that the character of the land would change overtime, becoming more overgrown. However, this impact would be primarily visual. The impacts on land use are therefore envisaged to be neutral for the 'do-nothing' scenario.

12.5.2 Human Health Impacts

Human health may be impacted on in a variety of ways and by several environmental receptors including water, biodiversity, climate, flooding, air and major accidents, etc. Exposure to contaminants or pollutants can have serious implications for human health. Potential impacts on pollution and human health include inadequate water and wastewater infrastructure, contamination of soils, excessive noise, flooding due to non-control of surface water, poor air quality in areas where

there are large volumes of traffic and the health impacts associated with the storage of hazardous materials during the construction stage. These issues are addressed within the relevant discipline of the EIAR as summarised in Table 12.9.

Human health risks not addressed elsewhere in the EIAR relate to Construction Health & Safety; and availability of Recreation and Amenity Facilities and are summarised in the following sections.

Construction Phase

The proposed development is predominantly residential in character and it is considered that the greatest health and safety risks⁷ will be posed during the construction phase of the proposed development.

As with any construction site, there will be potential risks to the health and safety in terms of injury or death of construction personnel on-site due to the usage of large, mobile machinery as well as heavy equipment and materials. Proposed mitigation measures are offered in Section 12.6.

Operational Phase

Due to the nature of the development, there will be few hazards associated with the operational phase of the development and therefore no potential significant negative impact in terms of health and safety. A lack of adequate recreation or amenity facilities has the potential to negatively impact human mental and / or physical health. The proposed layout provides for excellent public amenity and recreational facilities, including approximately 4.4 hectares of parkland (i.e. the Dughghlaise Valley parkland which runs east to west through the site), a network of c. 1.5km of fitness trails, walking routes and cycleways that meander through the site, other smaller park areas and parklets, as well as a number of play opportunities for children of all ages. The provision of these amenity facilities within the proposed Castletreasure development will be of benefit to future residents and existing residents in the local environs. The operational phase of the proposed development, in terms of recreation and amenity facilities. will therefore, have a permanent significant positive impact on Human Health.

⁷ A 'risk' is defined by the Health and Safety Authority as 'the likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard'. Source <http://www.hsa.ie/eng/Topics/Hazards/>

Table 12.9: Summary of Risks to Human Health

Discipline	Human Health Risk	Proposed Mitigation
Landscape	None	None
Material Assets - Traffic	None	None
Material Assets - Service Infrastructure	Inadequate provision of services and infrastructure to serve the proposed development	Compliance with regulations of appropriate regulatory authority.
Land & Soils	Exposure to hazardous materials (i.e. fuel, paints, cleaning agents etc.)	Correct storage and spill management if required (i) Compliance with regulations of appropriate regulatory authority
Biodiversity	None	None
Noise & Vibration	None	None
Air Quality & Climate	None	None
Cultural Heritage	None	None
Population & Human Health	(i) Potential lack of access to recreation and amenity facilities (ii) Construction Risks	(i) Provision of high-quality amenity facilities within the development, including parks, fitness trails, walkways, cycle routes, and play areas. (ii) Compliance with Health & Safety at Work Regulations.

12.5.3 Population and Economic Activity Impacts

Construction Phase

Generally, the potential impacts arising during the construction phase relate to quality of life including visual impact / amenity, noise, air quality and transport. Where relevant, these impacts have been considered in the relevant chapters of the EIAR and will be minimised or mitigated where appropriate. It is unlikely that these impacts will be of a scale to either encourage people to move from the area, or discourage people from moving to the area. Therefore, the impact on population will be imperceptible.

The construction of the proposed development, as described in Chapter 2 Project Description, is anticipated to support the on-going employment of approximately 80-100 workers (per phase) directly on site with others employed indirectly through spin-off jobs off-site such as manufacturing of blocks, concrete, roofing materials etc. The construction phase of the proposed development will therefore have a moderate positive short-term impact on the local construction industry.

The land was formally under agricultural pastoral use. However, as the land is under the ownership of the applicant and is not actively farmed at present, it will not result in a loss of agriculturally based employment. Given that there will be no interference with farming activities within the lands bounding the EIAR study area, there will be a neutral impact on the agricultural economy.

Operational Phase

In terms of the operational phase, the employment opportunities arising because of the operation of the proposed development will be limited given the fact that residential is the most prominent land use proposed. Notwithstanding this, there will be additional employment from the proposed creche, albeit small in scale. The economic impact of the operational phase on the immediate area would therefore be permanent slight positive.

The provision of up to c.475 quality homes within the proposed development will have a significant permanent positive impact on the population of Douglas, contributing to the settlement's growth in a compact manner and accommodating a substantial portion of the planned population growth of the town. In line with the trend towards falling household sizes, as well as the proposed mix of accommodation within the EIAR study area, it is envisaged that the proposed development will accommodate a projected population of between 1,140 and 1,330 people⁸. This population will also generate additional spending within the area, which will likely have a permanent moderate positive impact on economic activity in the town.

The number of pre-school children that will be in the completed development is likely to be in the range of 80 to 93⁹ (see Table 12.10). This will create a demand for additional pre-school childcare places, notwithstanding that some children will be cared for at home, by childminders, or in creche facilities close to their parent's location of employment. Guidelines on the Provision for Childcare facilities require that a creche is provided for any development over 75 housing units. The proposed development incorporates a creche with capacity for c.75 children, which will add to the existing supply of pre-school / creche provision in the Douglas area, as shown in Figure 12.3. The proposed development, which includes provision for a new creche, will therefore have a neutral to slight positive long-term impact on the demand for pre-school places.

The proposed development will result in a demand for school places at both primary and post-primary level. Projections based on the methodology contained in 'The Provision of Schools and the Planning System - A Code of Practice for Planning Authorities' (2008) identifies that primary school aged students within the proposed development will likely account for 9.5% of the population. Based on the percentage of total population aged 12 to 18 in the Douglas ED, it is estimated 9% of the development's population will be post-primary school aged children.

Table 12.10 provides a breakdown of the project number of pre-school children and student in the context of the projected population. In accordance with the SE-R-06 zoning objective for the site, permission has been granted to the Minister of Education (currently subject to third party appeal), for the development of a 24-classroom primary school within the EIAR study area. This, together with the existing provision of schools in the areas, and the proposed 600-pupil secondary school at Ardarrig will ensure sufficient capacity to serve the future population of the proposed development.

Table 12.10 - Estimated Level of Primary and Post Primary School Students

Projected Population	Projected Pre-school Children	Projected Primary School Students	Projected Secondary School Students
1,140 - 1,330	80 - 93	108 - 126	103 - 120

It will take several years before the development is built out and demand for school places will reach its peak. Demand for school places may also be less than the maximum levels predicted, as some children's choice of school may be elsewhere in Douglas, or in Cork City. Existing primary and post-primary schools will provide capacity for new students generated in the short term. Therefore, the need for short term mitigation measures is not anticipated.

⁸ Assuming average household size in the range of 2.4 (Cork City average household size) to 2.8 (Douglas ED and Cork County average household size) people * 475 units.

⁹ Based on assumption of c.7% of the population, consistent with current profile in Douglas.

In the medium to long term, the construction of a primary school within the EIAR study area (providing 624 pupil spaces), as well as the completion of the proposed secondary school at Ardarrig (providing 600 pupil spaces) would cater for additional growth in student numbers as the population of the completed development grows and matures, while also offering increased choice for both future and existing populations. While both schools are currently being decided by both Cork County Council (ref. 18/6246) and An Bord Pleanala (ref. 18/5369 / ABP ref. 302942-18), both applications demonstrate that it is the intention of the Department of Education to provide these schools in the short to medium term. However, should these schools not be provided in a timely manner, as demand for school places increases in the town, this would have a moderate medium to long term negative impact.

12.5.4 Local Amenity Impacts

Construction Phase

During construction, a stock-proof fence will be erected along the perimeter boundary where required with the purpose of restricting public access to the work area as well as preventing the entry of any animals or livestock from adjacent property / fields. This will likely block views of the area during the construction period and alter the passive amenity available to adjacent properties and passers-by. However, as a sizable proportion of the proposed site is screened by existing trees and hedgerows which are to be retained in accordance with the zoning objective of the site, this impact will be slight negative short term in nature.

Operational Phase

During operational phase, the change of the land use from agricultural to primarily residential will permanently change the views currently enjoyed by adjacent properties and road users. This impact is visual and is dealt with in Chapter 4 Landscape.

The Cork County Council Recreation and Amenity Strategy 2006 requires all new residential developments to comply with its policy to ensure the adequate provision of recreation and amenity facilities to meet the needs of future residents. The policy requires that a minimum of 30% of the required facilities be delivered on-site (measured as 1 point per 6 housing units). With consideration to this, there is a total point equivalent of up to 78 points¹⁰, with 30% of this equating to 23.5 points.

In order to meet this requirement, the proposed scheme will include approximately 4.4 hectares of parkland, a network of c. 1.5km of fitness trails, walking routes and cycleways that meander through the site, other smaller park areas and parklets, as well as a number of play areas pepper-potted throughout the site. These will exceed the 30% recreation and amenity points requirement and will be of particular benefit to both existing and future residents. Therefore, it is considered that there will be a significant positive permanent impact on their local amenity.

The proposed linear amenity walk will also link with the existing network of public walkways/cycle routes in the area, specifically the Ballybrack Greenway which will provide a direct cyclist/pedestrian connection with Douglas Town Centre. This will result in a significant positive permanent impact on local amenity, especially for those who currently use the network of existing greenway routes in the surrounding area.

¹⁰ 473 units / 6 units = 78 points

12.5.5 Cumulative Impacts

There are a number of planned and likely developments in the vicinity of the EIAR study area which in combination with the proposed development could have cumulative impacts. The cumulative impacts related to the following projects have been considered where relevant, in the context of the human environment:

- **Proposed Part 8 Greenway Extension by Cork County Council** - These improvements relate specifically to the existing greenway network in Douglas. Cork County Council are actively seeking the extension of this greenway network across the South Environs, and several of the identified improvements are located in the immediate vicinity of the EIAR study area. This includes the provision of part of the greenway through the adjacent Irish Water pumping station, to link into the existing network which currently ends at the entrance to the Vicarage Estate. While a Part 8 application has not yet been made for these works, it is likely that the construction of same will correspond with the construction of the earlier stages of the proposed development. This would consolidate the duration of construction employment in the area which will have a moderate, positive short-term impact on economic activity.
- **M28 Cork to Ringaskiddy Project Motorway Scheme by Cork County Council in conjunction with Transport Infrastructure Ireland (ABP Ref. PL04. MA0014)** - The upgrade of the existing N28 to motorway status was approved by An Bord Pleanála in June 2018 and is currently subject to judicial review. However, if permission is subsequently granted by the Court, it is likely that construction will overlap with part of the later stages of construction of the proposed development. This would consolidate and lengthen the duration of construction employment in the area and have a moderate, positive medium-term impact on economic activity.
- **Proposed Educational Developments by the Minister of Education (ref. 18/5369 and 18/6246)** - As stated previously, both of these developments are currently being decided. If granted permission, it is likely that the construction of these developments will overlap with the construction of the proposed development and would have a slight, positive short-term impact on construction employment in the area. There would also be a moderate, positive permanent impact on both future and existing population levels by providing additional school places to meet growing demand at both primary and post-primary level.
- **Residential and Mixed-Use Developments by George Maloney, Statutory Receiver of O'Brien & O'Flynn (in liquidation and receivership) (ref. 16/7271) at Maryborough Ridge, Murnane & O'Shea Limited (ref. 18/6245) at Clarendon Brook, and Lidl Ireland GmbH (ref. 18/5814) on the Carrigaline Road** - These residential/mixed use developments are at varying stages of the planning process: The residential development of 198 no. units at Maryborough Ridge was granted permission by Cork County Council in Q4 2017 and the developers, Glenveagh Properties PLC are currently engaging with Cork County Council to seek compliance on the conditions of that permission. The residential development of 48 no. units at Clarendon Brook was approved by Cork County Council in Q4 2019 and is currently subject to a first party appeal to the Board, due for decision in May 2019. The mixed-use Lidl development with 5 no. apartments was also approved and is awaiting the final grant from the Council. It is likely that construction of these developments will overlap with the construction of the proposed development which would have a slight, positive short-term impact on construction employment in the area. There would also be a moderate, positive permanent impact on population levels in the area by helping to achieve the settlements targets up to 2021.

12.6 Mitigation Measures

No likely negative impacts have been identified for population, or land use, accordingly no mitigation measures are required.

The proposed development has been designed to avoid negative impacts in relation to local amenities and recreational facilities by:

- Incorporating the provision of a creche within the design proposal;
- Providing direct access to the proposed primary school located within the EIAR study area;
- Incorporating extensive leisure and amenity facilities within the layout, including c. 4.4 hectares of parkland; various other park/parklet areas, play areas and extensive provision for walking and cycling throughout the development, including the extension of the Ballybrack Greenway through the site.

Accordingly, no further mitigation measures are required.

Potential negative impacts have been identified related to Health & Safety during the construction process, mitigation measures are proposed in section 12.6.2. No significant risks to Human Health have been identified within this discipline in relation to the operational phase of the development. Accordingly, no further mitigation measures are required.

12.6.1 Health and Safety Mitigation

In relation to the pre-construction and construction phases, health and safety risks will be managed in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013.

The design of the proposed development will be subject to safety design reviews to ensure that all requirements of the project are safe. A Project Supervisor for the Design Process (PSDP) has been appointed as part of this process. Where issues are identified, corrective actions will be implemented to amend design issues prior to the issuance of final design for construction.

During the construction phase, safety will be a primary concern. A Project Supervisor for the Construction Process (PSCP), will be appointed to oversee site safety. A contractor safety management programme will be implemented identifying potential hazards¹¹ associated with the proposed works. Temporary contractor facilities and areas under construction will be fenced off from the public with adequate warning signs of the risks associated with entry to these facilities. Entry to these areas will be restricted and they will be kept secure when construction is not taking place. Measures to ensure public safety, with respect to construction traffic will be included in the final Traffic Management Plan, to be agreed with the Planning Authority prior to commencement of development.

¹¹ A 'hazard' is defined by the Health and Safety Authority as 'potential source of harm or adverse health effect on a person or persons'. Source <http://www.hsa.ie/eng/Topics/Hazards/>

12.7 Monitoring

Measures to avoid negative impacts on Population and Human Health have been integrated in to the design and layout of the proposed development. Compliance with the proposed design and layout will be a condition of any permitted development. Monitoring will be undertaken by the Building Regulations certification process and by the requirements of specific conditions of a planning permission.

Monitoring of compliance with Health & Safety requirements will be undertaken by the PSCP.

Table 12.11 Summary of mitigation & monitoring measures for Population & Human Health

Nature of Effect	Impact	Mitigation	Monitoring
Local Amenity	- Demand for childcare and school places.	- Avoidance of impact through provision of creche and provision of primary school (ref. 185369 / ABP ref. 302924-18).	- Building Regulation Certification. - Compliance with Planning Conditions.
Local Amenity	- Demand for Community and Recreational Facilities	- Avoidance of impact through provision of on-site recreation and amenity facilities.	- Building Regulation Certification. - Compliance with Planning Conditions.
Health & Safety During construction process	- Possible Moderate to significant negative impact	- Compliance with Safety, Health & Welfare at Work Regulations. - Appointment of PSDP for design stage and PSCP for construction stage.	- PSCP will be responsible for ensuring compliance with mitigation requirements.

12.8 Residual Impacts

The proposed mitigation measures will either avoid, prevent or reduce impacts on the human environment during the construction and operational phases of the proposed development. Residual impacts are those which remain following the implementation of the proposed mitigation measures.

It is considered that there will be a moderate negative permanent residual impact on local amenity due to the change of land use and the removal of passive views of the open agricultural land from adjacent properties and roadways. The land will have an urban character, rather than agricultural. However, this change is in context with the specific zoning of the site for residential development and the impact is considered acceptable when balanced with the other positive impacts on amenity, such as the provision of active public amenity spaces and the extension of the greenway through the development.

12.9 References

12.9.1 Documents

Ballincollig-Carrigaline Municipal District Local Area Plan 2017, Cork County Council

Cork County Development Plan 2014, Cork County Council

Cork County Draft Landscape Strategy 2007, Cork County Council

The Provision of Schools and the Planning System - A Code of Practice for Planning Authorities (2008), The Department of Education and Science, and the Department of the Environment, Heritage and Local Government

12.9.2 Websites

Health and Safety Authority website - <http://www.hsa.ie/eng/Topics/Hazards/> (Accessed 04/12/2018)

Central Statistics Office (CSO) website www.cso.ie (Accessed 05/12/2018)

Department of Education and Sciences (DES) website www.education.ie (Accessed 20/02/2019)

Environmental Protection Agency website www.epa.ie/radiation/radonmap/ (Accessed 04/12/2018)

Tusla website www.tusla.ie/ (Accessed 20/02/2019)



Chapter 13

Interaction of Significant Impacts

13

CHAPTER 13 INTERACTION OF SIGNIFICANT IMPACTS

13.1 Introduction

The construction, operational and cumulative impacts of the proposed development have been assessed within each chapter of the EIAR. This chapter considers the significant interactions of impacts between each of the separate disciplines. Table 13.1 provides a matrix summarising potential significant interactions.

In practice many impacts have slight or subtle interactions with other disciplines. This chapter highlights those interactions which are considered to potentially be of a significant nature. Discussions of the nature and effect of the impact is primarily undertaken within each of the relevant chapters, while this chapter identifies the most important potential interactions.

13.2 Description of Significant Interactions

13.2.1 Landscape & Visual Impacts

Chapter 4, assesses the likely landscape character and visual impacts arising from the proposed development. The landscape chapter has identified the following potential significant interactions with other disciplines during the construction phase of the development.

- **Material Assets - Traffic & Transport:** Construction traffic and plant will be visible during the construction phase of the development, particularly in areas adjacent to the site boundary. Impacts will be temporary and will be mitigated by the provision of construction hoarding and fencing which will provide screening. No significant interactions have been identified during the operational phase of the development, as traffic movements will form part of the changed landscape character of the site.

- **Land and Soils:** Construction works associated with earthworks, including the temporary stockpiling of soils to be removed from the site will be visible during the construction phase of the development, particularly within areas adjacent to the site boundary. Impacts will be temporary and will be mitigated by the provision of construction hoarding and fencing which will provide screening, and the storage of stockpiled soil away from existing residential boundaries. No significant interactions have been identified during the operational phase of the development.

No significant interactions with other disciplines were identified during the operational phase of the development.

13.2.2 Material Assets - Traffic

Chapter 5, section A, assesses the likely traffic impacts arising from the proposed development. The following potential significant interactions with other disciplines have been identified:

- **Noise & Vibration:** The Noise and Vibration discipline (Chapter 9) has been prepared in close consultation with the traffic consultant. No significant negative impacts associated with operational traffic have been identified. For the construction phase, mitigation measures are proposed to avoid or reduce negative impacts associated with construction traffic by implementing best practice control measures for noise and vibration from construction sites, found within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites. With mitigation measures in place, construction impacts, including construction traffic, is considered to have a negative moderate and short-term impact on the surrounding environment.

- **Air Quality and Climate:** The Air Quality discipline (Chapter 10) has been prepared in close consultation with the traffic consultant. No significant interaction between traffic and air quality and climate was identified during the operational phase. During the construction phase there is a potential significant interaction due to dust that might be generated by construction vehicles using temporary haul roads. Chapter 10 details mitigation measures to limit the speed of construction vehicles using unpaved site road and to ensure any hard-surfaced roads will be swept to remove mud and aggregate. With mitigation measures in place, no significant interaction of impacts has been identified between construction traffic and the Air Quality & Climate discipline.

13.2.3 Material Assets - Infrastructure

Chapter 5, Section B, assesses the likely impacts arising from infrastructure, including the provision of a new foul water drainage system and new potable water infrastructure, both of which have the potential to have a significant impact in terms of the Water, and Population and Human Health Disciplines during the construction and operational phases of the development.

- **Water Discipline:** Poor construction processes or inadequate specifications for the foul water drainage system and potable water infrastructure have the potential to negatively impact on the quality of surrounding watercourses or groundwater. The Water Discipline (Chapter 7) has considered proposals for the new foul drainage and potable water infrastructure and did not identify any significant negative impacts, having assessed the design specifications for the proposed infrastructure and construction processes.

- **Population and Human Health:** Poor construction processes, or inadequate specifications for the foul water drainage system and potable water infrastructure have the potential to negatively impact on Human Health, if the quality of surrounding watercourses or groundwater were to be affected. However, as noted, the Water Discipline (Chapter 7) did not identify any significant negative impacts, having assessed the design specifications for the proposed infrastructure and construction processes.

13.2.4 Land and Soils

Chapter 5 assesses the likely impacts on land and soils arising from the proposed development. The following potential significant interactions with other disciplines have been identified:

- **Water:** Excavation and soil works (i.e. through site clearance, re-profiling etc.) during the construction stage have the potential to cause significant impact on the hydrology and hydrogeology of the site by increasing aquifer vulnerability, deposition of silt in streams, leakage of hydrocarbons, altering the surface water characteristics etc. Chapter 6 of the EIA assesses these impacts in detail, proposing adequate mitigation measures, which will avoid or mitigate these potential impacts. With the mitigation measures in place, no residual significant negative interaction of impacts is predicted.
- **Biodiversity:** Excavation and soil works (i.e. through site clearance, re-profiling etc.) during the construction stage have the potential to cause significant impact on the biodiversity of the site, for example through the generation of suspended solids, or windblown dust, which could negatively impact the watercourse habitat. The Construction Management Plan, outlined in draft in chapter 2, details mitigation measures to prevent windblown dust, and surface water runoff from stockpiles. Further mitigation measures are detailed in the Land and Soils discipline (Chapter 6) and a Dust Minimisation Plan is provided in Appendix 10.3 of the Air Quality and Climate discipline. With the mitigation measures in place, no residual significant negative interaction of impacts is predicted.
- **Air Quality & Climate:** The excavation and storage of earthworks during the construction phase of the development has the potential to cause significant impacts on the air quality of the immediate environs of the development, should dust nuisance arise. The Air Quality & Climate chapter includes a Dust Mitigation Plan to mitigate these potential impacts. With mitigation measures in place, no residual significant negative interaction of impacts is predicted.
- **Population and Human Health:** The storage of hazardous materials during the construction phase (fuels, paints, cleaning agents etc.) has the potential to contaminate soils and impact negatively on human health. The Land and Soils chapter has detailed mitigation measures to provide for safe storage of all hazardous materials on site during construction to mitigate these potential impacts. With mitigation measures in place no residual significant negative interaction of impacts is predicted.

13.2.5 Water

Chapter 7 assesses the likely hydrological and hydrogeological impacts arising from the proposed development. Potential significant interactions with Land and Soils; and Material Assets - Infrastructure have already been discussed.

The following additional potential significant interaction with another discipline has been identified:

- **Biodiversity:** Adverse water impacts associated with the Construction and Operational phases have the potential to interact negatively on biodiversity associated with the watercourses of the Moneygurney and Douglas streams. The Water Discipline (Chapter 7) has outlined a series of mitigation measures to avoid any contamination of watercourses and groundwater during the construction phase. With mitigation measures in place, no residual significant negative interaction of impacts is predicted.
- During the operational phase, there is potential for an interaction with the Biodiversity discipline should there be accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network. However, the Water discipline identified the potential negative impacts as being imperceptible and temporary. With mitigation measures in place no residual significant negative interaction of impacts is predicted.
- **Population and Human Health:** Contamination of water courses or the ground water (by either construction works, or operational effluent) has the potential to have a significant interaction with the Human Health Discipline. The Water Discipline (Chapter 7) has outlined a series of mitigation measures to avoid any contamination of watercourses and groundwater during the construction phase. With mitigation measures in place, no residual significant negative interaction of impacts is predicted.
- Having assessed the design specifications for the proposed infrastructure for the new foul drainage and potable water infrastructure, and with mitigation the Water Discipline did not identify any significant negative operational impacts, that might have a significant interaction with the Population and Human Health discipline.

13.2.6 Biodiversity

Chapter 8 assesses the likely impacts on biodiversity arising from the proposed development. Potential significant interaction with Land and Soils; and with Water have already been discussed. No additional potential significant interaction has been identified.

13.2.7 Cultural Heritage

Chapter 11 assesses the likely cultural heritage impacts arising from the proposed development. No significant interaction with other disciplines has been identified.

13.2.8 Population & Human Health

Risks to Human Health have been considered by each discipline of the EIA. Potential significant interaction with Land and Soils; and Water disciplines have already been discussed. No additional potential significant interaction has been identified.

Table 13.1 Matrix of potential Significant Interactions

Interaction	Landscape		Material Assets - Traffic & Transport		Material Assets - Infrastructure		Land & Soils		Water		Biodiversity		Noise & Vibration		Air Quality & Climate		Cultural Heritage		Population & Human Health		
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	
Landscape			✓	x	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Material Assets: Traffic & Transport							x	x	x	x	x	x	✓	x	✓	x	x	x	x	x	x
Material Assets: Infrastructure									✓	✓	x	x	x	x	x	x	x	x	✓	✓	
Land & Soils									✓	x	✓	x	x	x	✓	x	x	x	✓	x	
Water											✓	✓	x	x	x	x	x	x	✓	✓	
Biodiversity														x	x	x	x	x	x	x	
Noise & Vibration																x	x	x	x	x	
Air Quality & Climate																		x	x	x	
Cultural Heritage																				x	
Population & Human Health																					

Con.	Construction Phase
Op.	Operational Phase
✓	Potential Significant Interaction
x	No Significant Interaction



Chapter 14

Summary of Mitigation Measures

14

CHAPTER 14 SUMMARY OF MITIGATION MEASURES

14.1 Introduction

This EIAR is written in a grouped format, i.e. disciplines are considered by specialist consultants. One disadvantage with a grouped structure is that it may be more difficult to gain a comprehensive understanding of the full range of mitigation measures, as they are discussed in separate chapters.

To overcome this difficulty, this chapter provides a summary of all the identified mitigation measures discussed in the previous EIAR chapters.

14.2 Project Description

Chapter 2 details the project description, including proposed construction activities. The chapter details an outline Construction Management Plan (CMP), including measures to avoid, reduce or mitigate negative impacts that may arise from the construction phase of the development. The outline CMP includes measures on the following:

- Dust Minimisation Plan
- Waste Management Strategy
- Noise & Vibration Controls
- Sediment & Water Pollution Controls
- Outline Traffic Management Plan
 - Construction Access Arrangements
 - Anticipated Construction Traffic
 - Staff Travel Plan & Parking
 - Abnormal Load

The final CMP will be agreed with the Planning Authority prior to the commencement of construction activities on the site.

14.3 Alternatives

Chapter 3 details the alternatives considered during the design process of the proposed application. Several layouts and bridge design options were considered during the design process to avoid or minimise environmental impacts. Mitigation measures associated with the final design details are addressed within each relevant discipline of the EIAR.

14.4 Landscape

Chapter 4 considers the landscape impacts of the proposed development. It outlines the following measures to mitigate the identified impacts:

Avoidance Measures

The site selection process and alternatives considered is set out in Chapter 2 - Project Description and Chapter 3 - Alternatives Considered.

- Retention and protection of the existing mature woodland and greenways along the site boundary. Existing trees to be retained and protected will be protected during the construction stage in accordance with recommendations of the Arboricultural Assessment and the BS 5837:2012. Prior to commencement of construction, existing trees which are to be retained will be protected by erection of timber post and wire fence to BS 5837:2012 to ensure no works are carried out under reach of their canopies. Unstable trees should be removed under direction of the arborist.

- Avoidance of most elevated portion of land as a location for tallest development (apartment blocks)

Reduction Measures

- Location of taller residential apartment blocks at lower parts of the slope to reduce visibility.
- The Proposed Development will be fenced off during the construction phase to reduce the visual impact of the works
- Vehicles exiting site during the construction stage should be subject to wheel wash facilities or road sweepers shall be used in order to maintain clean roads;
- Any lighting used during the construction process should be kept to a minimum, providing for site safety only and shall be directed into the site and away from adjacent residential properties. Lighting shall be shielded to avoid light spill onto adjacent properties and roads;
- Disturbance of existing vegetation will be minimised where possible. Proposed planting will help integrating the Proposed Development into the surrounding landscape, provide screening where needed, reflect vegetation patterns of local habitats, and minimise the effect on the landscape character of the area;

Remediation Measures

- Enhancement of site tree cover by introduction of additional tree and woodland planting.
- Provide a permeable design by creating connections to other amenities, such as the Ballybrack Greenway and the proposed extension.

- Landscape works to be carried out as per associated Site Landscape Layout;
- Appropriate new native plant species to be used throughout the scheme;
- Landscape management and maintenance plan to be drawn up and approved of by qualified professional.
- Ensure that ongoing landscape maintenance and debris cleaning is carried out during the operational period within the site; and
- Ensure that ongoing maintenance and replacement of failing or failed plant material.

Six landscape typologies are incorporated within the design across the development site, each offering a distinct character, purpose and program. These character areas function as part of a site-wide landscape architectural framework, ensuring suitable screening, visual and aesthetic interest, recreation and integration of the Proposed Development into its adjoining environs. The 6 typologies are described in detail in the Green Infrastructure Landscape Strategy, included in this submission, and comprise the following

- Dubhghlaise Valley Nature Park;
- Homezones;
- Village Park;
- Castle Terrace Linear Park;
- Parklets; and
- Streetscapes.

The aim of the proposed landscape mitigation measures is to minimise the visual effects on identified receptors within the study area, in particular residential receptors. The landscape mitigation will complement the space by adding new landscape elements helping to integrate the Proposed Development into its existing environs over time. The overarching design intention is to propose open spaces designed to resemble the existing vegetative fabric of the site. These high value amenity spaces contain trails and walks that weave through the woodland and wildflower meadows offering contrast to the suburban grain that exists within typical residential developments.

14.5 Material Assets

The Material Assets chapter is divided into 2 sections

- Traffic and Transport
- Infrastructure - Utilities

The mitigation measures proposed for each section are as follows:

14.5A Traffic & Transport

Construction Phase

To minimise disruption to the local area, construction traffic volumes will be managed through the following measures:

- **Arrivals**
During peak hours, ancillary, maintenance and other site vehicle movements on the local road network will be discouraged. Daily construction programmes will be planned to minimise the number of disruptions to surrounding streets by staggering HGV movements to avoid any site queues. Only the minimum essential site parking has been provided. Construction staff will be prohibited from parking on adjacent public roads or residential neighbourhoods.
The Applicant will promote travel by sustainable modes of transport through the Construction Traffic Management Plan.
- **Hours of Work**
Construction operations on site will generally be between the hours of 07:00 and 18:00, Monday to Friday and 08:00 to 14:00 on Saturdays. The construction times will ensure construction traffic will have limited impact on the peak periods of 08:00-09:00 in the morning and 17:00-18:00 in the evening, as it is envisaged that staff will generally arrive to work before 08:00 in the morning and either leave before 17:00 or after 18:00 in the evening, to reduce any impact on the PM peak traffic.
- **Construction Traffic Management Plan**
As part of the construction works, an Outline Traffic Management Plan has been prepared (Section 2.6 - Chapter 2).
A detailed Construction Traffic Management Plan will be prepared by the contractor and agreed with Cork County Council, prior to the commencement of works.
- **Construction staff travel plan/onsite parking arrangements**
The Applicant will provide management of all site traffic movements and parking throughout the duration of the works. The access points will be secured for the duration of the development and safety signage erected on all fences and gates.
75 No. designated parking spaces will be within the site boundary.
The location of the designated parking area will be within the site boundary within the designated site compound No. 1 (As detailed in Figure 5A.8).

Operational Phase

- **Pedestrian/Cycle Facilities**
A 4m cycle path is to be provided running along the northern boundary of the site linking the Ballybrack Valley greenway to the future inter-urban route on the N28/M28.
- **Provision of Local Schools/Services**
The development proposals for the Castletreasure site include for the provisions of a creche facility and direct pedestrian routes to the proposed primary school adjacent to the site.

14.5B Infrastructure - Utilities

Construction Phase

The Material Assets - Infrastructure and Utilities discipline outlines the following mitigation measures during the construction phase of the proposed development:

- An outline "Construction Management Plan" is included in Chapter 2 of this EIAR which will be further developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the "Construction Management Plan".
- All new sewers will be laid in accordance with Irish Water standards, pressure-tested and CCTV surveyed to ascertain any possible defects.
- The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be removed off site to a licensed facility until a connection to the public foul drainage network has been established.
- The construction compound's potable water supply shall be protected from contamination by any construction activities or materials.
- The diversion of the existing 300mm watermain will be carried out in full consultation with Irish Water and connections to the existing watermain at each end of this diversion, and the permanent connection to serve the development, will be carried out under an agreed methodology and with full notification to existing Irish Water customers who will be affected by the short-term interruptions to water supply which will occur while making these connections.
- Where possible backup network supply to any services will be provided, should the need for relocation or diversion or existing services be required, otherwise relocation or diversion works will be planned to incur minimal impact, with users notified in advance of any works.
- Connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.
- The storm sewer network is designed to flow under public roads and open spaces to insure unimpeded access is available to the pipe network

(including hydrocarbon interceptors and silt traps) at all times to allow for monitoring and maintenance.

Operational Mitigation

The Material Assets - Infrastructure and Utilities discipline outlines the following mitigation measures during the operational phase of the proposed development:

- All new drainage lines (foul and surface water) will be pressure-tested and will be subject to a CCTV survey to identify any possible defects prior to being made operational.
- It is envisaged that the development will take place and be occupied on a phased basis (i.e. 4 No Phases) and therefore the downstream foul sewerage system (foul sewer network and wastewater treatment facility) will be loaded gradually and incrementally which corresponds to the intentions identified in the pre-connection enquiry submitted to Irish Water for the development.
- Water conservation methods such as the use of low flush toilets and low flow taps will be incorporated into dwellings to reduce water volumes and related treatment and abstraction costs of the development.

14.6 Land & Soils

Chapter 6 considers the impacts of the proposed development on Land & Soils discipline. It outlines the following measures to mitigate the identified impacts:

Construction Phase

An outline CMP is included in Section 2.4 of the EIAR. A project specific Construction Management Plan (PCMP) will be prepared and submitted to the planning authority prior to the commencement of development and will be maintained by the contractor during the construction phase. The PCMP will include a range of site specific measures which will include the following mitigation measures:

- Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development.
- At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas.
- Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter watercourses.
- Topsoil will be re-used where possible in gardens and park areas.
- Disturbed subsoil layers will be stabilised as soon as practicable. Therefore, backfilling of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping will all be carried out promptly.

- Stockpiles of excavated subsoil material will be protected for the duration of the works. Stockpiles of subsoil material will be located separately from topsoil stockpiles.
- Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site.
- Refueling and servicing of construction machinery will take place in a designated hardstanding area, remote from surface water inlets (when it is not possible to carry out such activities off-site).
- All hazardous materials will be stored within secondary containment designed to retain at least 110% of the storage contents. Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase of the project. Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the project.
- Designated stockpile areas for the temporary storage of topsoil, subsoils and rock material required for site use will be established in areas where the ground is flattest and well away (>20m) from surface water features and steep slopes.
- Phase 1 temporary storage of material acceptable for re-use surplus to on site requirements will be stockpiled until the completion of the Moneygurney Bridge is operational. The stockpile will be limited to a maximum height of 2.5m above existing ground levels. Stockpiles to be retained for a period greater than six months will be sown with a grass (a non-perennial ryegrass mix or sterile ryegrass) which will reduce the potential for weed germination. Topsoil stockpiles will be clearly signposted for easy identification and to avoid any inadvertent losses. stockpiles will have sediment control measures installed (as detailed in Section 2 - Construction Management Plan).
- A contaminated soils management plan will be in place in case unexpected materials are encountered during the excavation of subsoils (in particular existing areas of made ground TP011, BH7 and BH 8 (south of the Templegrove Apartments) and TP 14 and BH10 (east of the Irish Water Pump Station). This will include the detailed site assessment, soil segregation, storage, testing and if necessary, removal from site, of any suspect or contaminated material.

Operational Phase

No likely negative impacts on the Land & Soils discipline were identified during the operational phase of the development, therefore no mitigation measures are required.

14.7 Water

Chapter 7 considers the impacts of the proposed development on the Water discipline. It outlines the following measures to mitigate the identified impacts:

Construction Phase

- Mitigation measures will be implemented as part of a site-specific Construction Management Plan.
- A 20-m wide stream/river buffer (which will extend beyond all river woodlands) is proposed for surface water protection during construction.
- Where development occurs within 20m of a watercourse (i.e bridge works), or where there is insufficient space to achieve the desired 20m buffer (i.e extreme western portion of the site adjacent to Douglas Stream), additional mitigation measures will be put in place to ensure maximum protection of the stream or river, as outlined in Section 2.6 of Chapter 2 Project Description.

General Site: Works will be required to:

- Implement best practice construction methods and practices complying with relevant legislation to avoid or reduce the risk of contamination of watercourses or groundwater.
- A site-specific Construction Management Plan will be developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Construction and Environment Management Plan.
- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and treat sediment-laden runoff prior to discharge of surface water at a controlled rate.
- Weather conditions and seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations, with an objective of minimizing soil erosion.
- The extent of sub-soil and topsoil stripping to be minimised to reduce the rate and volume of the run-off during construction until the topsoil and vegetation are replaced.
- Precast concrete units fabricated off site will be specified for bridging structures with cast in-situ requirements minimised.
- Concrete batching will generally take place off site, or if carried out on site, in a designated area with an impermeable surface and appropriate drainage/interception/collection measures in place.
- Concrete wash down and wash out of concrete trucks will take place off site or in a designated area with an impermeable surface and appropriate drainage/interception/collection measures in place.
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds.

- Oil and fuel stored on site for construction will be stored in designated areas. These areas shall be bunded and should be located away from surface water drainage and features.
- Refuelling of construction machinery shall be undertaken in designated areas away from surface water drainage in order to minimise potential contamination of the water environment. Spill kits shall be kept in these areas in the event of spillages.
- Hazardous construction materials shall be stored appropriately to prevent contamination of watercourses or groundwater.
- Spill kits should be kept in designated areas for re-fuelling of construction machinery.
- Dewatering measures should only be employed where necessary and if such works are necessary an agreed Method Statement will be prepared to ensure full control of these works.

Bridge & Greenway Works

To minimise the impact of the construction phase on the water environment, mitigation measures will be implemented as part of a site-specific Construction and Environmental Management Plan.

The proposed bridge designs and construction method have been prepared in accordance with Inland Fisheries Ireland's "Guidelines on Protection of Fisheries During Construction Works In and Adjacent to Waters".

Bridge design avoids works within the watercourse and riverbanks. The Inland Fisheries Ireland's guidelines to achieve best practice will be observed during the construction phase and the following mitigation measures will be implemented.

- Best site management practice for the control of silt and solids discharge into the watercourse.
- Excavation must be properly monitored; all topsoil is to be stored at a safe distance from the excavation.
- Site clearance. All areas of vegetation removal will have appropriate surveys for wildlife/ecological purposes as outlined in the EIAR in accordance with and on approval of the IFI and NPWS. Any mitigation or control measures within the survey will be detailed in the contractor's detailed construction management plan prior to construction.
- Earthworks to allow construction of abutments will be carried out to reduce existing ground levels to formation/foundation levels. Soil heap locations to be detailed in the contractor's detailed construction management plan.
- Piling Setup for installation of piled foundations (to be confirmed at detailed design stage). Temporary access routes for piling rig to be agreed prior to construction and be detailed in the contractor's detailed construction management plan. Construction of hard standing and management of spoil arisings and runoff to be included as detailed in Section 2.4, Outline Construction Management Plan.

- Crane Setup for installation of main spans. Temporary access routes for craneage to be agreed prior to construction and be detailed in the contractor's detailed construction management plan. Construction of hard standing including foundations for crane outriggers need to be included.
- Prefabricated beams transportation. Delivery of precast elements to site. Storage area of precast elements to be defined in contractor's construction management plan within reach of crane to minimise further disruption/construction traffic at river edge.
- Placement of prefabricated bridge beams. Crane position to be designed to minimise movements near stream edge.

Operational Phase

Operational phase mitigation measures are detailed below:

- Surface water runoff from the site will be attenuated to the greenfield runoff rate as recommended in the Greater Dublin Strategic Drainage Study (GDSDS). Surface water discharge rates will be controlled by Hydrobrake flow control devices, with underground attenuation tanks, provided to store runoff from a 1 in 100 year return period event. SuDS features such as the use of permeable paving are implemented in the surface water drainage network to reduce the rate of runoff from hard standing area and to improve the quality of surface water runoff.
- Surface water runoff from the development will be collected by an appropriately designed system with contaminants removed prior to discharge i.e. petrol interceptor.
- A regular maintenance and inspection programme of the flow control devices, attenuation storage facilities, gullies and petrol interceptor will be required during the Operational Phase to ensure the proper working of the development's networks and discharges.
- A regular maintenance and inspection programme for the bridge structures (main and pedestrian bridges) will be required during the Operational Phase to ensure the proper working of the development's infrastructure.

14.8 Biodiversity

Chapter 8 considers the impacts of the proposed development on the Biodiversity discipline. It outlines the following measures to mitigate the identified impacts:

Mitigation

Designated Nature Conservation Sites

No particular mitigation measures are required in relation to designated nature conservation sites during the construction and operational phases.

Habitats & Flora

Construction Phase

- No removal of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff. Other than the two bridge crossings of Moneygurney Stream and the western portion of the site closest to Douglas Stream, a buffer zone of 20m will be maintained between the works area and both streams. Designated temporary storage areas for any excavated spoil will be at least 25m away from the Douglas and Moneygurney Streams.
- As per the proposed Landscape Masterplan (see Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application), new landscaping will take existing native tree/shrub species representative of the study site and soil conditions as well as non-native pollinator friendly species into account (see NBDC 2016), and also ensure that new planting connects to woody habitat/other vegetation in order to maintain and provide connectivity for fauna via wildlife corridors.
- Existing trees being retained at/near the site will be protected in line with current guidelines (e.g. NRA 2006a).
- A pre-works (including enabling, clearance or other construction related activities) survey for native Penny Royal will be undertaken by a suitably qualified/experienced ecologist at potentially suitable locations at the study site, during the optimum flowering survey period (August to September inclusive). Any areas where native Penny Royal are noted will be cordoned off in the field to allow easy identification for all site staff and thereby ensure protection from inappropriate disturbance/loss (e.g. erect a notice and hazard tape). A translocation management plan will then be drawn up and implemented by a suitably qualified/experienced ecologist in accordance with best practice guidelines and in consultation with NPWS where relevant (e.g. translocation licence) using suitable receptor areas within the study site where possible.

Operational Phase

- No particular mitigation measures are required in relation to Habitats & Flora during the operational phase.

Aquatic Ecology**Construction Phase**

- To minimise the impact of the construction phase on the water environment, soils and water management measures will be implemented (see Chapters 2, 6 & 7 of this EIAR). This includes measures relating to the storage and management of potentially polluting substances (e.g. chemicals, hydrocarbons, cement, hydraulic fluid and cleaning agents).
- In advance of all site clearance and soil stripping, a siltation management plan will be prepared and implemented in full. This will include silt fences and settlement ponds that are sized and positioned in order to minimise pollution escapement and maximise attenuation efficiency. The performance of such devices will be reviewed and upgraded as appropriate by suitably qualified staff. The construction footprint will be fenced to prevent ingress of machinery within 20m of watercourses with the exception of areas for bridging construction works or unavoidable 'pinch points' (e.g. western portion of the site closest to Douglas Stream). The zone between the fence and river will not be interfered with, as adjoining woodland and riparian habitats are critical for aquatic ecosystem health.
- All temporary crossings constructed will be agreed with Inland Fisheries Ireland to ensure appropriate culvert size, burial depth, width etc. This will reduce the potential for solids to enter watercourses and facilitate fish passage. Silt fences and other control measures will tie into temporary crossings to prevent 'weak points' where silt laden water can enter the adjoining streams.
- The suspended solids control measures will follow best practice guidance: (i) Technical Guidance C532: Control of Water Pollution from Construction Sites (CIRIA 2001); (ii) Technical Guidance C648: Control of Water Pollution from Linear Construction Projects (CIRIA 2006) and (iii) Guidelines for the protection of Fish during construction works in and adjacent to waters (IFI 2016).
- The suspended solids levels will aim to remain below 25mg/l as per the Guidelines on Protection of Fisheries during construction works in and adjacent to waters (IFI 2016). The same guidance also specifies that there will be no deposition of silts resulting from construction works on the gravels of the receiving watercourses.
- Significant works/earthworks near water will not take place if storm rainfall events are predicted (e.g. >10mm/hr, >25mm in a 24hour period) as heavy rain will significantly increase the risk of suspended solids escapement to the adjoining stream habitats.

- Concrete pouring will be undertaken in the dry and away from surface-water pathways. Ready mix trucks will not be washed on site. *In-situ* mixing will use faster setting concrete. When using *in-situ* concrete near watercourses an approach will be agreed with IFI as it presents a risk to fish and invertebrates should residues enter the receiving watercourses (i.e. Douglas, Moneygurnery & Ballybrack Streams here).
- All structural/bridge designs adjacent to/within watercourses (including method of construction and proposed mitigation measures to prevent damage to riparian habitats and instream fisheries habitat) will be agreed with Inland Fisheries Ireland to minimise impacts to the riverbed, riparian zone and fish. In such an approach the design of such structures will not encourage downstream erosion or deposition, as such hydrological impacts to the channel will not occur and instream works will be avoided as the channel widths in this case are small.
- Instream works will only take place between July and September (IFI 2016, p. 16). However, the precise allowable timing of instream works can vary between regions and will be agreed with IFI in advance of construction commencement.
- An ecological clerk of works (ECoW) will be present during all bridge crossing construction, but also for culvert/outfall headwall construction near watercourses or indeed any works potentially presenting a serious risk to water quality.
- An emergency response plan will be prepared to ensure accidental or intentional spillages (e.g. security breach) of chemicals can be dealt with to minimise harm to the environment. This will include suitably trained and qualified personnel, the availability of spill kits and suitable means of disposal.

Operational Phase

- Operational phase mitigation for aquatic ecology will broadly follow measures stipulated in Chapter 7 of this EIAR (which should be read in conjunction with this chapter). The mitigation measures include surface water runoff at greenfield rates using adequately sized attenuation facilities etc. for storm runoff and attenuation of the collected runoff. This includes the use of integrated silt traps and petrol interceptors. These structures will be inspected and maintained. Maintenance will prevent the excessive build-up of sludge that can be removed to reduce the risk of pollution during storm rainfall events (particularly after dry periods). A maintenance plan and schedule will therefore be developed for silt traps and hydrocarbon interceptors to prevent impacts to the receiving stream habitats due to operational failures.

Fauna: Birds, Mammals (non-volant), Bats & Other Taxa**Construction Phase**

- Subject to other environmental concerns (e.g. soil and water management), and as far as it is reasonable, the removal of woody vegetation (hedgerow, treeline/trees, scrub & woodland) will not be undertaken during the bird breeding season (currently defined by the Irish Wildlife Acts 1976 - 2018 as March 1st to August 31st inclusive); this will protect nesting birds and eggs/chicks from disturbance (especially through nest failure), injury, fatality.
- In tandem with study site clearance (as part of enabling, construction or other associated works), a suitably qualified/experienced ecologist will supervise/check areas where hedgerow, treeline, scrub & woodland removal is due to identify potential unforeseen wildlife issues (e.g. unknown badger sett, Harlequin Ladybird *Harmonia axyridis* infestation) so that appropriate measures can be undertaken in accordance with best practice guidelines and in consultation with NPWS where relevant (e.g. derogation licence for removal or works in the vicinity of a Badger sett; see NRA 2005a).
- Where a fauna species is found actively using the development footprint for breeding/resting (e.g. bird nest, bat roost, Badger sett) during study site clearance/construction phase, relevant works will cease immediately, and the area will be cordoned off until advice is sought from a suitably qualified/experienced ecologist.
- To minimise disturbance to fauna that are roosting/resting or active at night, construction operations during the hours of darkness will be kept to a minimum.
- Where open excavations must be left in-situ overnight, measures will be taken to ensure that mammals do not become inadvertently trapped and potentially injured within such open excavations. Such measures (covering, fencing off, allowing access/egress) will be decided under the advice of a suitably qualified/experienced ecologist at construction stage.
- Trees due for felling will be assessed in advance by a suitably qualified/experienced ecologist in accordance with best practice guidelines (e.g. BTHK 2018) to identify tree specimens with potential to support bat roosts, all of which will be marked in the field to allow easy identification for all site staff and thereby ensure protection from inappropriate felling (e.g. erect a notice as per NRA 2005b). The subsequent felling of all trees with potential to support bat roosts will be undertaken under the advice/supervision of a suitably qualified/experienced ecologist in accordance with best practice guidelines (e.g. NRA 2005b) and in consultation with NPWS where relevant (e.g. derogation licence to remove bat tree roost; see NRA 2005b).
- At least one month prior to the commencement of construction related works (as part of enabling, construction or other associated works) a minimum of twenty woodcrete (or equivalent) bat roosting boxes will be erected on suitable trees of woodland being retained that is associated with Douglas and Moneygurney Streams at the study site. The box type(s), location and installation of the bat boxes will be undertaken under the advice/supervision of a suitably qualified/experienced ecologist in accordance with best practice guidelines (e.g. Aughney 2008, NRA 2006b).

- All bat boxes installed will be monitored every two years post-installation by a suitably qualified/experienced ecologist to check for usage and to conduct maintenance as appropriate in accordance with best practice guidelines (e.g. Aughney 2008) and under NPWS derogation licence (which will be in place prior to monitoring). Usage of the boxes by bats will be reported to Bat Conservation Ireland and NPWS. As the overall development will take c. 4-5 years, post-installation bat box monitoring will be relevant to the construction phase.
- The study site will not be floodlit during the construction phase; instead all lighting systems will be designed to minimise light spillage nuisance by using shielded, downward directed lighting wherever possible and switching off all non-essential lighting during the hours of darkness. This will benefit bats as well as other fauna generally active at night (see Public Lighting Report, C874-OCSC-XX-XX-RP-E-0001-S8-P01, by OCSC accompanying the planning application).
- As per the proposed Landscape Masterplan (see Sheet Number 60577778-SHT-20-0000-L-1001 by AECOM accompanying the planning application), landscaping will include Hazel *Corylus avellana* as part of the native woodland planting mix to allow a year-round food supply for Red Squirrel of the wider area that may use the existing on-site wet woodland riparian corridors of the Douglas and Moneygurney Streams. As per the Landscape Masterplan, new landscaping will take existing native tree/shrub species representative of the study site and soil conditions as well as non-native pollinator friendly species into account (see NBDC 2016), and also ensure that new planting connects to woody habitat/other vegetation in order to maintain and provide connectivity for fauna via wildlife corridors.

Operational Phase

- Until the development is taken in charge by the Local Authority, the developer will be responsible for ensuring that all bat boxes installed will be monitored every two years post-installation by a suitably qualified/experienced ecologist, to check for usage and to conduct maintenance as appropriate in accordance with best practice guidelines (e.g. Aughney 2008) and under NPWS derogation licence (which will be in place prior to monitoring). Usage of the boxes by bats will be reported to Bat Conservation Ireland and NPWS. After the development is taken in charge, monitoring procedures for the bat boxes will become the responsibility of the Local Authority.
- As per the proposed lighting design plan (see Public Lighting Report, C874-OCSC-XX-XX-RP-E-0001-S8-P01, by OCSC accompanying the planning application), the operational phase lighting scheme will be designed to minimise light spillage nuisance on retained/new wildlife corridors by using shielded, downward directed lighting wherever possible, switching off all non-essential lighting during the hours of darkness, using narrow spectrum lighting types with no UV and luminaire accessories (shield, louvre). This will benefit bats as well as other fauna active/resting at night.

Monitoring

Construction Phase Monitoring

A suitably qualified/experienced ecologist will be engaged in the role of Ecological Clerk of Works (ECoW) for the construction phase of the project, whose role will include the following monitoring in relation to relevant proposed mitigation measures (as outlined in Section 8.6) and liaising with relevant experts/team-members where required;

- Adherence to the proposed 20m buffer zone between the works area and both Douglas and Moneygurney Streams and proposed distances of at least 25m between designated temporary storage areas for any excavated spoil and both streams.
- Review new landscaping to ensure it is in line with/equivalent to proposed mitigation regarding native tree/shrub species, non-native pollinator friendly species and wildlife corridor connectivity.
- Ensure that retained trees are adequately protected.
- Ensure that the pre-works survey for native Penny Royal is undertaken with subsequent protection and translocation where relevant.
- The site-specific Construction Management Plan will incorporate mitigation measures as outlined in Chapter 2 of this EIAR, which will include monitoring of construction related activities during the construction phase. The ECoW will monitor water quality during critical stages of the construction schedule including soil stripping and works adjacent to watercourses. It is recommended that suspended solids and turbidity at a minimum are monitored at these stages. Visual checks of the riverbed of the Moneygurney and Ballybrack Streams should also be undertaken to ensure suspended solids are not impacting stream gravels for spawning brown trout. These should be undertaken along the works boundary but also upstream and downstream.
- Ensure that areas where hedgerow, treeline, scrub & woodland removal is due are checked for unforeseen wildlife issues (e.g. unknown badger sett) with appropriate follow-up actions where required.
- Ensure that a pre-felling tree survey is undertaken to identify tree specimens with potential to support bat roosts, with subsequent protection and appropriate follow-up actions where required.
- Ensure that at least twenty woodcrete (or equivalent) bat roosting boxes are appropriately installed on suitable trees at retained woodland associated with Douglas and Moneygurney Streams at least one month prior to the commencement of construction related works. Also ensure adherence to post-installation monitoring requirements.
- Review construction/operational phase lighting plan to ensure minimal light spillage nuisance on retained/new wildlife corridors.

Operational Phase Monitoring

The following proposed monitoring items as outlined in Chapter 7 of this EIAR regarding the water and hydrogeological environment during the operational phase will have associated benefits for aquatic biota:

- The taking in charge of the water infrastructure will ensure the system is regularly inspected and maintained (see Chapter 7 of this EIAR).
- The performance of all SuDS features will be monitored by the relevant authorities during the life of the development (see Chapter 7 of this EIAR).
- Monitoring of the installed Hydrobrake and gullies will be required to prevent contamination and increased runoff from the site (see Chapter 7 of this EIAR).

The monitoring of bat boxes by a suitably qualified/experienced ecologist installed during the construction phase will also be relevant to the operational phase monitoring; as outlined in Section 8.6.4.2 (mitigation), monitoring will be undertaken every two years post-installation to check for usage and to conduct maintenance as appropriate in accordance with best practice guidelines (e.g. Aughney 2008) and under NPWS derogation licence (which will be in place prior to monitoring). Usage of the boxes by bats will be reported to Bat Conservation Ireland and NPWS. The developer will be responsible for this until the development is taken in charge by the Local Authority, after which this will become the responsibility of the Local Authority.

14.9 Noise & Vibration

Chapter 9 considers the impacts of the proposed development on the Noise & Vibration discipline. It outlines the following measures to mitigate the identified impacts:

Construction Phase - Noise

The following best practice measures set out BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Parts 1 and 2 will be implemented during the construction phase:

- selection of quiet plant;
- noise control at source;
- screening;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

Selection of Quiet Plant

- This practice is recommended in relation to static plants such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise Control at Source

- If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

Referring to the potential noise generating sources for the works under consideration, the following best practice mitigation measures should be considered:

- Site compounds will be located in excess of 30m from noise sensitive receptors within the site constraints. The use lifting bulky items, dropping and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling.
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Piling

- Piling programmes should be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working programme should be phased so as to prevent unacceptable disturbance at any time.
- During consultation the planner, developer, architect and engineer, as well as the local authority, should be made aware of the proposed method of working of the piling contractor. The piling contractor should in turn have evaluated any practicable and more acceptable alternatives that would economically achieve, in the given ground conditions, equivalent structural results.
- On typical piling sites the major sources of noise are essentially mobile and the noise received at any control points will therefore vary from day to day as work proceeds. The duration of piling works is estimated to be of the order of 4.5 to 6 weeks which is relatively short in relation to the length of construction work as a whole, and the amount of time spent working near to noise sensitive areas can represent only a part of the piling period.
- Noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- Screening by barriers and hoardings is less effective than total enclosure but can be a useful adjunct to other noise control measures. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken in location, having due regard also for access routes. When appropriate, screens or enclosures should be provided for such equipment.
- Contributions to the total site noise can also be anticipated from mobile ancillary equipment, such as handling cranes, dumpers, front end loaders etc. These machines may only have to work intermittently, and when safety permits, their engines should be switched off (or during short breaks from duty reduced to idling speed) when not in use.

Screening

- Construction site hoarding will be constructed around the site boundaries as standard. The hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m² to provide adequate sound insulation.
- In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

Liaison with the Public

- A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Monitoring

- Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.
- Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics - Description, measurement and assessment of environmental noise*.

Project Programme

- The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ piling or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Construction Phase - Vibration

- The vibration from construction activities will be limited to the values set out in Section 9.2. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Limit values have been provided for soundly constructed residential and commercial properties.

Operational Phase

No likely negative impacts on the Noise & Vibration discipline were identified during the operational phase of the development, therefore no mitigation measures are required.

14.10 Air Quality & Climate

Chapter 10 considers the impacts of the proposed development on the Air Quality & Climate discipline. It outlines the following measures to mitigate the identified impacts:

Construction Stage

A dust management plan will be in place for the construction phase of the development. Full details of the dust management plan can be found in Appendix 10.3 The key aspects of controlling dust are:

- The specification and circulation of a dust management plan for the site and the identification of persons responsible for managing dust control and any potential issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust management plan can be monitored and assessed;
- The specification of effective measures to deal with any complaints received.
- At all times, the procedures within the plan will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

- On-site or delivery vehicles will be prevented from leaving engines idling, even over short periods.
- All efforts will be made to minimising waste of materials due to poor timing, or over ordering on site.

Operational Stage

No likely negative impacts on the Air Quality & Climate discipline were identified during the operational phase of the development, therefore no mitigation measures are required

14.11 Cultural Heritage

Chapter 11 considers the impacts of the proposed development on the Cultural Heritage discipline. It outlines the following measures to mitigate the identified impacts:

Archaeology

- A programme of archaeological investigations, to comprise a geophysical survey of undisturbed greenfield areas followed by targeted archaeological test trenching, will be undertaken prior to the commencement of the construction phase.
- A wading survey and metal-detecting survey of the sections of the northern stream to be crossed by an access road bridge and a pedestrian bridge will be undertaken in conjunction with the test trench excavations.
- These archaeological investigations will be carried out under licences issued by the National Monuments Service. Method statements detailing the proposed strategy for all pre-construction site investigations will be submitted for approval to the National Monuments Service as part of the licence applications.
- A report will be compiled on all site investigations which will clearly present the results in written, drawn and photographic formats. Copies of these reports will be submitted to the National Monuments Service, Cork County Council and the National Museum of Ireland.
- In the event that any sub-surface archaeological deposits, features or artefacts are identified during site investigations the Planning Authority and the National Monuments Service will be consulted to determine further appropriate mitigation measures.

Architectural Heritage

There are no Protected Structures or NIAH listed structures, or extant structures of any date, located within the study area. There are also no designated architectural heritage structures located within 500m of its boundary and the surrounding built environment is modern in date. It is, therefore, concluded that no mitigation measures, or monitoring measures thereof, for the architectural heritage resource are required.

Undesignated Cultural Heritage Features

- A small stream extending through the northern end of the study area forms the townland boundary between Castletreasure and Moneygurney. The two sections of this watercourse to be impacted by the proposed access road bridge and pedestrian bridge will be investigated as part of the archaeological mitigation measures.

14.12 Population and Human Health

Chapter 12 considers the impacts of the proposed development on the Population and Human Health discipline. No likely negative impacts have been identified for population, or land use, accordingly no mitigation measures are required.

In respect of human health, the following measures have been incorporated in the design to avoid negative impacts in relation to local amenities and recreational facilities by:

- Incorporating the provision of a creche within the design proposal;
- Providing direct access to the proposed primary school located within the EIAR study area;
- Incorporating extensive leisure and amenity facilities within the layout, including c. 4.4 hectares of parkland; various other park/parklet areas, play areas and extensive provision for walking and cycling throughout the development, including the extension of the Ballybrack Greenway through the site.

Health and Safety Mitigation

- Health and safety risks during the pre-construction and construction phases will be managed in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013.
- The design of the proposed development will be subject to safety design reviews to ensure that all requirements of the project are safe. A Project Supervisor for the Design Process (PSDP) has been appointed as part of this process. Where issues are identified, corrective actions will be implemented to amend design issues prior to the issuance of final design for construction.
- During the construction phase a Project Supervisor for the Construction Process (PSCP), will be appointed to oversee site safety. A contractor safety management programme will be implemented identifying potential hazards associated with the proposed works. Temporary contractor facilities and areas under construction will be fenced off from the public with adequate warning signs of the risks associated with entry to these facilities. Entry to these areas will be restricted and they will be kept secure when construction is not taking place.
- Measures to ensure public safety, with respect to construction traffic, will be included in the final Traffic Management Plan, to be agreed with the Planning Authority prior to commencement of development.

No significant risks to Human Health have been identified within this discipline in relation to the operational phase of the development. Accordingly, no further mitigation measures are required to address Human Health impacts.

14.13 Significant Interaction of Impacts

No significant residual interaction of impacts has been identified, when taking account of mitigation measures proposed by each discipline. Accordingly, no further mitigation measures are required to address potential significant interaction of impacts.