Carrickmines-Shanganagh River Flood Relief Scheme

EIAR – Volume 2 Main Report

Final Report

February 2025

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This report relates to the Carrickmines-Shanganagh River Flood Relief Scheme commissioned by Dún Laoghaire-Rathdown County Council (DLRCC), on behalf of the Office of Public Works (OPW). Conor O'Neill and Bernadette O'Connell of JBA Consulting compiled this report, which was prepared by the competent experts listed in Table 1-1 of Chapter 1.

Purpose

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Abbreviations

AA	Appropriate Assessment
AEP	Annual Exceedance Probability
CDP	County Development Plan
CEMP	Construction Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
COF	Confirmation of Feasibility
DAU	Development Applications Unit
DEHLG	Department of Environment, Heritage and Local Government
DLR	Dún Laoghaire-Rathdown
DLRCC	Dún Laoghaire-Rathdown County Council
DTM	Digital Terrain Model
ECFRAM	Eastern Catchment Flood Risk Assessment and Management
EHS	Environmental Health Service
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EU	European Union
FRM	Flood Risk Management
FRS	Flood Relief Scheme
GDSDS	Greater Dublin Strategic Drainage Study
GHS	Geological Heritage Site
GIS	Geographic Information System
GSI	Geological Survey Ireland
HSE	Health Service Executive
IFI	Inland Fisheries Ireland
LAWPRO	Local Authorities Water Programme
LVIA	Landscape and Visual Impact Assessment
MCA	Multi-Criteria Assessment
NBS	Nature-Based Solutions
NEHS	National Environmental Health Service
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NML	Noise Monitoring Location
NMS	National Monuments Service
NPF	National Planning Framework
NPWS	National Parks and Wildlife Service
NSOs	National Strategic Outcomes
NTS	Non-Technical Summary
OPW	Office of Public Works
PCD	Public Consultation Day
PCE	Pre-Connection Enquiry
PE	Population Equivalent

pNHA	Proposed Natural Heritage Area
QI	Qualifying Interest
RBMP	River Basin Management Plan
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SAC	Special Areas of Conservation
SDZ	Strategic Development Zone
SFRA	Strategic Flood Risk Assessment
SoP	Standard of Protection
SPA	Special Protection Areas
SW	Surface Water
SWAN	Sustainable Water Network Ireland
TBM	Tunnel Boring Machine
TII	Transport Infrastructure Ireland
TTA	Traffic and Transport Assessment
UAIA	Underwater Archaeological Impact Assessment
UWWTP	Urban Wastewater Treatment Plant
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant
ZoI	Zone of Influence

1 Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared on behalf of Dún Laoghaire-Rathdown County Council (DLRCC) and the Office of Public Works (OPW) in relation to a proposed Flood Relief Scheme (FRS) on the Carrickmines-Shanganagh River, in the vicinity of Sandyford, Leopardstown, Loughlinstown, and Shankill.

DLRCC intends to apply for planning permission for a Flood Relief Scheme along the Carrickmines-Shanganagh River. The proposed development comprises a flood relief scheme to minimise the risks currently posed to people, the community, social amenity, environment, and landscape. The terms *proposed development* and *proposed scheme* are used interchangeably in this EIAR to refer to the Carrickmines-Shanganagh River Flood Relief Scheme.

1.1 Location and Context

The Carrickmines-Shanganagh River originates in the Dublin mountains near Kilternan village. It flows in a southeasterly direction through Sandyford, Leopardstown, Loughlinstown, and Shankill before eventually discharging into the Irish Sea at Killiney Bay.

The catchment is approximately 36km^2 and encompasses a wide variety of land uses ranging from rural mountainous areas in the west, to urban residential areas in the east. Several tributaries flow into the Carrickmines-Shanganagh River, the most significant being the Brides Glen River, the Kilgobbin Stream, and the Ballyogan Stream.

The area is heavily developed, with numerous residential estates, commercial and employment centres, and the M50, N11, and Dublin-Bray railway line all present.

There is a history of fluvial flooding in the catchment at various locations, the most recent significant flood event occurring in October 2011. Areas such as Commons Road in Shankill, Glenamuck Road in Carrickmines as well as the M50 and N11 roads, critical transport routes, have been frequently impacted by fluvial flooding from the river system. In response to this flood history the area has undergone multiple flood studies. The largest and most important studies being the Greater Dublin Strategic Drainage Study (GDSDS) and the Eastern Catchment Flood Risk Assessment and Management (ECFRAM) Study. These two studies examined the catchment from a stormwater drainage capacity and fluvial flooding perspectives respectively.

1.2 Purpose of this Report

The Environmental Impact Assessment Directive (Directive 2011/92/EU, amended by Directive 2014/52/EU, hereafter the 'EIA Directive') requires that, before development consent is given, projects likely to have effects on the environment by virtue of their nature, size or location are made subject to a requirement for development consent and an assessment of their effects on the environment. This is referred to as an 'Environmental Impact Assessment' (EIA). Where an EIA is required, the developer must prepare an EIAR, and the EIA Directive sets out minimum information which the EIAR must include.

Schedule 5 of the Planning and Development Regulations 2001 (as amended, hereafter the 2001 Regulations') set out a wide range of development categories with associated thresholds for which an EIA is required.

Part 2 of Schedule 5 of the Planning and Development Regulations 2001, as amended, includes:

10. Infrastructure projects

(f) (ii) Canalisation and flood relief works, where the immediate contributing sub-catchment of the proposed works (i.e., the difference between the contributing catchments at the upper

> and lower extent of the works) would exceed 100 hectares or where more than 2 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 kilometres.

This category contains three thresholds; if any of these thresholds are exceeded, the proposed development must undergo a mandatory EIAR. As such, they will be addressed in turn.

> "where the immediate contributing sub-catchment of the proposed works (i.e., the difference between the contributing catchments at the upper and lower extent of the works) would exceed 100 hectares".

Works are proposed mainly on the Carrickmines and Ballyogan rivers: an upstream area affecting those two rivers, around Woodside and Kilgobbin neighbourhoods; and the Cherrywood and Hackettsland areas surrounding Shanganagh downstream. These rivers are fed by the immediate sub-catchments shown on Figure 1.1, which together are approx. 139 hectares. The scheme therefore exceeds the 100-hectare threshold.

> "where more than 2 hectares of wetland would be affected"

The project ecological team has undertaken a Fossitt habitat survey of the scheme area and defined the habitats in the areas to be affected. The survey results (detailed further in Chapter 8) note that 0.56 hectares of wetland are likely to be impacted during construction. The scheme is therefore under the 2-hectare wetland threshold.

> "where the length of river channel on which works are proposed would be greater than 2 kilometres"

The proposed works include measures in key areas of the scheme including Clon Brugh, Kilgobbin Road, Glenamuck Road, Cherrywood Road, Lower Brides Glen, the N11, Commons Road, and Bray Road. The river sections affected by the FRS were calculated by measuring the lengths of river reaches that will be impacted. The total length of river channel affected is 2.06 km. The scheme is therefore above the 2km threshold.

The proposed flood relief scheme exceeds the threshold limits set out in 10(f)(ii) as described above. The immediate contributing sub-catchment is above 100 hectares, and the length of river channel on which works are proposed is greater than 2km. Therefore, an EIAR has been automatically triggered for the proposed development.

1.3 EIAR Scoping

The purpose of scoping is to identify what information should be contained in an EIAR and what methods should be used to gather and assess that information. It should provide focus for the EIAR and ensure that all relevant issues are identified and addressed in the EIAR.

The document 'Environmental Impact Assessment of Projects Guidance on Scoping' (European Commission, 2017) outlines that although scoping can be considered as a discrete stage in the EIA process, one which ends with the issuing of the terms of reference for the EIA Report, the activity of scoping should continue throughout, so that the scope of work can be amended in light of new information. The scope of an EIA Report must be flexible enough to allow new issues, which may emerge either during the process or as a result of design changes or through consultations, to be incorporated.

An EIAR Scoping Report was prepared for the proposed development. The Scoping Report was shared with a list of statutory and non-statutory consultees for comment as part of the informal scoping. The Scoping Report outlined the proposed methodology of each chapter of the EIAR, provided a preliminary description of the baseline environment, and the potential impacts for each chapter. Formal Scoping, whereby a Scoping Opinion is sought from An Bord Pleanála, was not carried out.

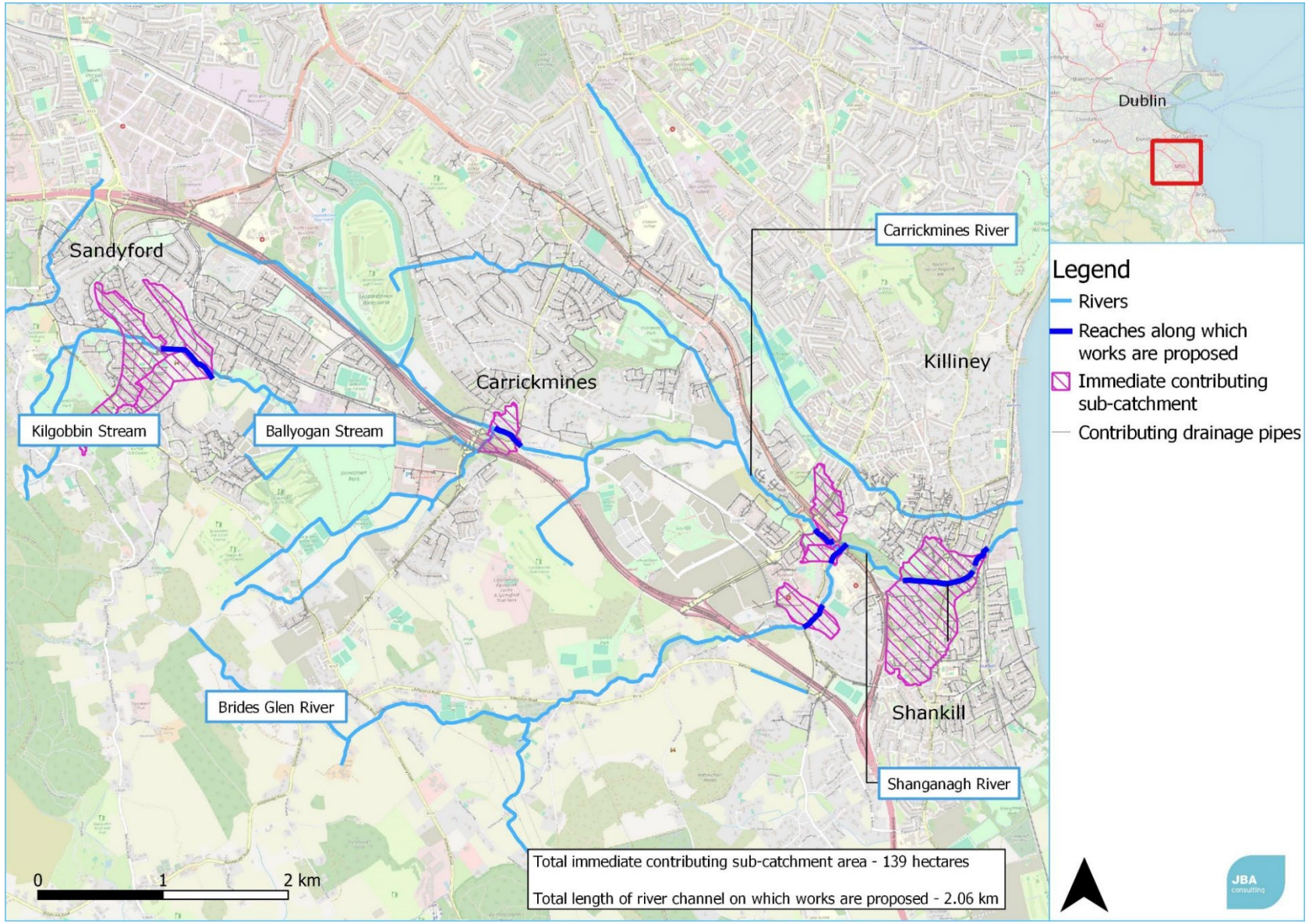

Figure 1.1: Map showing that the proposed development is over the threshold for Mandatory EIAR

1.4 Format and Methodology of the EIAR

This EIAR comprises 3 volumes as follows:

- Volume 1, Non-Technical Summary;
- Volume 2, Environmental Impact Assessment Report; and
- Volume 3, Environmental Impact Assessment Report Appendices

This EIAR comprises the presentation of an extensive range of information and analysis from the EIAR Team. The EIAR is split into the following Chapters:

- Chapter 1 – Introduction
- Chapter 2 – Examination of Alternatives
- Chapter 3 – Description of Proposed Development
- Chapter 4 – Legislation and Planning Policy
- Chapter 5 – Consultation
- Chapter 6 – Construction Impacts – Air Quality, Noise and Vibration, and Climate
- Chapter 7 – Population and Human Health
- Chapter 8 – Biodiversity
- Chapter 9 – Land and Soil
- Chapter 10 – Water – Surface and Groundwater
- Chapter 11 – Material Assets – Traffic and Transport
- Chapter 12 – Material Assets – Utilities and Waste
- Chapter 13 – Cultural Heritage
- Chapter 14 – Landscape and Visual Impact Assessment
- Chapter 15 – Interactions
- Chapter 16 – Cumulative Effects

Each competent expert has prepared their relevant chapters which are primarily set out in the following format:

- Methodology;
- Receiving Environment
- Potential Impact of the Proposed Development;
- Mitigation Measures;
- Residual Effects;
- Interactions; and
- Potential Cumulative Impacts.

1.5 EIAR Team

The EIAR has been compiled by JBA Consulting with input from a range of competent experts, the details of which are outlined in Table 1.1. Each consultant is appropriately qualified and competent in accordance with Article 5(3)(a) of the EIA Directive.

Table 1.1: EIAR team

Chapter	Consultant	Author
Introduction	JBA Consulting	Conor O'Neill BA (Mod) MSc Adv Dip *Conor has 5 years of environmental consultancy experience. He has been involved in all aspects of EIAR, from Screening and Scoping to EIAR co-ordination and chapter authoring for numerous projects including the Deansgrange, Castleconnell, and Carrickmines-Shanganagh River Flood Relief Schemes, along with other developments including transport infrastructure, residential, and commercial.* Bernadette O'Connell BA MSc CMLI PgCert *Bernadette has 35 years of engineering and environmental consultancy experience, has project managed EIARs for a range of strategic infrastructure projects including King's Island FRS, Castleconnell FRS and Mountmellick FRS and has acted as an Expert Witness at oral hearings.*
Examination of Alternatives	JBA Consulting	Ana Tomori BSc MSc MSc CIWEM *Ana has over 10 years of international experience in engineering and environmental consulting. She has been involved in EIA for several flood relief schemes in Ireland, specifically the Examination of Alternatives chapters and Water chapters.* Bernadette O'Connell BA MSc CMLI PgCert
Description of Proposed Development	JBA Consulting	Conor O'Neill BA (Mod) MSc Adv Dip
Legislation and Planning Policy	Coakley O'Neill Town Planning Ltd	Aiden O'Neill BSc (Hons) PG Dip MIPI *Aiden is a planning consultant with over twenty-eight years of post-qualification experience in the UK (8) and Ireland (20). Aiden set up Coakley O'Neill Town Planning with Dave Coakley in February 2010, and have since been particularly involved in advising on residential, commercial, retail and industrial developments, airport infrastructure, services infrastructure and waste infrastructure, across the full range of planning services.*
Consultation	JBA Consulting	Conor O'Neill BA (Mod) MSc Adv Dip Bernadette O'Connell BA MSc CMLI PgCert
Construction Impacts – Air Quality, Noise and Vibration, and Climate	AONA Environmental Consulting Ltd	Mervyn Keegan BSc Dip Env Sc MSc Env Sc Pg Dip *Mervyn has 23 years' experience in environmental consulting. He is a member of the Institute of Acoustics, the Institute of Environmental Sciences, and the Institute of Air Quality Management. Mervyn has appeared as an Expert Witness at oral hearings, public inquiries, and legal hearings, and has prepared Noise, Air Quality, and Odour Impact Assessment Reports across a range of development types including roads, residential, industrial, quarries, mines, and wind energy.* Olivia Maguire BSc MSc Env Sc BSc *Olivia is a Senior Consultant with over 17 years' experience in environmental consulting. Olivia is a Member of Institute of Environmental Management & Assessment and a Member of Occupational Hygiene Society of Ireland with a B.Sc. Occupational Safety and Health, M.Sc.*

		Environmental Science, B.Sc. (Hons) Geography, and is a qualified ISO 14001: Lead Environmental Auditor.
Population and Human Health	JBA Consulting	Jemima Kivikoski BSc Hons PgDip *Jemima is an environmental scientist with 2 years of experience in consulting. Since joining JBA, Jemima has been involved in all aspects of EIA, including Screening, Scoping, and full EIAR chapter authorship. Projects she has worked on include Active Travel Schemes, residential, commercial, and transport development, and several large flood relief schemes.* Conor O'Neill BA (Mod) MSc Adv Dip
Biodiversity	JBA Consulting	Michael Coyle BA (Hons) MSc William Mulville BSc (Hons) MSc ACIEEM Catherine Rodd BSc (Hons) MRes Cecol MCIEEM Laura Thomas BA MRes PGCert CEcol MCIEEM *Laura is a Chartered Ecologist and Technical Director at JBA, with a specialism in botany and with extensive experience of EcIA, NIS assessment including their production and quality assurance.*
Land and Soil	JBA Consulting	Jemima Kivikoski BSc Hons PgDip David Casey BSc MSc MCIWEM *David has 13 years of experience preparing and reviewing Flood Risk Assessments and Environmental Impact Statements, notable the Soils & Geology and Hydrology & Hydrogeology chapters, as well as Strategic Flood Risk Assessments (SFRA's) on behalf of county councils and has aided in the development of the OPW Western CFRAM Study.*
Water – Surface and Groundwater	JBA Consulting	Luigi Arbore BSc MSc MEngSc *Luigi is an environmental scientist and engineer with over 3 years of experience in consulting. Since graduating with an MSc in Environmental Science and an MEngSc in Water, Waste and Environmental Engineering, he has worked on numerous water-related projects including large flood relief schemes, Flood Risk Assessment, and hydrology and hydrogeology studies.* David Casey BSc MSc MCIWEM
Material Assets – Traffic and Transport	Egis	Kwok Cheun Lam BEng CEng MICE *Kwok Chuen Lam is a Senior Traffic Engineer from Egis and he has 17 years' experience specialising in the field of Traffic and Transport Engineering. He has been engaged as team member on a variety of Transportation and Traffic projects. His experience includes the design and management of road improvement projects, preparation of mobility management plans, EIAR (Traffic Chapter) and traffic impact assessments.*
Material Assets –	JBA Consulting	Justin Nangle BSc Hons Env Sc

Utilities and Waste		*Justin is an environmental scientist with 2 years' consulting experience, working on residential, commercial, and transport projects in that time. He has also worked on Strategic and Site-Specific Flood Risk Assessments. Before this he acted as an asset inspection engineer and GIS surveyor.* Conor O'Neill BA (Mod) MSc Adv Dip
Cultural Heritage	Courtney Deery	Yolande O'Brien BA (Hons) PhD MIAI *Yolande has 6 years of cultural heritage consultancy experience, and prior to this participated in research surveys and excavations for research projects in Ireland and France. She has produced and contributed to EIARs, route selection studies, and research and desk studies on archaeology, cultural heritage, and architecture for a range of residential, commercial, and infrastructural developments and flood relief schemes. Fieldwork in this role has included excavation, site inspections, fieldwalking, and the monitoring and recording of geotechnical investigations and topsoil removal.* Siobhan Deery BA, MA, Dip Planning & Env. Law, Licence Eligible Archaeologist MIAI, MICOMOS *Siobhan is a co-director of Courtney Deery Heritage Consultancy. She has 23 years of experience as a cultural heritage consultant, specialising in surveying and evaluating archaeological monuments, historic buildings, sites, and landscapes for conservation, environmental impact assessment, management, and development control. She is a licence-eligible archaeologist, and has carried out numerous archaeological testing, monitoring and excavations on a range of site types, settings and periods in both rural and urban contexts. She has managed cultural heritage EIARs for large-scale infrastructural projects and smaller schemes from the scoping stage to research, fieldwork, statement of impacts and mitigation measures for the EIAR process through to the oral hearing stage including consultation with design teams, stakeholders and statutory consultees.*
Landscape and Visual Impact	JBA Consulting	Maria Ines Timoteo BLA MLA MILI Christos Papachristou MSc MA CMLI *Christos has over 12 years' landscape architectural and horticultural experience working in Ireland, the UK and internationally. He lectured in UCD on LVIA and tutored on ornamental wildflower meadow establishment. He is a chartered landscape architect in the UK. He is also a member of the Irish Landscape Institute and the Greek Geotechnical Chamber. Christos specialises in LVIAs, EIAR and standalone, and has worked on several large flood relief schemes, including acting as EIAR coordinator for Kilkee FRS.*
Interactions	JBA Consulting	All of the above
Cumulative Impacts	JBA Consulting	All of the above

1.6 Description of Effects

This EIAR follows the guidance set out in the Environmental Protection Agency's (EPA) *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (2022) in relation to describing accurately the full range of likely significant effects. Figure 1.2 is taken from the EPA's EIAR Guidelines (2022) and provides a description of significance of effects (or impacts).

The EPA Guidelines (2022) outline that the probability of effects can be described as likely or unlikely and the duration of effects can range from momentary, brief, temporary, short-term, medium-term, long-term, permanent, or reversible while the frequency describes how often the effects will occur (Figure 1.3). The quality of effects can be described as positive, neutral or negative/adverse with varying degrees of significance (Figure 1.4).

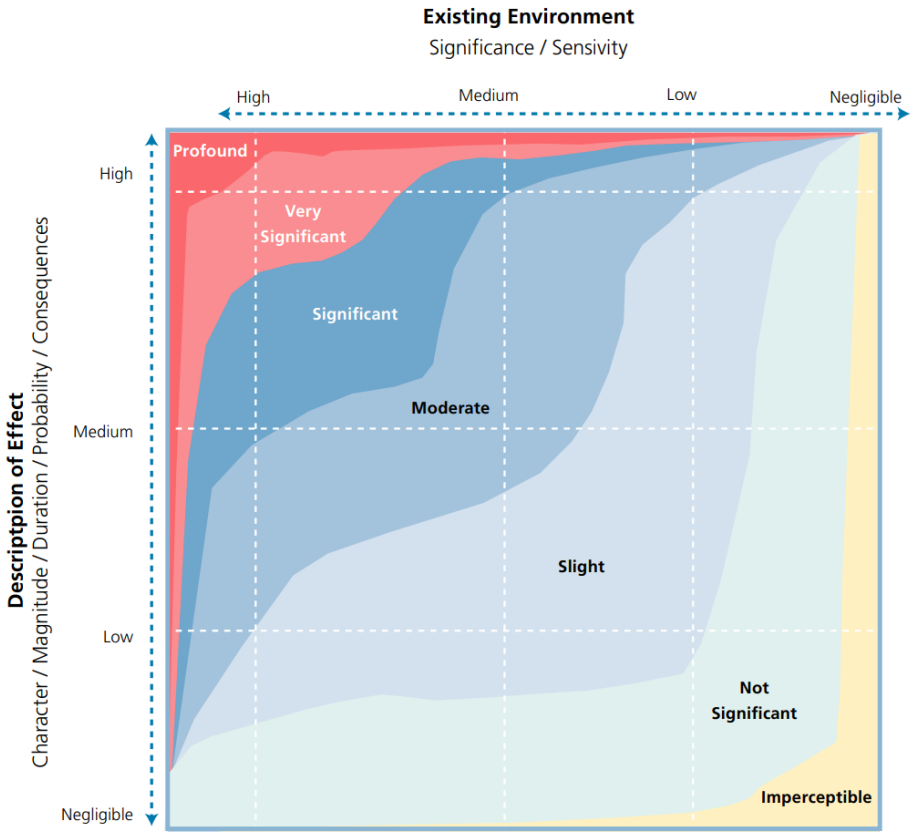

Figure 1.2: Determining the significance of effects (EPA, 2022)

Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Momentary Effects** Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

Figure 1.3: Description of Probability and Duration of Effects (EPA, 2022)

Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral.	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/Adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance).
Describing the Significance of Effects 'Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see *Determining Significance*).	**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 Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects 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 Effects An effect which obliterates sensitive characteristics.
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)

Figure 1.4: Description of effects (EPA, 2022)

1.7 Difficulties in Compiling Specified Information

No significant difficulties were encountered in compiling the necessary information for the EIAR.

1.8 Limitations and Assumptions

Data from the Greater Dublin Strategic Drainage Study (GDSDS) and the Eastern Catchment Flood Risk Assessment and Management Study (ECFRAM) was used in hydraulic modelling for the proposed development. The purpose of this was to inform catchment delineation, and the data was included in urban areas of the model to route flows to the watercourses. The development of the proposed project is informed from hydraulic modelling of fluvial risk only, because the objective of the project is to reduce fluvial flood

risk. Reduction in sewer flood risk is not part of the scope and so this was separated from the fluvial model. The effect of the proposed development on river flood levels was used to understand potential impacts on key surface water network locations, the network itself and existing control measures. It is assumed that measures to mitigate potential impacts on the drainage network, e.g., flap valves/non-return valves in fluvial defences as required, will form part of the detailed design. In addition to this, no rain-on-grid modelling was carried out. Flood flows were generated through a rainfall routing model for the scheme.

Once the proposed development is operational, a routine inspection and maintenance plan will be put in place whereby Dún Laoghaire Rathdown County Council and/or nominated maintenance contractors will inspect and maintain the proposed structures once per year to examine them for any defects and to ensure that staff are trained and familiar with the operational process for them. It is assumed that this will primarily be a combination of visual inspection for any damage, spot repairs to walls where needed, and removal of materials which could act as blockages, e.g., large tree branches, waste, etc. It is assumed that instream works or complex construction works (i.e., beyond basic spot repairs) as part of routine inspection and maintenance will generally not be needed.

1.9 Viewing the EIAR

Copies of this EIAR, the Non-Technical Summary (NTS) and all associated documentation will be available for viewing at the offices of Dún Laoghaire Rathdown County Council, and can be viewed on the FRS website (www.csfrs.ie/). Copies of the application documentation will also be available for viewing at An Bord Pleanála, and can be purchased for a reasonable cost depending on the number and format of pages in the application documents.

2 Examination of Alternatives

This chapter of the EIAR provides an overview of the alternative approaches, locations, designs, and concepts that were considered through the development of this FRS. The aim of this FRS is to reduce the risk of flooding in the Carrickmines-Shanganagh River catchment. This chapter describes the process of selecting the Preferred Option based on the engineering, design, and environmental criteria. Alternatives were selected to comply with the aim, providing feasible engineering and design with the lowest impact on the environment.

2.1 Alternatives Considered

In order to arrive at a suitable flood relief scheme, multiple assessments have been carried out at different stages.

At the outset of the project, a Constraints Report was prepared which identified the key environmental sensitivities and constraints in the area, which could affect the design of potential flood relief options. A topographical survey and river survey were also carried out, in order to gain a detailed understanding of the existing conditions on-site.

A Hydrology Report was prepared to understand the design flood flows for the scheme, while a Hydraulics Report was prepared to understand the river system and simulate predicted flood flows for different return periods. The hydraulic models can be used to test different flood defence measures and estimate economic damages arising from flooding.

Following this, multiple Flood Risk Management approaches were screened to see which were suitable or unsuitable for the proposed development. Suitable or viable measures were taken forward for further assessment. A number of potential options were then developed based on a viable measure or combination of several viable measures.

The flood risk management objectives were used to review the scheme performance relative to the baseline case. The characteristics of the Carrickmines-Shanganagh River catchment and the flood protection requirements of the scheme meant that only one option emerged from the above process which would provide the required standard of flood protection. As only one viable option emerged, no multi-criteria analysis of options was carried out. However, a qualitative assessment of the preferred option compared to the baseline was completed.

2.1.1 Directive 2014/52/EU

The EIA Directive 2014/52/EU[1] requires that the main alternatives of a proposed FRS be considered and presented in the EIAR, and the reasons for selecting the Preferred Option be justified accordingly. This requirement is outlined in the following statement:

"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".

Alternatives were considered for this development early in the Options Development phase, and their viability assessed regarding applicability to the area, economic impacts/benefits, environmental impacts/benefits, social impacts and acceptability, and cultural benefits/impacts.

[1] European Commission, (April 2014) EC Directive 2014/52/EU of 6 April 2014 amending Directive 2011/92/EU *Assessment of the effects of certain public and private projects on the environment,* Official Journal of the European Union No. L 124/1, 25/04/2014

2.1.2 Initial screening of measures

A review of alternative Flood Risk Management (FRM) approaches was undertaken to consider the different FRM methods that could potentially be viable, and which relate to the study area.

During the initial screening process, eight FRM approaches were screened for their potential viability, as well as consideration of nature-based solutions (NBS). The initial screening considered different scales of implementation and benefits; individual flood cell and settlement (Individual residences or group of residences with the same flood risk) scale, FRS area scale and catchment scale. Interactions arising from the flood measures and impacts upstream and downstream were considered. Measures were screened based on the following criteria:

- Applicability to the area;
- Effectiveness and ability to be delivered;
- Economic (potential benefits, impacts, likely costs etc);
- Environmental (potential impacts and benefits, including consideration of environmental constraints as identified in the Constraints Study);
- Social (impacts on people, society, and the likely acceptability of the measure);
- Cultural (potential benefits and impacts upon heritage sites and resources); and
- Climate Change adaptability.

The Do Nothing and Do Minimum scenarios are considered as possible options in Section 2.2 Options Assessment.

FRM Approach 1: Repurposing of existing non-flood management infrastructure

This approach examined the potential to use existing non-formal defence structures that act as barriers to flow. Walls or embankments would be updated to ensure they are of a suitable standard to protect against the designed event.

This approach was considered potentially viable at a flood cell and settlement scale. Limitations to it were buildability (whether infrastructure can be enlarged) and public perception (visual impacts).

FRM Approach 2: Catchment scale and disperse actions to reduce flow downstream

This approach examined wider catchment-scale measures that could result in benefits such as distributed storage areas and storage/buffers between stormwater and fluvial networks.

This approach was considered potentially viable at the catchment/scheme area scale. Limitations to it were buildability, available storage space within the scheme area, and a scientific basis to assess the benefits.

FRM Approach 3: Inline storage on main watercourse/tributaries to reduce flow downstream

This approach considered using storage to contain flow within the river channel, on a flood cell scale.

This approach was considered viable for the scheme at the flood cell and settlement scale. Limitations of this approach were buildability, hydromorphology, availability of storage space, and interaction with existing surface water networks.

FRM Approach 4: Diversion of flow around and away from risk areas

This approach considered flow diversion at the flood cell or settlement scale. Risk receptors that could benefit from flow diversion include properties downstream on the Brides Glen Stream (Flood Cell 4), and at Clon Brugh (Flood Cell 1).

This approach was considered potentially viable for the scheme, only at the flood cell or settlement scale. Limitations include buildability related to interference with utilities.

FRM Approach 5: Improved conveyance of flow

This approach considered the flood cell scale. It examined the improvement of conveyance given the presence of critical structures along the watercourse increasing water levels.

This was considered a feasible approach and assessed further considering key limitations such as the ability to upgrade structures and potential impacts of increased conveyance downstream.

FRM Approach 6: Refurbish or enhance defences to achieve standard of protection

As the formal defences at Commons Road (Flood Cell 5) do not have the desired Standard of Protection, this approach was considered viable and assessed further.

This was considered viable at the flood cell or settlement scale only. Limitations to this approach are the visual impacts of increased defence heights and structural stability of the features.

FRM Approach 7: Containment of flood level

This approach examined the potential impact of containing flows in bank to protect risk receptors.

This approach was considered potentially feasible at flood cell scale and assessed further taking into account the key limitations such as the risk of excessive wall heights and the buildability of defences where there is limited space along the channel banks and disconnection of the floodplain.

FRM Approach 8: Flood resilience, preparedness and emergency response

This involves the opportunity to implement a public information campaign about flooding and access in flood events to raise awareness. Flood warning was not considered a viable measure for the Carrickmines catchment as the timing of the flood wave is too short to allow for effective flood warning during an event to enable further preparedness and response.

Flood warning is not a viable measure for the Carrickmines catchment as the timing of the flood wave is too short to allow for effective flood warning during an event to enable further preparedness and response. These measures alone would not provide the desired Standard of Protection but would be needed where demountable defences are proposed or part of flood defence wall.

Nature-based solutions opportunities

Nature-based solutions were considered for the scheme. The land use in the Carrickmines Shanganagh catchment is varied with rural mountainous areas in the upper catchment and more urbanised areas in the lower catchment. The overall opportunities for NBS to provide flood protection in the wider catchment are limited.

A test was carried out where all available storage measures identified for each Flood Cell were included to see whether a full NBS storage solution could achieve the desired standard of protection. The modelling found that even with all the storage in place, flooding was not alleviated without the need for additional hard defences. This is because the maximum storage volume available in the system (12,350 m^3) is significantly less than the total volume (100,000m^3) that needs to be stored, and the phasing of the tributaries is not altered sufficiently to make a difference on the main watercourse.

Cabinteely Park appeared to be well-suited to NBS as there are existing ponds and green space that could be enhanced. Tests showed that the overall benefit from storage in place is minimal with very low flow reduction in Commons Road relative to the baseline scenario, as there are other tributaries which feed into the main watercourse. Similar results were seen across the scheme area.

Even though not considered a measure on its own, NBS and storage were examined to potentially be part of the scheme along with structural measures. Also, potential future opportunities for storm water retention measures could be integrated in the form of green detention or retention areas, as part of a SuDS program.

Development in the wider Carrickmines-Shanganagh area should focus on delivering NBS solutions to cope with additional pressures in the future while providing multiple benefits such as water quality improvement.

Although NBS are not included in this scheme because they do not provide the necessary level of protection without hard defences, storage and other nature-based solutions are likely to be part of future climate change adaptation for the flood risk scheme.

DLRCC is separately assessing the feasibility of NBS consisting of storage areas or ponds in Cabinteely Park and Fernhill Park, with Fernhill Park at the detailed design stage.

2.1.3 Initial Screening Summary

An initial set of measures were developed based on the FRM approaches described above. The measures were developed in each of the five flood cells and were screened initially based on hydraulic impact or benefit, buildability, safety, adaptability, maintenance needs, social impacts, and potential environmental impacts. The initial screening of FRM approaches highlighted that no catchment-scale approach is viable for the full scheme area.

The initial testing showed that removal of constrictions at critical watercourse crossings and containment of the river are the prime approaches that should be adopted for the scheme. These measures are effective at specific locations along the catchment, and in general due to the hydraulics involved do not have notable impacts on flow outside each area. The measures that were brought forward were those that provided a useful hydraulic or flooding impact, and on initial high-level examination did not have any major constructability or environmental constraints. Measures that were brought forward from this stage were further assessed in combination with each other. A summary of all the measures examined for each Flood Cell is given in Table 2.1 below.

In addition to the screening of measures by Flood Cell (shown in Table 2.1), a catchment-wide solution in the form of retention of flow from the motorway drainage systems to help reduce flood levels was examined. The overall impact of this was insignificant as the flow contribution from the M50 is peaky and occurs early on in a storm event. The cumulative impact of reducing these outflows from the motorway does not have a significant impact on the peak of the rural and urban responses from the rest of the catchment. As there is little to no benefit in this measure's ability to influence the main peak flow in the lower reaches, it has been screened out of the assessment at this stage.

Table 2.1: Measures considered and tested at initial screening stage

Area	Flood Cell 1	Flood Cell 2	Flood Cell 3	Flood Cell 4	Flood Cell 5
Measures	**1.A:** Upgrade and extend existing wall at Clon Brugh. **1.B:** Close existing openings along perimeter walls at Clon Brugh. **1.C:** Install headwall and overflow pipe to the rear of 92 Clon Brugh. Overflow pipe connect to the existing culvert downstream. **1.D:** Improve existing swale from 92 Clon Brugh to 104 Clon Brugh, making the swale larger and deeper. **1.E:** Improve the existing swale from 92 Clon Brugh to 104 Clon Brugh, making the swale larger and deeper, and extend the swale to the existing culvert downstream and prevent water moving out of swale into residential area. **1.F:** Addition of raised embankments along Carysfort-Maretimo River paired with a flow control outlet pipe into swale at spill point of Carysfort-Maretimo to limit flow in swale.	**2.A:** Storage at existing Belarmine stormwater ponds and greenspace **2.B:** Upgrade of Belarmine culvert inlet **2.C:** Creation of a flood storage area in Fern Hill Park. **2.D:** Replacement and rebuilding of walls at Belarmine culvert inlet **2.E:** Replacement and rebuilding of walls along area of low banks to contain flow up and downstream of Kilgobbin Road. **2.F:** Divert existing stormwater pond into new culvert. New culvert to bypass existing Kilgobbin bridge. **2.G:** Flood relief culvert included bypassing Kilgobbin bridge to alleviate flooding in Kilgobbin area.	**3.A:** Replacement, rebuilding and addition of defences upstream of Glenamuck Rd North, Priorsland and along watercourse between Glenamuck Rd North and the Luas P&R. **3B:** Upgrade of culverts at Glenamuck Rd North and Luas Park & Ride. **3.C:** Storage upstream of Ballyogan Stream using culvert constriction. **3.D:** Storage at Clay Farm greenspace	**4.A:** Walls from Cherrywood Rd roundabout to the viaduct. **4.B:** Raised banks along watercourse at downstream of N11 crossing. **4.C:** Upgrade of N11 culvert – Addition of culvert running parallel to existing **4.D:** Replacement of existing N11 culvert **4.E:** Upgrade of culvert under viaduct **4.F:** Flood relief culvert taking excess flow from Brides Glen into the Shanganagh River. Flow control structure required to regulate flow **4.G:** Installation of flood relief culvert under Cherrywood Road connecting back to Brides Glen River at N11 culvert **4.H:** Storage upstream of Mullinastill Rd roundabout and downstream of M50 crossing **4.I:** Refined storage upstream of M50 crossing	**5.A:** Raising of walls upstream of Shanganagh bridge with left bank wall at Brookdene estate **5.B:** Removal of wall on left bank and use of left bank for flood conveyance. Access bridge also removed. **5.C:** Addition of walls on left bank upstream of railway **5.D:** Addition of walls behind commercial properties downstream of Wyattville flyover, or property level measure **5.E:** Upgrade access bridge on Commons Road **5.F:** Remove access bridge on Commons Road. **5.G:** Pumping Station at Loughlinstown Pitch and Putt, outfalling into the Irish Sea. **5.H:** Storage upstream of Commons Road beside Loughlinstown Pitch and Putt. **5.I:** Storage in Cherrywood Valley. **5.J:** Storage in Cabinteely Park. **5.K:** Additional storage in Loughlinstown Pitch and Putt by reprofiling. **5.L:** New bypass culverts to Shanganagh Road Bridge
Measures Screened Out	**1.C, 1.D,** and **1.E** were screened out as they would expand the swale into an existing tree line, requiring the removal of a large number of trees. The creation of a large depression in a residential area which would be periodically flooded also has implications for public safety. **1.F** would lead to increases in flow and levels in the Carysfort-Maretimo River, which is already at flood risk, and so was also not carried forward.	**2.F** resolves flooding downstream at Kilgobbin but has other limitations that need to be considered. Construction risks with existing utilities along the route and size of overflow pipes are constrained by these services. Limited alignment and restricted pipe size mean adaptability for climate change not possible. Maintenance risks for culvert this long are also a serious concern, if culvert is damaged or blocked it would be problematic to resolve. Measure **2.C** did not result in decrease of water levels downstream of water location.	**3.B, 3.C** and **3.D** screened out at this stage. **3.B** would not fully resolve flood risk, and would be heavily constricted due to utilities. **3.C** and **3.D** provide limited hydraulic benefit and would not improve flood risk.	**4.H** screened out due to excessive construction and maintenance requirements, and would create large storage depths. **4.F** and **4.G** highly complex, as multiple utilities cross the area, and not taken forward for further assessment. **4.D** and **4.E** screened out because they do not fully resolve flooding, and cannot be adapted in the future due to constraints from existing infrastructure, and are not climate adaptable.	**5.E** and **5.F** screened out as bridge is the only access to the left-bank property, and other access routes not viable. **5.G** screened out due to high complexity and costs, interference with utilities. **5.H, 5.K** and **5.L** screened out as they do not provide enough hydraulic benefit or reduce flood levels significantly. **5.J** would provide limited decrease of flow levels, so screened out at this stage but should remain in the climate adaptation plan.
Measures Taken forward	**1.A** and **1.B** provide flood benefit with no obvious major environmental impacts or constructability constraints.	**2.A, 2.B, 2.D, 2.E (upstream portion only),** and **2.G** provide flood benefit with no obvious major environmental impacts or constructability constraints.	**3.A** provides flood benefit with no obvious major environmental impacts or constructability constraints.	**4.A, 4.B, 4.C** and **4.I** provide flood benefit with no obvious major environmental impacts or constructability constraints.	**5.A, 5.B, 5.C, 5.D,** and **5.I** provide flood benefit with no obvious major environmental impacts or constructability constraints.

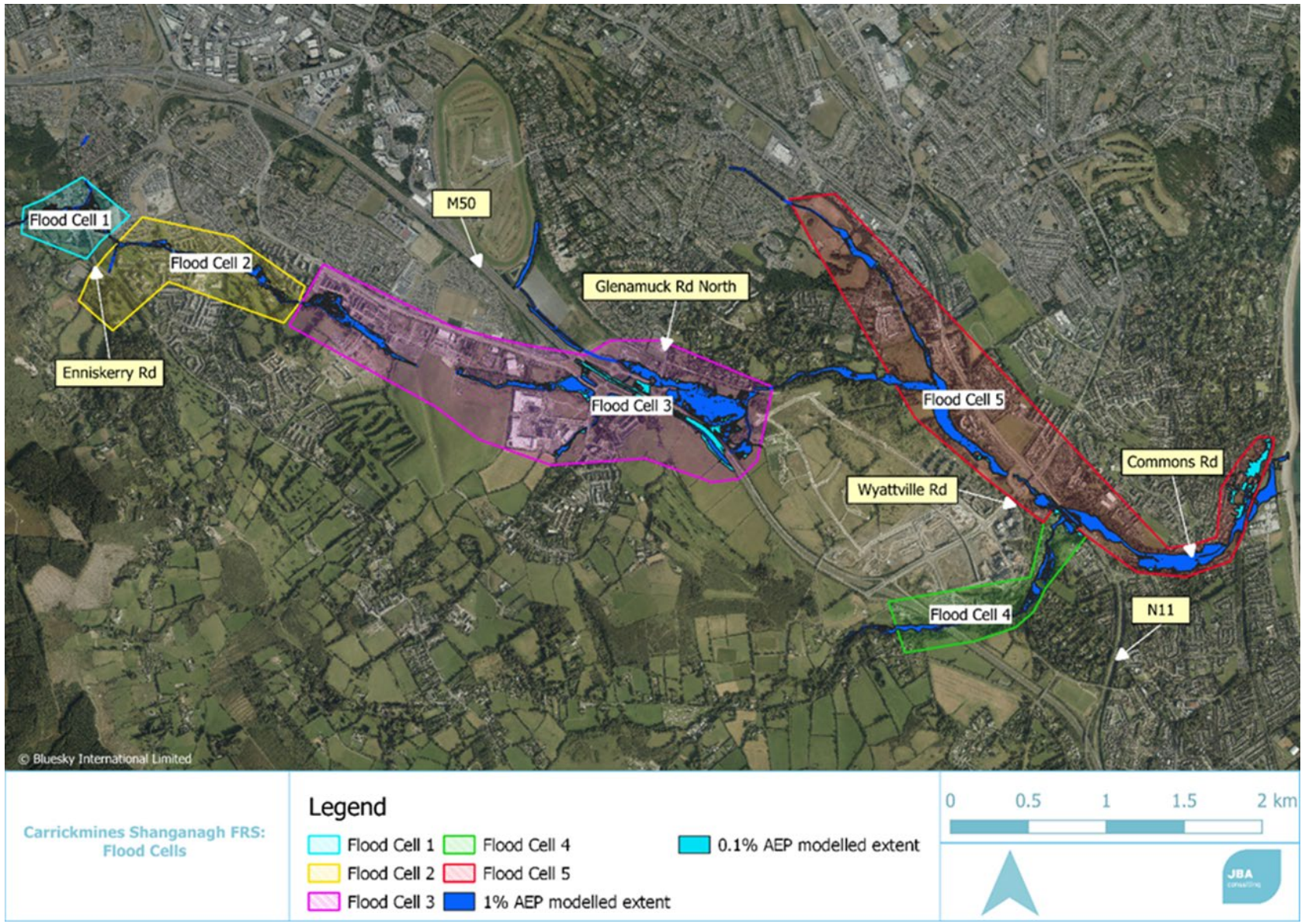

Figure 2.1: Carrickmines-Shanganagh River FRS Flood Cells

2.1.4 Technical assessment of feasible measures

The measures taken forward from the initial screening as provided in Table 2.1 were assessed further in different combinations, and also considering climate change. They are discussed below for each Flood Cell, and viable combinations were brought forward for option consideration.

Flood Cell 1

Measure 1.A – upgrade and extension of existing walls at Clon Brugh and Measure 1.B – Closing of existing openings in existing walls at Clon Brugh, were brought forward from the initial screening. Protection from the crossflow in this upstream flood cell is achieved only if these two measures work together. These two measures were therefore taken forward for option consideration.

Flood Cell 2

For Flood Cell 2, combination tests were carried out for storage and containment with the following potentially viable measures:

- Measure 2.A: Storage at existing Belarmine stormwater ponds;
- Measure 2.B: Upgrade of Belarmine culvert inlet;
- Measure 2.D: Replacement and rebuilding of existing walls immediately upstream of Belarmine culvert;
- Measure 2.E: Replacement and rebuilding of existing walls up- and downstream of Kilgobbin Road Bridge; and
- Measure 2.G: Installation of flood relief culvert at Kilgobbin Road Bridge.

Measure 2.A was not considered viable at present-day as there is an alternative combination of measures that provide the necessary protection, with fewer limitations (required height of storage area embankments, flooding of a public amenity, additional lowering of ponds required, flooding at residential areas reduced but not fully resolved, safety risk due to depth of flood waters, culvert restriction not addressed). Given this, the containment combination (Measures 2.B, 2.D, 2.E (partially, upstream of Kilgobbin Bridge only) and 2.G) was brought forward for options consideration.

Flood Cell 3

Measure 3.A (replacement, rebuilding, and addition of walls/defences around Glenamuck Rd North Roundabout and Priorsland) was the only measure that passed the initial screening phase. This measure resolves the flooding in the key risk areas, and was taken forward for Option assessment. There was no viable alternative in this flood cell to be considered.

Flood Cell 4

Four measures were taken forward from the initial screening for testing in combination:

- Measure 4.A: Addition of defences upstream of viaduct
- Measure 4.B: Addition of defences upstream of N11 culvert;
- Measure 4.C: Addition of flood relief culvert at the N11 crossing; and
- Measure 4.I: Storage upstream of M50 crossing.

In the combination testing, Measure 4.A was included in all tests. Measure 4.A is the only measure brought through initial screening that addresses the upstream flooding and so must be included.

Testing showed that the combination of Measures 4.A, 4.B and 4.C allowed for defences with acceptable heights (i.e., not excessively tall) and also prevented flooding of the N11. Measure 4.I was found not to provide a meaningful decrease in flooding or potential defence levels, and so was not brought forward for the present-day scenario.

Flood Cell 5

Combined tests were conducted for the five measures taken forward from the first stage:

- Measure 5.A: Raising and addition of walls at Commons Road and Brookdene
- Measure 5.B: Conveyance and reconnection of the floodplain on the left-hand bank at Commons Road
- Measure 5.C: Addition of defences upstream of Railway
- Measure 5.D: Addition of defences at Loughlinstown Village
- Measure 5.I: Storage at Cherrywood Valley

Testing showed that to achieve the required standard of protection, all containment measures (5.A, 5.C, and 5.D) have to be included. One or both of the storage measures (5.B and 5.I) were considered for the future scenario.

Summary of combined testing

A scheme option is formed by combining different viable measures to produce a whole-scheme solution which provides the necessary Standard of Protection (SoP), which in this case is up to and including the 1% annual exceedance probability (AEP) event. Flooding along the watercourses happens in isolated areas within each flood cell. Although these areas are all connected, the measures which provide flood protection in each of the flood cells do not have any significant impact on flooding either upstream or downstream of each area. This means that a combination of individual measures across the catchment is required in order to provide the full scheme-area Option that meets the necessary SoP.

Storage was examined as a catchment-wide measure initially to see whether distributed Nature Based Solutions could be established for the scheme area. It was found that even with all potential areas included, the storage volume available was insufficient and the standard of protection could not be achieved through storage alone. A catchment-wide containment and conveyance approach was also shown to be not viable as again the standard of protection could not be achieved, or the proposed defences were too high or with poor buildability.

Based on this, a combination of flood management approaches was shown to be required, with no single measure or mechanism providing the necessary standard of protection. Multiple measures were tested in the five flood cells, as described above. The number of potentially viable solutions in each flood cell was limited to only one, meaning there was a single combination of measures for the Carrickmines-Shanganagh River FRS which is viable and which provides the necessary standard of protection for the entire area in the present day. There are not enough viable combinations of measures to make more than one option. As a result, only one viable Option was developed for the scheme.

The arrival at a single scheme option is unusual but is a product of the constraints on the system: steep tributaries, urban runoff, and a narrow floodplain funnelling flow to a finite capacity channel through to the sea.

An overview of the viable Option is shown in Figure 2.2, and the measures which it is comprised of are summarised in Table 2.2.

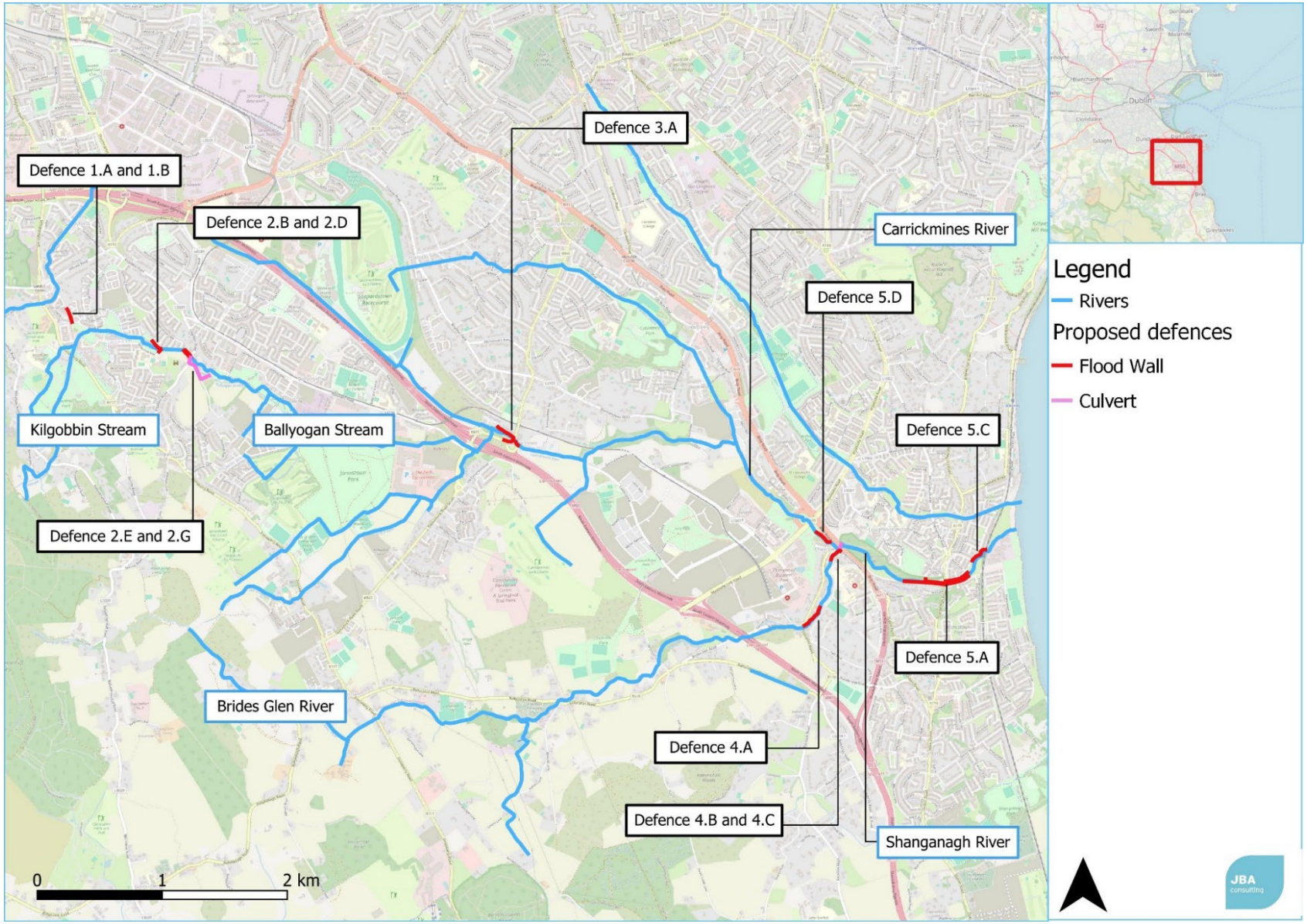

Figure 2.2: Option 1 Overview

Table 2.2: Summary of measures for Option 1

Location	Option 1	Measures details
Flood Cell 1	**1.A** Upgrade and extension of existing walls in Clon Brugh **1.B** Closing existing openings at walls at Clon Brugh	• New reinforced concrete flood wall up to 1.35m high above adjacent footpath connected to the existing masonry wall adjoining the overflow channel and extend south at Clon Brugh • Demolition of c. 16m of existing masonry walls and realignment works to the existing footpath.
Flood Cell 2	**2.B** Upgrade of Belarmine culvert inlet **2.D** Replacement and rebuilding of existing walls immediately upstream of Belarmine culvert **2.E** Replacement and rebuilding of existing walls up- and downstream of Kilgobbin Road Bridge **2.G** Installation of Flood Relief Culvert at Kilgobbin Road Bridge	• At Belarmine Park: Replacement of the existing boundary wall to Sandyford Hall Crescent/Grove with a new defence reinforced concrete wall up to 2.6m high. • Minor upgrades to the existing culvert inlet. • Removal and reinstallation of the existing screen structure. • At Kilgobbin: Installation of a new overflow pipe (c.298m) and associated ancillaries (including weir, headwalls, and manholes). • Installation of a new reinforced concrete weir within the existing riverbanks, upstream of the existing bridge at Kilgobbin Road to regulate flow into the proposed overflow pipe on Kilgobbin Road. • Installation of a new headwall at both the upstream and downstream faces of the overflow pipe. • Replacement of boundary walls associated with Kilgobbin House and adjoining the left bank with new reinforced concrete walls • Installation of a new flood defence wall along the right bank of the river finished in stone cladding on both facades
Flood Cell 3	**3.A** Replacement, rebuilding, and addition of walls/defences around Glenamuck Rd North Roundabout and Priorsland	• Installation of new reinforced concrete walls of up to 1.7m in height adjoining the riverbank upstream & downstream of the existing bridge at Glenamuck Road North, finished in natural stone to match the existing stone. This will also include infilling the upstream parapet of the bridge. • Installation of a new in-channel debris screen immediately upstream of the existing bridge.
Flood Cell 4	**4.A** Addition of defences upstream of viaduct (Brides Glen River) **4.B** Addition of defences along upstream of N11 culvert (Brides Glen River) **4.C** Addition of flood relief culvert at the N11 crossing	• Construction of new flood defence walls of up to 2.7m in height from adjacent gardens adjoining the existing riverbank and located to the south of existing properties, finished in stone natural stone cladding. • Installation of a concrete overflow pipe 2400mm dia. concrete overflow pipe (c.53m in length) beneath the existing N11 dual carriageway, overflow weir at the upstream end. • New concrete flood wall up to 2m high upstream of the N11 overflow on the left bank, with protective railing, finished in natural stone cladding
Flood Cell 5	**5.A** Raising and addition of walls at Commons Road **5.C** Addition of defences upstream of railway line **5.D** Addition of defences at Loughlinstown Village	• Bray Road: Construction of new reinforced concrete walls up to 3.4 m at the back of properties on Bray Road, within the existing riverbed, associated with minor channel modification (excavation and reshape of banks) • Raising of existing flood defence walls on Commons Road to a maximum height of 3.6m from existing footpath. • Construction of new flood defence walls up to a height of 2.4m along Commons Road. • Strengthening of existing Shanganagh bridge parapet and installation of scour protection to the existing Shanganagh bridge • Construction of flood defence wall up to 1.2m high to the south of the Brookdene estate, finished in natural stone cladding and decorative railing • Construction of a new reinforced concrete wall up to 1.8m high, finished with natural stone cladding in the greenfield area to the south of Bayview Lawns and adjoining the Shanganagh River. • New reinforced concrete between the upgraded boundary wall of No. 20 Bayview Lawns and the existing arch culvert beneath the railway.

2.2 Options Assessment

The potential environmental impacts associated with the only workable Option, the 'do nothing' scenario, and the 'do minimum' scenario are summarised below. The assessment for the viable option was undertaken as part of the Options Report and aimed to compare the potential impacts of shortlisted measures with a focus on the highest impacts across the Flood Cells.

Due to the requirements of the FRS, other viable options were not developed. Other measures were considered in earlier stages (described above), but for technical reasons were not brought forward. As these other measures did not meet the requirements of the FRS (i.e., they did not solve flooding in the area), their potential environmental impacts were not assessed against the viable option.

2.2.1 Do Nothing

The 'do nothing' scenario is defined as the option involving no future expenditure on flood defences or maintenance of existing defences/channels and the abandonment of any existing practices. The implication would be that the existing risk of flooding persists in the study area and would possibly worsen over time.

The 'do nothing' scenario would likely result in significant adverse effects on multiple environmental factors. Continued flooding would lead to adverse economic, social, and health effects on the population of the affected areas. It would also likely adverse impact material assets in the area, such as roads and drainage infrastructure. As flooding worsens over time, material assets would also be more likely to fail or experience damage during flood events.

Flooding of increasing magnitude and frequency of an urban area would likely adversely impact water quality, as potential sources of pollution become inundated. This would also have an indirect adverse effect on biodiversity.

While the 'do nothing' scenario has been discounted due to it not meeting the flood protection requirements of the scheme, it is also not acceptable from an environmental point of view.

2.2.2 Do Minimum

The 'do minimum' measure would consist of implementation of additional minimal measures to reduce the flood risk in specific problematic areas without introducing a comprehensive strategy. This would maintain the existing standard of protection and would generally involve repairing and reinforcing existing walls now and as repairs are needed in the future. This is not a suitable option as the rivers will overspill culverts and upstream banks at key locations. Therefore, doing the minimum of maintaining these defences and carrying out minimum river maintenance will not provide a meaningful reduction in flood levels.

In addition to these points, while the do minimum scenario would not have as significant an adverse impact as the do nothing, it would likely still result in adverse effects on several environmental factors, particularly over the long-term.

The 'do minimum' scenario would require ongoing maintenance of aging drainage infrastructure and existing flood defences. These could become more likely to fail over time, potentially adversely impacting material assets in the area and resulting in flood events. The possibility of flood events occurring which overcome existing defences could also increase over time due to climate change and deterioration of existing infrastructure as it ages. This would in turn lead to adverse impacts as described above in the 'do nothing' scenario.

For these reasons, the 'do minimum' scenario was not taken forward.

2.2.3 Option 1

The measures which combined make up the only viable Option for the proposed FRS were assessed as part of the Options Report for their potential environmental impacts. The weight of the effect is displayed by different symbols in Table 2.3 and Table 2.4: the blue circle represents High potential effects; orange represents Moderate potential effects and green is a Slight or Neutral effect. These symbols are shown below.

As noted in the Options Report for the scheme, the use of the terms “High”, “Moderate”, and “Slight” in this context was solely for the comparative assessment of shortlisted measures only and does not reflect the assessment of potential impacts for the proposed development as outlined in the rest of this EIAR.

It was concluded in the Options Report that the proposed measures taken together are likely to be relatively low in environmental impact, with most impacts likely to be temporary and during the construction phase.

Proposed instream works have the potential to adversely impact water quality resulting in a temporary moderate or high adverse effect on hydrology and hydromorphology. Mitigation measures are feasible for these impacts and the measures were thus considered acceptable in terms of water. Increases to peak water levels as a result of containment measures could have an intermittent moderate adverse effect on the hydrology and hydromorphology of affected waterbodies during the operational period of the FRS.

Instream and bankside work has the potential to accidentally release pollutants to local watercourses within the scheme area or otherwise impact habitats, resulting in moderate or high impacts on local ecological receptors. Mitigation measures to reduce this impact are feasible and so the proposed Option was considered acceptable from the point of view of Biodiversity.

Impacts to archaeology are possible due to the potential for disturbance of underground archaeological features and the inherent archaeological potential around the riverine environment. Measures 2.E and 3.A were assessed as having a high potential effect on cultural heritage, due to potential for direct effects on architectural features. Field assessment of the riverbanks, access roads, compound areas and any other associated works will be required and further investigative methods may also be recommended such as geophysical survey, topographical survey, building survey, explorative test excavation and underwater metal detection and wade survey.

Slight to moderate impacts on landscape and visual amenity, and due to construction works and access disruption, are likely during construction and operation. Mitigation measures are feasible to reduce these impacts.

Key areas within the scheme, where more detailed discussion on decision-making is required due to their complexity, are discussed below.

Kilgobbin Road

At Kilgobbin Road, the removal of an existing stone boundary wall and construction of a new flood wall are required at Kilgobbin House, listed on the Dún Laoghaire-Rathdown (DLR) Record of Protected Structures (RPS No. 1684). While the existing stone walls at Kilgobbin House are part of its protected curtilage and have cultural heritage value (discussed further in Chapter 13), a flood containment measure was identified as being appropriate for the area.

At present during a flood event, flood waters shoot through gaps in the existing stone wall and spill out onto Kilgobbin Road and surrounding residential properties. The possibility of repairing the existing wall was examined, however the condition of the wall means that it could not be relied upon to remain in place during a flood event, due to the differing levels of pressure on either side. The risk of collapse of the wall during a flood event would be too great in this scenario, and would represent both a flooding risk and a health and

safety risk, neither of which would be acceptable under the requirements of the FRS. Therefore, removal of the existing wall and construction of a new flood wall is required in this area to resolve flood risk.

While it is not possible, due to the requirements of the FRS, to retain the existing stone wall, it is proposed that stones from the wall be recovered and prepared for reuse with the new flood wall. The proposed flood wall will be constructed with a reinforced concrete core and faced with stone from the original stone wall.

N11 Overflow Culvert

The Shanganagh River flows beneath the N11 national road through an approx. 53m long masonry arch culvert, which transitions to a narrower twin box culvert beneath the road. In the present scenario during flood events, this narrowing of the culvert structure acts as a flow constriction on the existing system, which creates a backwater effect at the upstream end of the culvert. This results in flood water spilling out over the N11 road and nearby residential properties.

Three fundamental approaches were tested for this area:

- Additional catchment storage upstream
- Containment
- Conveyance

Testing was undertaken to determine the theoretical storage volume that would be required in order to facilitate a feasible storage measure. The testing determined that a theoretical storage volume of 100,000m^3 would be required. Two viable storage areas upstream were identified through analysis of the catchment digital terrain model (DTM), with a total maximum storage volume of 12,350m^3 within the catchment. This maximum volume is well below the required volume, mainly due to the steep characteristics and urban environs of the catchment.

Containment in the form of flood walls is proposed upstream of the N11, which will give partial protection to properties on Cherrywood Road and Bray Road, however spillage of flood waters is still likely due to the risk of blockage of the N11 culvert. Hydraulic modelling showed that a wall height of approx. 5.5-6m would be required to give protection up to the 1% AEP event. While flood walls of this height could be built from an engineering perspective, they would not be socially acceptable with little or no precedence in practice, as the required heights would dwarf surrounding properties. Improved conveyance, in addition to containment with lower walls of an acceptable height, is therefore required to fully resolve flood risk in this area.

Replacement of the existing N11 culvert, construction of an additional culvert under the N11, or the creation of a flow diversion into the Shanganagh River were all considered as means of improving conveyance. On initial examination of the potential flow diversion, it was noted that a recent property extension had impacted the feasibility of the route by blocking the intended route -- meaning that a large section of the diversion would be through private lands, including residential. For these reasons, this measure was ruled out.

The construction requirements for the replacement of the existing culvert, combined with the peak flows which arrive at the existing culvert under baseline conditions and the 1% AEP scenario, mean that a temporary offline bypass culvert beneath the N11 would also be required. This would need to be installed in advance of works to the existing culvert. This would effectively repeat the works required.

The construction of an additional overflow culvert was identified as the least disruptive and most feasible option for improving conveyance.

The proposed overflow culvert will be constructed with an open cutting and subsequent backfilling and reinstatement of the road. A construction methodology which uses an open cutting rather than a trenchless method is required due to constraints on constructability using a trenchless method. Trenchless construction using a tunnel boring machine (TBM) is not feasible due to the risk of damage to utilities in the area and

constraints on pipe gradient, which would limit pipe capacity. An open cutting method does not have similar constructability constraints.

Commons Road and Shanganagh Road Bridge

Commons Road is a critical area within the scheme as it is a point of historic flooding and has potential for high damages and impacts. Defences in the form of flood walls are already present along Commons Road, however they are too low to protect against the 1% AEP event. The Shanganagh Road Bridge is a protected structure (RPS No. 1772) which crosses over the river at Commons Road. During flood events, the bridge acts as a partial blockage, leading to water backing up behind the bridge and spilling out over the existing flood walls.

It is proposed to raise and extend the existing walls to contain peak flows. This is because there is insufficient storage potential upstream to stop the overtopping of existing defences. The increase in containment will increase flow within the channel, putting additional pressure on Shanganagh Road Bridge. There will be an increased risk of scour on the bridge, which will increase the risk of the bridge being damaged during a flood event.

A scour assessment was carried out which resulted in two alternative mitigation measures:

1. Removal and replacement of Shanganagh Road Bridge with a single-span bridge. This would create greater space for water to flow and reduce pressures in this area.
2. Installation of scour protection and reinforcement. By adding scour protection within the riverbed around the bridge and adding reinforcement to the bridge parapet, risks to the structure would be reduced.

The first measure would require complete removal of the bridge, which as noted above is a protected structure. The Planning and Development Act 2000 (as amended) states that “permission may only be granted for demolishing a protected structure in exceptional circumstances (Section 57(10)(b), 2000 Act). In accordance with the Architectural Heritage Protection Guidelines, where a proposal is made to demolish a protected structure, it requires the strongest justification before permission is granted. The onus is on the applicant to make a case for demolition. This requires that all options, other than demolition, receive serious consideration.

Removal was not seen as a favourable approach, especially as the second measure would allow for the retention of the bridge. Direct alterations to the bridge in the form of reinforcements and scour protection are less intrusive than its full removal and will also ensure that risks to the bridge in future flood events are lowered. Upgrade and extension of the existing flood walls, plus installation of scour protection and reinforcement at Shanganagh Road Bridge, are therefore the proposed option in this area.

2.2.4 Summary

In summary, the proposed option was the most appropriate when considering potential environmental impact and the only option which meets the required design standard. It is subject to a complete assessment in this EIAR.

Table 2.3: Colour coded system representing the expected level of impacts.

Legend	
High potential effect	
Moderate potential effect	
Slight/no potential effect	

Table 2.4: Summary of the environmental impacts of the measures in each cell, as assessed in the Options Report stage of the FRS

	Flood Cells											
	1		2				3	4			5		
	Carysfort-Maretimo overflow		Belarmine Kilgobbin				Carrickmines area	Brides Glen			Commons Road		
Measures	1.A	1.B	2.B	2.D	2.E	2.G	3.A	4.A	4.B	4.C	5.A	5.C	5.D
Water	●	●	●	●	●	●	●	●	●	●	●	●	●
Biodiversity	●	●	●	●	●	●	●	●	●	●	●	●	●
Cultural Heritage	●	●	●	●	●	●	●	●	●	●	●	●	●
Landscape and Visual	●	●	●	●	●	●	●	●	●	●	●	●	●
Construction	●	●	●	●	●	●	●	●	●	●	●	●	●
Comments	Highest impacts are expected from construction. As excavation works are required for the wall construction, and presence of construction compounds has the potential to have temporary Moderate impacts due to disturbance and nuisances for local residents.		Instream works across Flood Cell 2 would have Moderate adverse impacts on biodiversity and hydrology and hydromorphology. Highest adverse impacts in biodiversity are expected from the Belarmine culvert upgrade due to instream work which would directly impact the river habitat and sensitive species. Works to the walls upstream of Kilgobbin Road will have a High permanent adverse impact on their architectural value. Moderate temporary effects would be expected during construction in all site locations due to disturbance and nuisance to the local residents, construction compounds and road traffic.				Highest adverse impacts in Flood Cell 3 are expected at Carrickmines Castle. Any earthmoving works associated with the construction may reveal in-situ subsurface archaeological deposits that might be associated with the Carrickmines settlement or earlier. Ministerial consent will be required for any development works in this location. Moderate adverse impacts are expected on biodiversity as a result of removal of trees along the right bank where the wall will be placed. Wall heights would have the potential to have a permanent Moderate adverse effect on visual amenity in this area. Construction and excavation works along Kilgobbin road has the potential to cause Moderate temporary impacts to the road traffic and pedestrians along the Kilgobbin Road and neighbouring streets.	High adverse impacts on hydrology are expected from N11 culvert upgrade due to due to sediment input and pollution form excavation, riverbed and riverbank disturbance and risk of accidental spill. The overspill flow path that re-enters Brides Glen River downstream of the viaduct is eliminated, which will result in a High adverse effect on the natural flood and sedimentation dynamics of the river. Instream works would have potential Moderate adverse effects on hydrology and biodiversity as a result of culvert construction and additional defences across Flood Cell 4. The construction of defences at Waterfall Cottage will have a Moderate permanent adverse visual effect on the setting of the structure. However, preventing the future flooding of the structure will have a positive effect on the physical fabric of the structure. Temporary Moderate construction impacts due to disturbance and nuisances are expected for residents.			Measures in Flood Cell 5 have highest impact on biodiversity. Significant instream works and tree removal along Commons Road and bridge reinforcement, and the importance of Loughlinstown Wood is expected to have High impacts during construction in absence of mitigation measures. Highest impacts on hydrology are expected Shanganagh River realignment. Temporary Moderate adverse effects are expected due to disturbance from construction machinery and excavation, and construction compound on site. Moderate adverse effects are anticipated at Shanganagh Bridge, a protected structure, due to the strengthening works. Construction impacts would be moderate and temporary, due to the construction compound, diversion of footpaths, stop and go system and road closures, with the compound located in the greenfield.		

Note: table key shown in Table 2-3 above

3 Description of Proposed Development

3.1 Introduction

This section of the EIAR outlines the proposed FRS for the Carrickmines-Shanganagh River, in the areas shown in Figure 3.1. Generally described, it is a series of flood defences positioned along the banks of the Carrickmines-Shanganagh river system as it flows from the R117 Enniskerry Road towards the sea between Killiney and Shankill. The defences comprise new and upgraded flood walls, culvert adjustments, and instream works.

3.2 Site Location and Context

The Carrickmines-Shanganagh River catchment is approximately 36km^2 and encompasses a wide variety of land uses ranging from rural mountainous areas in the west, to urban residential areas in the east. The proposed development will be situated primarily in the built-up residential parts of the catchment. A description of the works are as follows, from west to east (upstream to downstream). References to the areas are as shown in Figure 3.1.

Clon Brugh (Figure 3.1, defences 1.A and 1.B, and Figure 3.2) is a residential estate situated just east of the R117 Enniskerry Road. It comprises a mix of 3-4 storey apartment blocks and houses, with small green areas, car parking, and footpaths. The proposed works in this area will be located along an area of linear green space and footpath. The area surrounding Clon Brugh is also primarily residential, with green space to the west and south in the Dublin mountains foothills.

Belarmine Park (Figure 3.1, defences 2.B and 2.D, and Figure 3.3) is a small public park surrounded by residential areas to the north, east, west, and southwest, and a school to the southeast. The Kilgobbin Stream flows through the park from roughly west to east through a wooded area, with grassy areas to the north and south. A small pond or wetland is also within the park. The stream enters a culvert at the eastern end of the park and emerges approx. 80m upstream of Kilgobbin Road. Works will be taking place at the boundary wall between the park and houses to the north in Sandyford Hall Grove and Sandyford Hall Crescent.

Kilgobbin Road (Figure 3.1, defences 2.E and 2.G, and Figure 3.4) is a small road lined with trees and stone walls, with a narrow footpath on one side for much of its length. The works in this area will take place along the boundaries of two houses on the western side of the road, before running beneath the road and turning east down a narrow laneway, finally running across an area of open space to join back with the river approx. 220m downstream. The houses in this area are all detached, on large plots of land. Kilgobbin House is a protected structure (RPS No.1684) whose stone wall boundary will be removed and reconstructed as a flood wall. The stone walls in this area are of cultural heritage value and are discussed in Chapter 13 Cultural Heritage.

The works at 3.A (Figure 3.1, defence 3.A, and Figure 3.5) are centred around the Glenamuck Road North Roundabout, Ballyogan Grove/Castle View, and Priorsland. Works will be in close proximity to Carrickmines Castle (DU026-005001) and in view of houses along Ballyogan Grove/Castle View and Priorsland. Glenamuck Road North is a busy link road between Carrickmines and the M50 Junction 15, with access also to the Carrickmines Luas Park and Ride, and Leopardstown Racecourse. The proposed works along the northern side of the roundabout are adjacent to an existing footpath and segregated two-way cycle lane, while those along Ballyogan Grove/Castle View are adjacent to the existing road surface, and will replace an existing low stone wall.

Cherrywood Road (Figure 3.1, defence 4.A, and Figure 3.6) is a tree-lined local road with detached houses on either side. It is situated between the M50 to the west and the N11 to the east, with the Cherrywood Strategic Development Zone (SDZ) to the north. Land use in this area is primarily residential, with large green spaces separating individual houses. The proposed works will take place within the property of three

houses, adjacent to the river. The river has a riparian corridor here consisting of mature trees and other vegetation. Immediately downstream of this point, the river flows beneath the Cherrywood Viaduct, which is a protected structure (RPS No. 1783).

The works at 5.D (Figure 3.1, defence 5.D, and Figure 3.7) will take place on the Carrickmines River, between a green field to the west and the rear of buildings on Bray Road to the east. Bray Road is a cul-de-sac adjacent to the N11 with a mix of commercial and residential buildings. The buildings back on to the river which flows south before crossing under the N11 in a culvert. A mix of trees line the river, with an open green field on its western side.

Approximately 100m southeast of the Bray Road works, at Lower Brides Glen (Figure 3.1, defences 4.B and 4.C, and Figure 3.7), works will take place within the garden of a private residence called Waterfall Cottage, and beneath the N11. The N11 is a busy road corridor and changes to the M11 motorway approx. 500m south of the works area. The downstream end of the N11 culvert overflow works is within Loughlinstown Woods, a densely wooded area which is also designated as a proposed Natural Heritage Area (pNHA). The pNHA is discussed in Chapter 8 Biodiversity.

Works at 5.A (Figure 3.1) will take place along the Shanganagh River as it flows from west to east along Commons Road, under the Shanganagh Road Bridge, and between Shanganagh Wood and Brookdene. Upstream of the bridge, Commons Road has residential development along its south side, with the river adjacent to the north. The northern side of the river at this point is wooded, with one house and a bridge providing access at roughly the midway point of the works. North of the wooded area is housing. Shanganagh Road Bridge is a protected structure (RPS No. 1772) and is a narrow two-lane stone arch bridge. Downstream of the bridge, Shanganagh Wood and Brookdene are both residential roads, with a footpath adjacent to the river along Shanganagh Wood, and a riparian strip and tree line on the left (north) bank at Brookdene.

Bayview (Figure 3.1, defence 5.C) is a residential area bound to the east by the railway line and a green area through which the Shanganagh River flows. Bayview comprises semi-detached and detached houses with front and rear gardens. Downstream of this point, the river flows beneath the railway line and past Shanganagh Wastewater Treatment Plant to the south, before discharging into the sea at Killiney Bay.

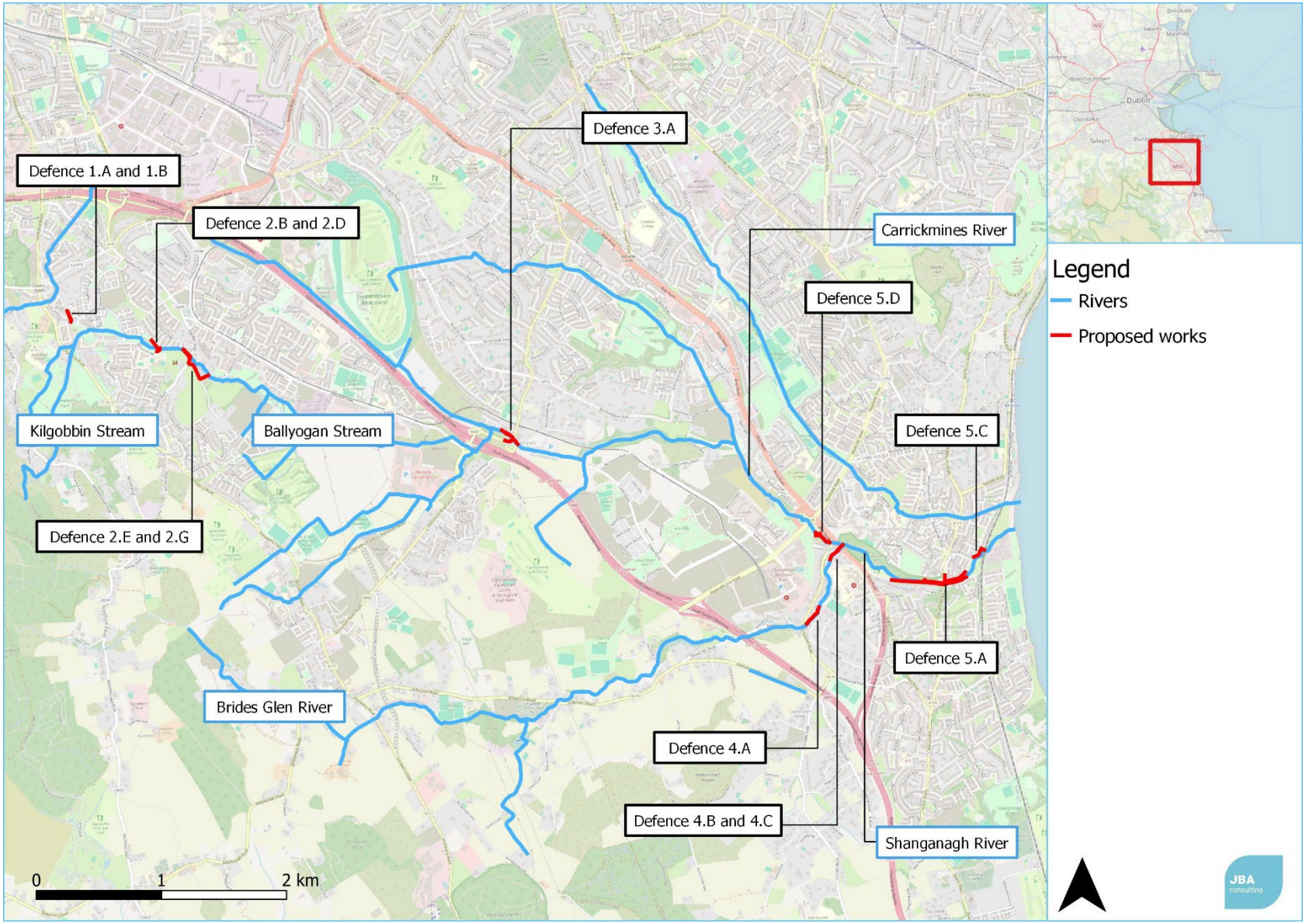

Figure 3.1: Carrickmines-Shanganagh FRS Overview

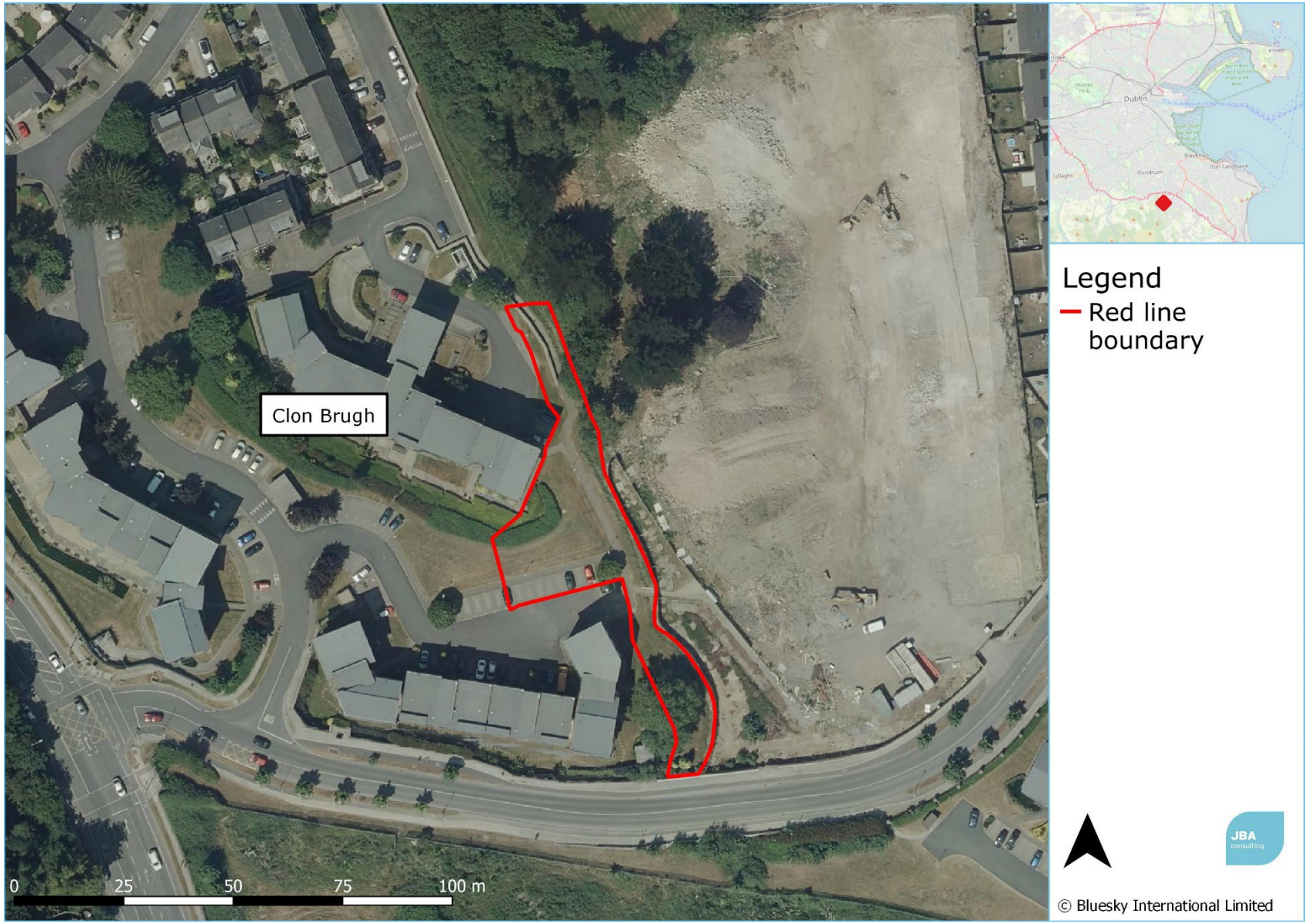

Figure 3.2: Proposed red line boundary at Clon Brugh – 1.A and 1.B

Figure 3.3: Proposed red line boundary at Belarmine Park – 2.B and 2.D

Figure 3.4: Proposed red line boundary at Kilgobbin Road – 2.E and 2.G

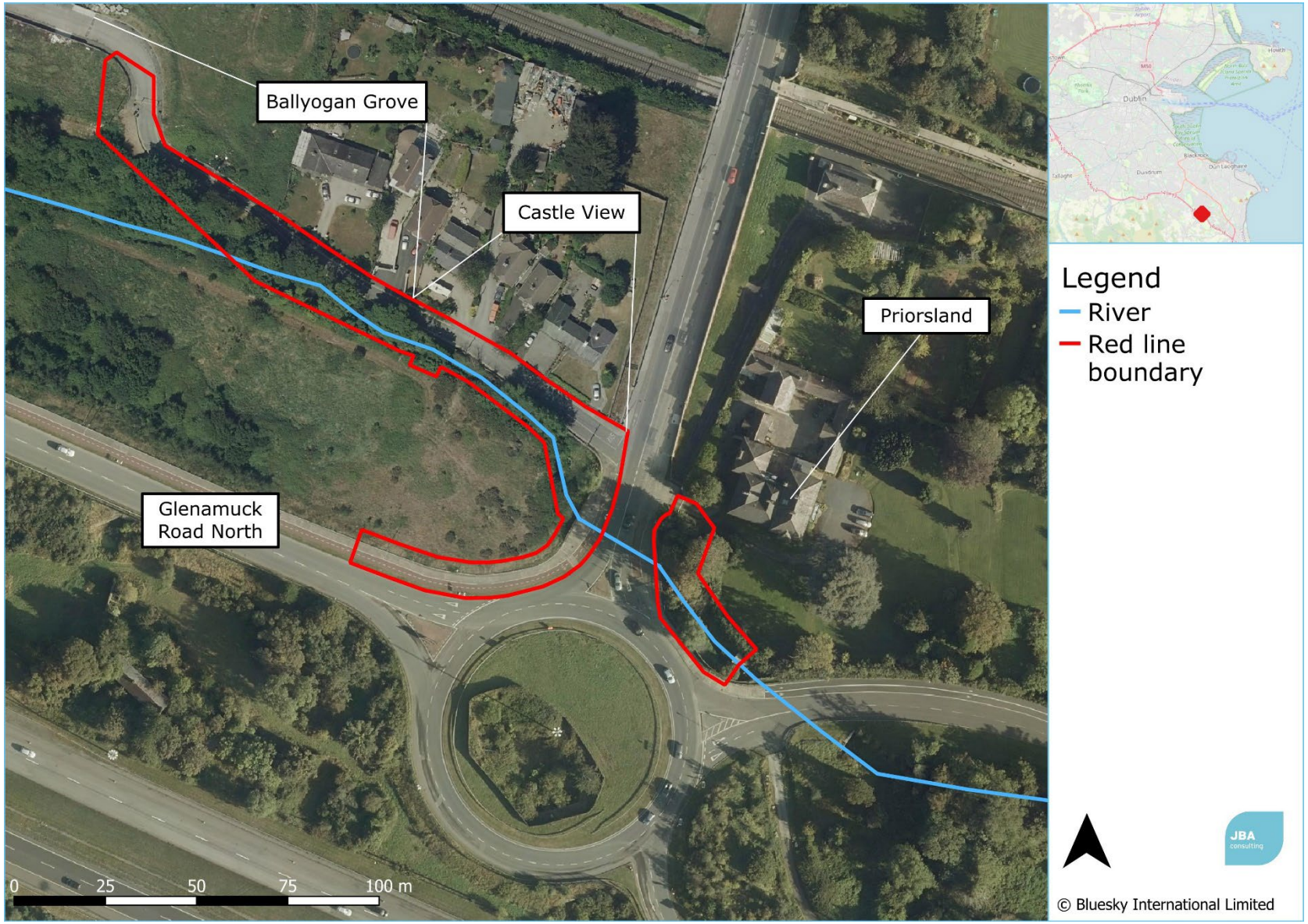

Figure 3.5: Proposed red line boundary at Glenamuck Road North - 3.A

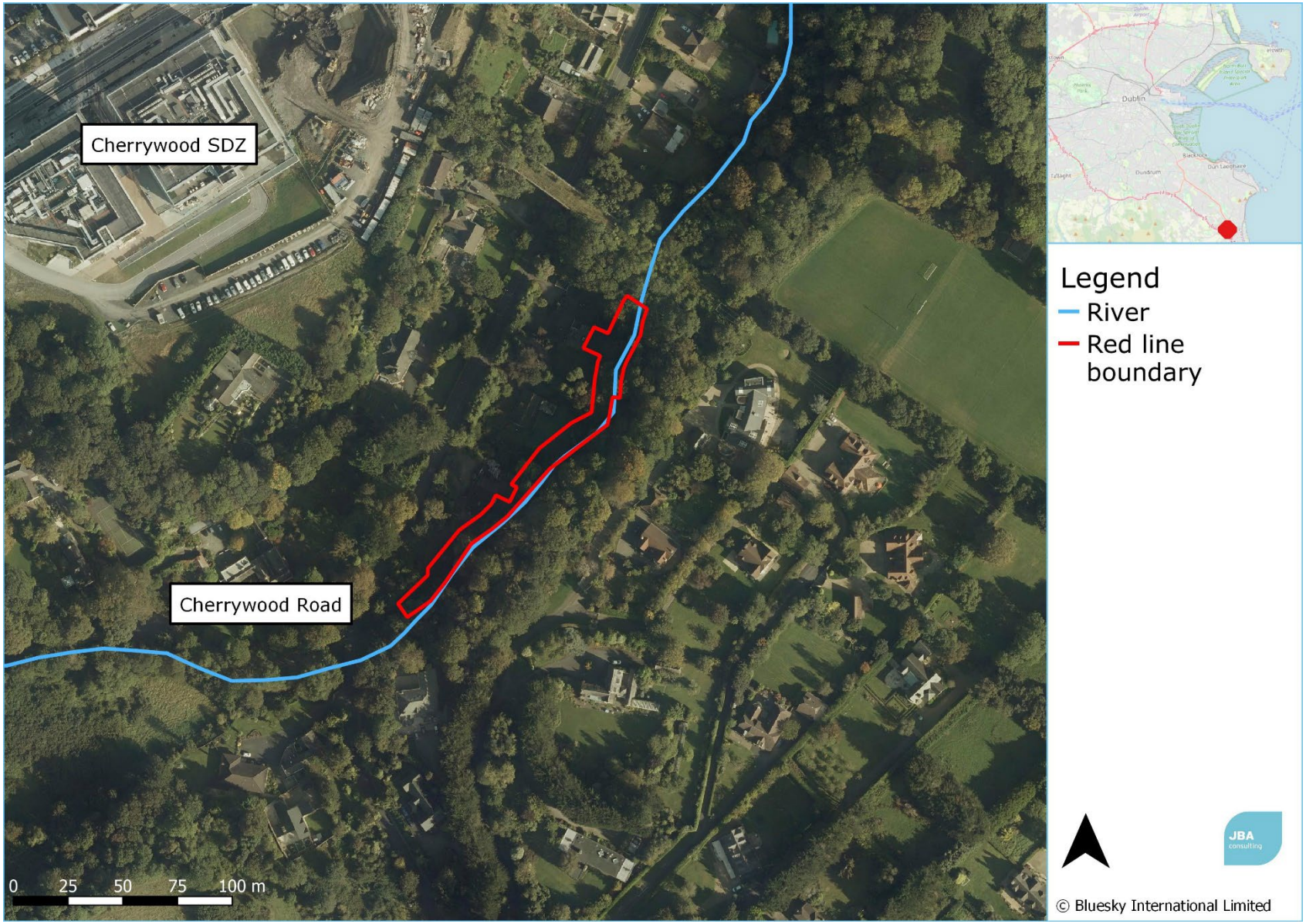

Figure 3.6: Proposed red line boundary at Cherrywood Road – 4.A

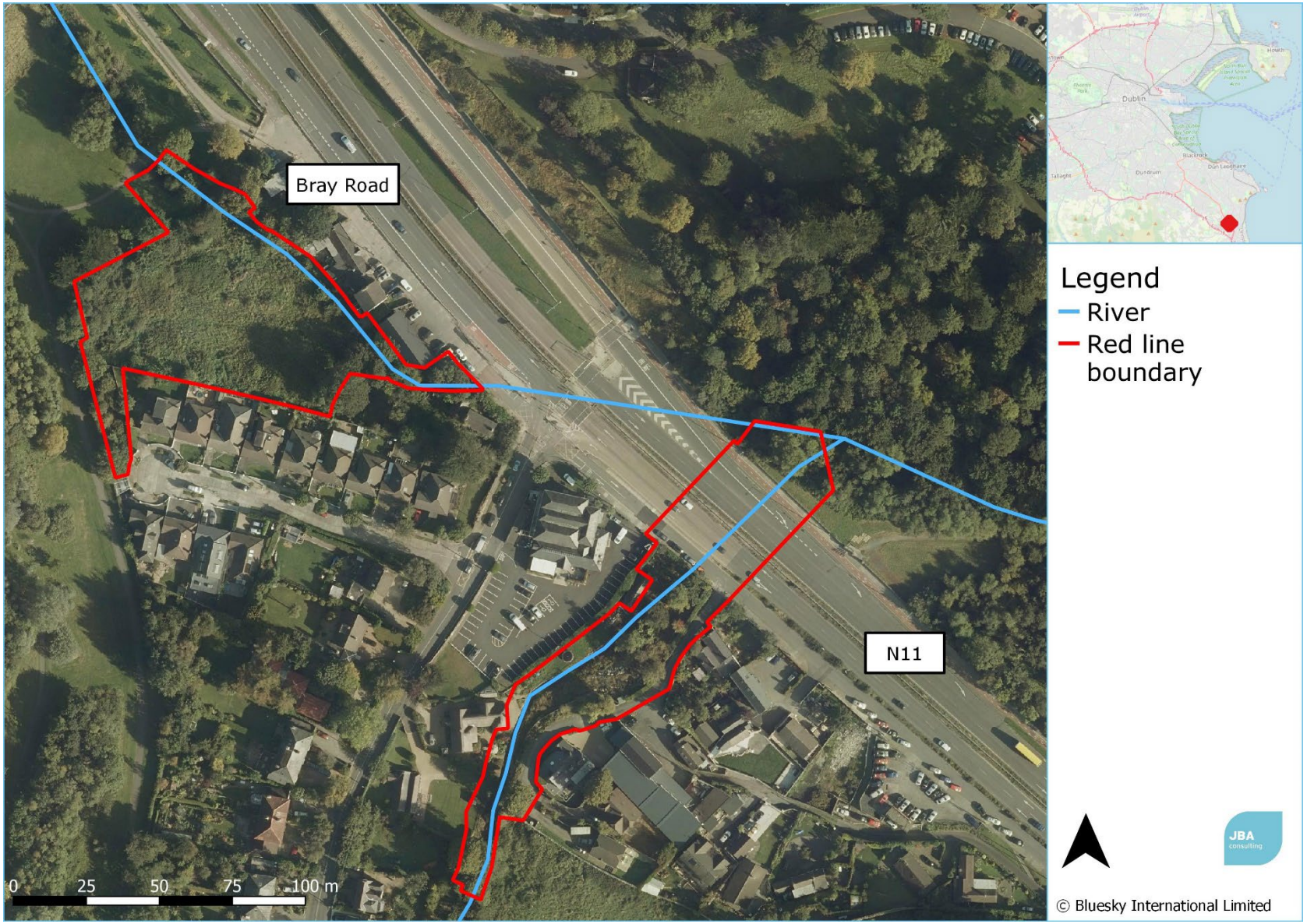

Figure 3.7: Proposed red line boundary at Lower Brides Glen and Bray Road - 4.B, 4.C and 5.D

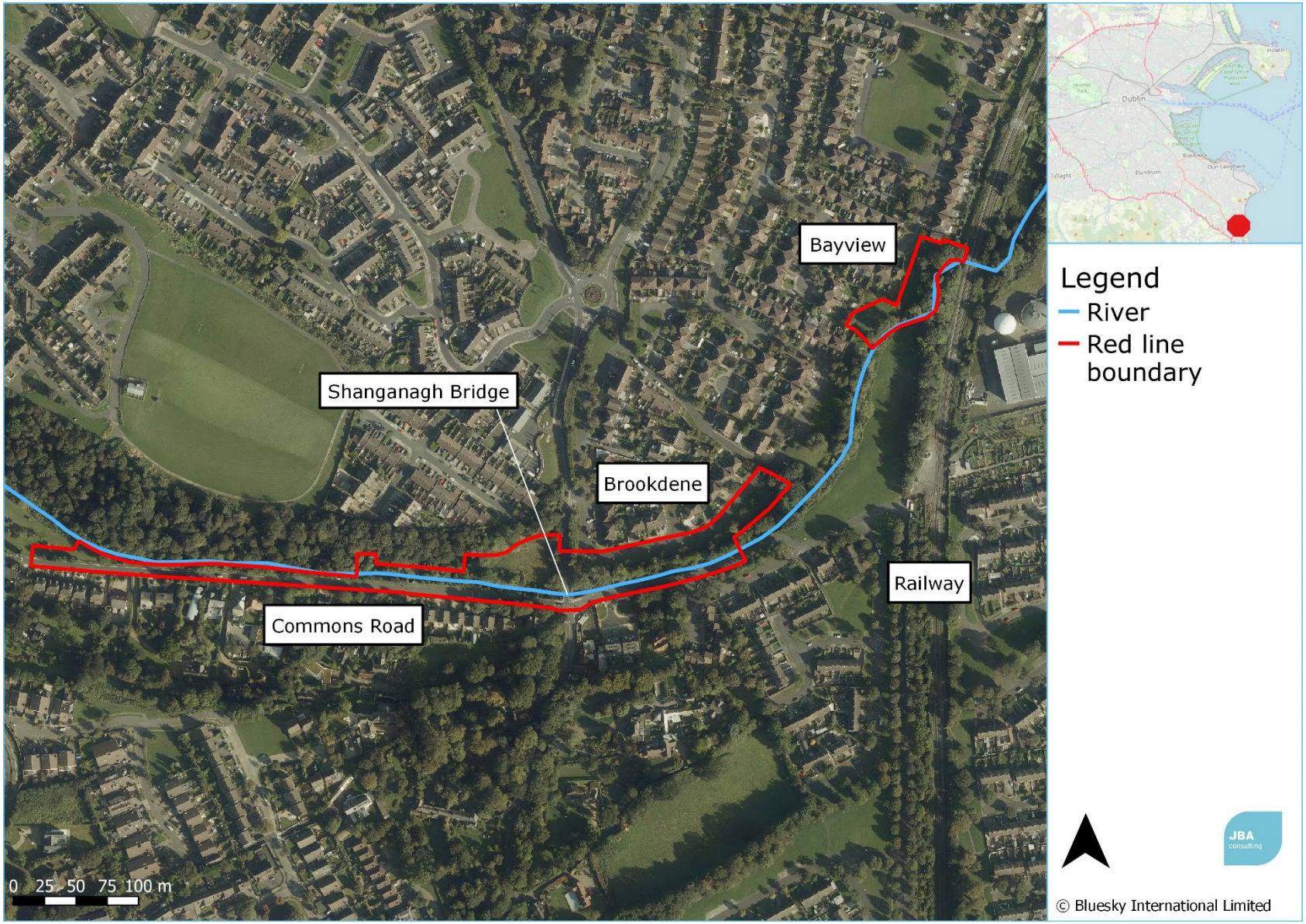

Figure 3.8: Proposed red line boundary at Commons Road, Brookdene, and Bayview – 5.A, 5.C

3.3 Description of Proposed Development

The Carrickmines-Shanganagh Flood Relief Scheme aims to develop an FRS for the Carrickmines-Shanganagh area with a SoP up to and including the 1% AEP event. Potential flood relief options for all locations within the study area where required were developed using combinations of those flood risk management measures which were determined to be technically viable. The measures proposed for the preferred option are listed in the table below.

Data from the GDSDS was used in hydraulic modelling for the proposed development. The purpose of this was to inform catchment delineation, and the data was included in urban areas of the model to route flows to the watercourses. The data was not connected to the 2D zone of the model to avoid issues with mapping sewer and fluvial flooding.

Level information was used to understand potential impacts on the surface water (SW) network at key locations, such as balancing ponds at Belarmine Park. However, the SW networks itself and existing control measures were not modelled in detail. Measures to mitigate potential impacts on the drainage network, e.g., flap vales, will form part of the detailed design.

Table 3.1: Measures included in FRS Preferred Option – developed further during the EIAR

Measure	Description
1.A	Addition of defences at Clon Brugh
1.B	Closing existing openings at walls at Clon Brugh
2.B	Upgrade of Belarmine culvert inlet
2.D	Addition of defences at Belarmine culvert inlet
2.E	Addition of defences upstream of Kilgobbin Road
2.G	Installation of flood relief culvert upstream of Kilgobbin Road Bridge
3.A	Addition of defences in the area around Glenamuck Rd North Roundabout
4.A	Addition of defences upstream of the existing Cherrywood Viaduct (Brides Glen River)
4.B	Addition of defences upstream of N11 culvert (Brides Glen River)
4.C	Addition of flood relief culvert at the N11 crossing
5.A	Raising and addition of walls at Commons Road and Brookdene
5.C	Addition of defences upstream of railway line, at Bayview
5.D	Addition of defences at Bray Road

3.3.1 Clon Brugh – 1.A, 1.B

The proposed measures at Clon Brugh are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02910_Clon Brugh_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02911_Clon Brugh_Proposed Sections
- 20108-JBB-00-XX-DR-Z-02912_Clon Brugh_Proposed Elevations

The proposed measures at Clon Brugh will protect from flood overflows from the Carysfort-Maretimo stream. This watercourse is not within the Carrickmines-Shanganagh catchment, however during flood events, flood water from this watercourse overflows into the Clon Brugh housing development. The measures as described below will be constructed along an open green space area, with a stretch of existing flood wall that will be realigned.

- Construction of c. 113m of new flood defence walls up to 1.35m high adjacent to the existing overland flow path from the Carysfort Maretimo Stream.
- Demolition of c. 16m of existing masonry walls and realignment works to the existing footpath.

3.3.2 Belarmine Park – 2.B, 2.D

The proposed measures at Belarmine Park are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02913_Belarmine Park_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02914_Belarmine Park_Proposed Sections
- 20108-JBB-00-XX-DR-Z-02915_Belarmine Park_Proposed Elevation

Belarmine Park is a small open green space with housing to the north, east, west, and southwest, and a school to the south. Mature trees are present in the area of works.

- Replacement of c. 100m of the Sandyford Hall boundary wall with a new concrete flood defence wall up to 2.6m high.
- Construction of c. 36m of new flood defence walls in Belarmine Park up to 1.65m high to tie into the existing culvert inlet.
- Minor upgrade works to the existing culvert inlet structure.

3.3.3 Kilgobbin – 2.E, 2.G

The proposed measures at Kilgobbin are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02916_Kilgobbin Road_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02917_Kilgobbin Road_Proposed Site Layout 2
- 20108-JBB-00-XX-DR-Z-02918_Kilgobbin Road_Proposed Elevations 2 and 3
- 20108-JBB-00-XX-DR-Z-02919_Kilgobbin Road_Proposed Sections
- 20108-JBB-00-XX-DR-Z-02920_Kilgobbin Road_Proposed Elevation 1

Proposed measures in this area will be along the boundaries of private gardens, and underneath the public road. One of the houses, Kilgobbin House, is a protected structure.

- Replacement of c.69m of existing stone boundary wall to a protected structure Kilgobbin House (RPS Ref: 1684) and construction of c.100m of stone finished flood defence walls up to c.1.7m upstream of Kilgobbin Bridge.
- Installation of c.298m of culvert from a proposed flow control weir at Kilgobbin Bridge to a discharge point adjoining Meadowbrook downstream.

3.3.4 Glenamuck Road North – 3.A

The proposed measures at Belarmine Park are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02921_Glenamuck Rd North_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02922_Glenamuck Rd North_Proposed Elevations
- 20108-JBB-00-XX-DR-Z-02923_Glenamuck Rd North_Proposed Sections

The area of works here is a busy link road between Glenamuck Road North and the M50 Junction 15, with access also to the Carrickmines Luas Park and Ride, and residential properties at Ballyogan Grove/Castle View and east of the Glenamuck Road North roundabout. The existing walls at Ballyogan Grove/Castle View have existing vegetation along them, including mature trees.

- Demolition and removal of c. 128m of existing masonry walls.
- Construction of c. 259m of stone finished flood defence walls up to 1.9m high, including flood gate, along Castle View/Ballyogan Grove and the upstream face of the bridge at Glenamuck Road roundabout.
- Construction of c. 90m of flood defence wall up to 1.5m high adjacent to the river immediately downstream of Glenamuck Road roundabout.
- Installation of a new in-channel debris screen immediately upstream of the existing bridge.

3.3.5 Cherrywood Road – 4.A

The proposed measures at Cherrywood Road are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02924_Cherrywood Road_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02925_Cherrywood Road_Proposed Elevations
- 20108-JBB-00-XX-DR-Z-02926_Cherrywood Road_Proposed Sections

This measure is within the gardens of 3 no. existing residential properties. Mature trees and vegetation are present along the river in this area.

- Construction of c. 178m of concrete flood defence wall ranging from 1.1m to 2.7m high, including demountable barriers and railings, on the bank of the Brides Glen River adjoining the existing properties and upstream of the Cherrywood Viaduct (RPS Ref. 1783).

3.3.6 Bray Road – 5.D

The proposed measures at Bray Road are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02927_Bray Road_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02928_Bray Road_Proposed Elevations
- 20108-JBB-00-XX-DR-Z-02929_Bray Road_Proposed Sections

This measure will be constructed along the rear of commercial properties at Bray Road. This area is generally not accessible to the public, but is partially visible from houses in Cherrywood Park and the open green space to the west.

- Construction of c. 133m of concrete flood defence wall ranging from 1.1m to 3.1m high, including flood gate, on the Carrickmines River to the rear of existing properties on Bray Road.
- Circa 75m of river channel realignment, replacement of the existing access bridge and strengthening works to the existing masonry arch.

3.3.7 Lower Brides Glen – 4.B

The proposed measures at Lower Brides Glen are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02930_Lower_Brides_Glen_N11_OF_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02931_Lower_Brides_Glen_N11_OF_Proposed Elevations
- 20108-JBB-00-XX-DR-Z-02932_Lower_Brides_Glen_N11_OF_Proposed Sections

This measure will be constructed within a private garden (Waterfall Cottage).

- Construction of c. 129m of flood defence walls ranging from 1.2m to 2m in height. The walls are to be located along the north bank of Brides Glen River, within the curtilage of existing properties including a protected structure Waterfall Cottage (RPS Ref: 1770) and immediately upstream of the N11 culvert. Works include demountable barriers and decorative railings.

3.3.8 N11 Overflow Culvert – 4.C

The proposed measures at the N11 are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02930_Lower_Brides_Glen_N11_OF_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02931_Lower_Brides_Glen_N11_OF_Proposed Elevations
- 20108-JBB-00-XX-DR-Z-02932_Lower_Brides_Glen_N11_OF_Proposed Sections

The current proposal allows for the installation of an overflow culvert to the Brides Glen River under the N11 to alleviate flooding immediately upstream of the current culvert under the N11, consisting of the following elements. Several trees will require removal.

- Installation of c. 53m of new 2.4m diameter overflow pipe beneath the N11 dual carriageway including an inlet upstream of the N11 and an outlet structure in Loughlinstown Park.

3.3.9 Commons Road, River Lane and Brookdene – 5.A

The proposed measures at Commons Road, River Lane, and Brookdene are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02934_Commons Road_&_Brookdene_Proposed Site Layout 1
- 20108-JBB-00-XX-DR-Z-02935_Commons Road_&_Brookdene_Proposed Site Layout 2
- 20108-JBB-00-XX-DR-Z-02936_Commons Road_&_Brookdene_Proposed Elevations 1
- 20108-JBB-00-XX-DR-Z-02937_Commons Road_&_Brookdene_Proposed Elevations 2
- 20108-JBB-00-XX-DR-Z-02938_Commons Road_&_Brookdene_Proposed Elevations 3
- 20108-JBB-00-XX-DR-Z-02939_Commons Road_&_Brookdene_Proposed Sections 6_6 to 12_12
- 20108-JBB-00-XX-DR-Z-02940_Commons Road_&_Brookdene_Proposed Sections 13_13 to 20_20
- 20108-JBB-00-XX-DR-Z-02941_Commons Road_&_Brookdene_Proposed Sections 21_21 to 23_23

An existing flood wall is present along part of Commons Road and Shanganagh Wood, on the right bank of the Shanganagh River. This flood wall will be upgraded to the required height, with new flood wall built to match it at the western end of the area. In Brookdene on the north side of the river, a new flood wall will be constructed in green open space, between an existing treeline/woodland and the road.

- Construction of c.209m of flood defence walls up to 2.4m high on Commons Road adjoining the river.
- Structural works to upgrade c. 324m of existing flood defence walls upstream of Shanganagh Road Bridge to an overall height of up to c.3.6m.
- Structural remedial works to the existing Protected Structure, Shanganagh Bridge (RPS Ref: 1773) including underpinning, scour protection and reinforcement of the masonry parapet.
- Upgrading of c.113m of existing flood defence wall on River Lane to a height of up to c.1.8m and construction of c.185m of flood defence wall to a height of up to c.1.2m in in the Brookdene Estate.

3.3.10 Bayview – 5.C

The proposed measures at Bayview are shown on the following planning drawings:

- 20108-JBB-00-XX-DR-Z-02942_Bayview_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02943_Bayview_Proposed Sections and Elevation

This measure will be located in an existing green open space, to the rear and side of houses in Bayview. Access to the grass area will be maintained following construction.

- Construction of c. 95m stone finished flood defence walls up to c.1.8m high in the green area adjacent to Bayview Grove/Lawns.
- Replacement of c.17m of existing boundary wall at 20 Bayview Lawns with a new flood defence wall to match existing wall height and finishes and
- Replacement of remaining c.10m of fence and wall tying into the culvert under the railway with a concrete flood defence wall.

3.4 Construction Activities

It is expected that the construction phase will take place over c. 18-24 months.

3.4.1 Construction Compounds

Several compound areas will be established during the construction phase, for use in different areas of the scheme. Establishment of these areas will include the following:

- Site offices;

- Site facilities (canteen, toilets, drying rooms, etc.);
- Secure compound for the storage of all on-site machinery and materials;
- Temporary car parking facilities;
- Temporary fencing;
- Site Security to restrict unauthorized entry;
- Bunded storage of fuels and refuelling area;
- A separate container will be located in the Contractors compound to store absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by a licenced waste contractor at a licenced site. Records will be maintained of material taken off site for disposal; and
- Drainage collection system for washing area to prevent run-off into surface water system.

It is expected that the following areas will be used as construction compounds, subject to agreement with the landowners, where located in private lands. Where located in private lands, compounds will be temporarily acquired by agreement with the landowners.

- At Clon Brugh, in the open green space adjacent to the works area;
- At Belarmine Park, lands immediately south of the works area. The public open space in use as the site compound will not be accessible to the public during the works. The proposed compound avoids an archaeological Zone of Notification in this area (discussed in more detail in Chapter 13);
- At Kilgobbin Road, in the greenfield on the left bank of the river, behind Riverside house. Access will be through an existing gate off Kilgobbin Road;
- At Glenamuck Road North, in the greenfield at the end of Ballyogan Grove. Access to the compound will be from the Leopardstown Racecourse Road;
- At Bray Road, in the greenfield on the right bank of the Carrickmines Stream, adjacent to the Bray Road channel widening works; and
- At Commons Road, in the DLRCC-owned greenfield area on the left bank of the Shanganagh River, immediately upstream of Shanganagh Road Bridge and accessed from Shanganagh Road.

The compound locations described above are shown in blue in Figure 3.9, Figure 3.10, and Figure 3.11. These areas are within the red line boundaries of the project.

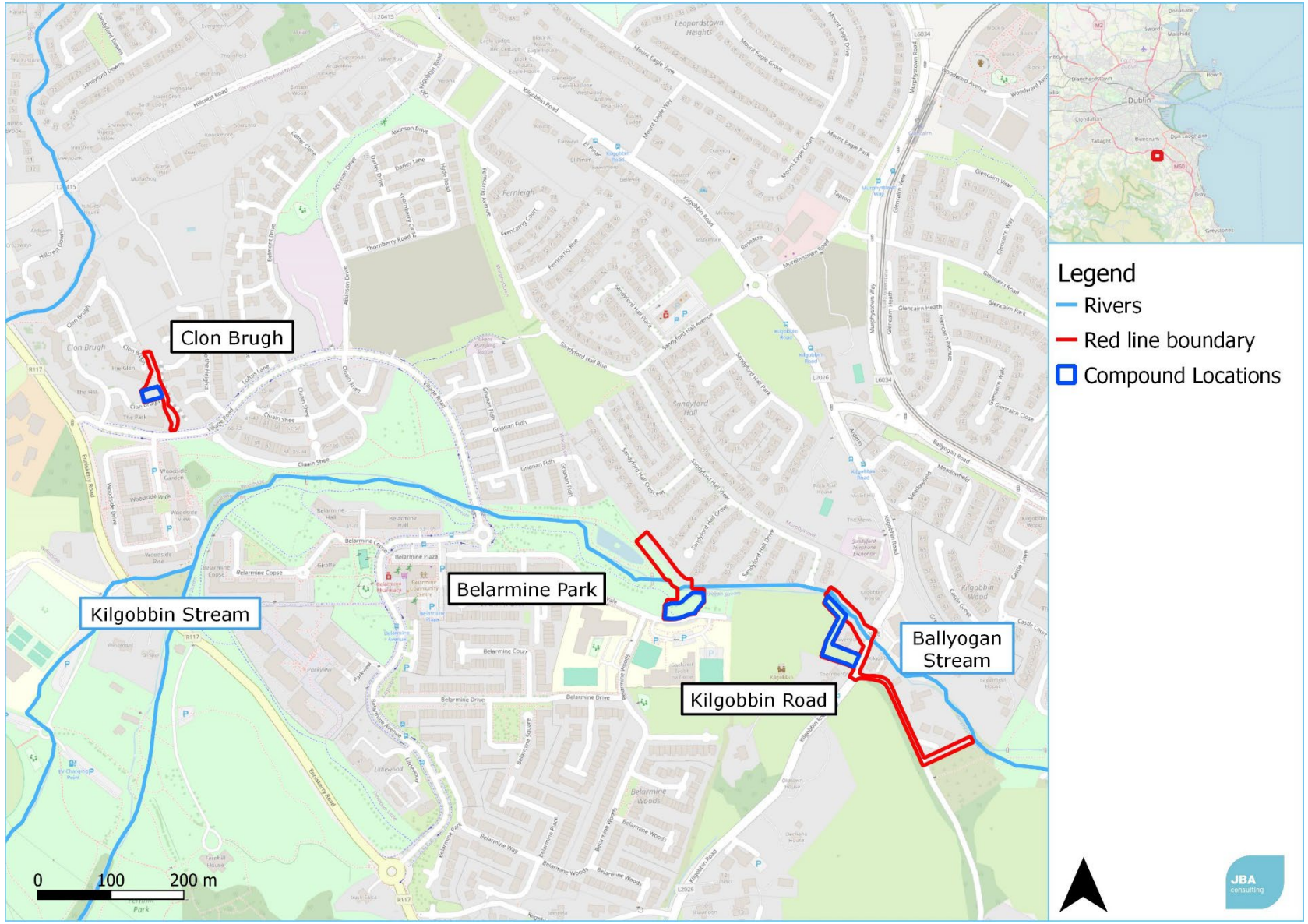

Figure 3.9: Compound locations, Clon Brugh (1.A and 1.B), Belarmine Park (2.B and 2.D), and Kilgobbin Road (2.E and 2.G)

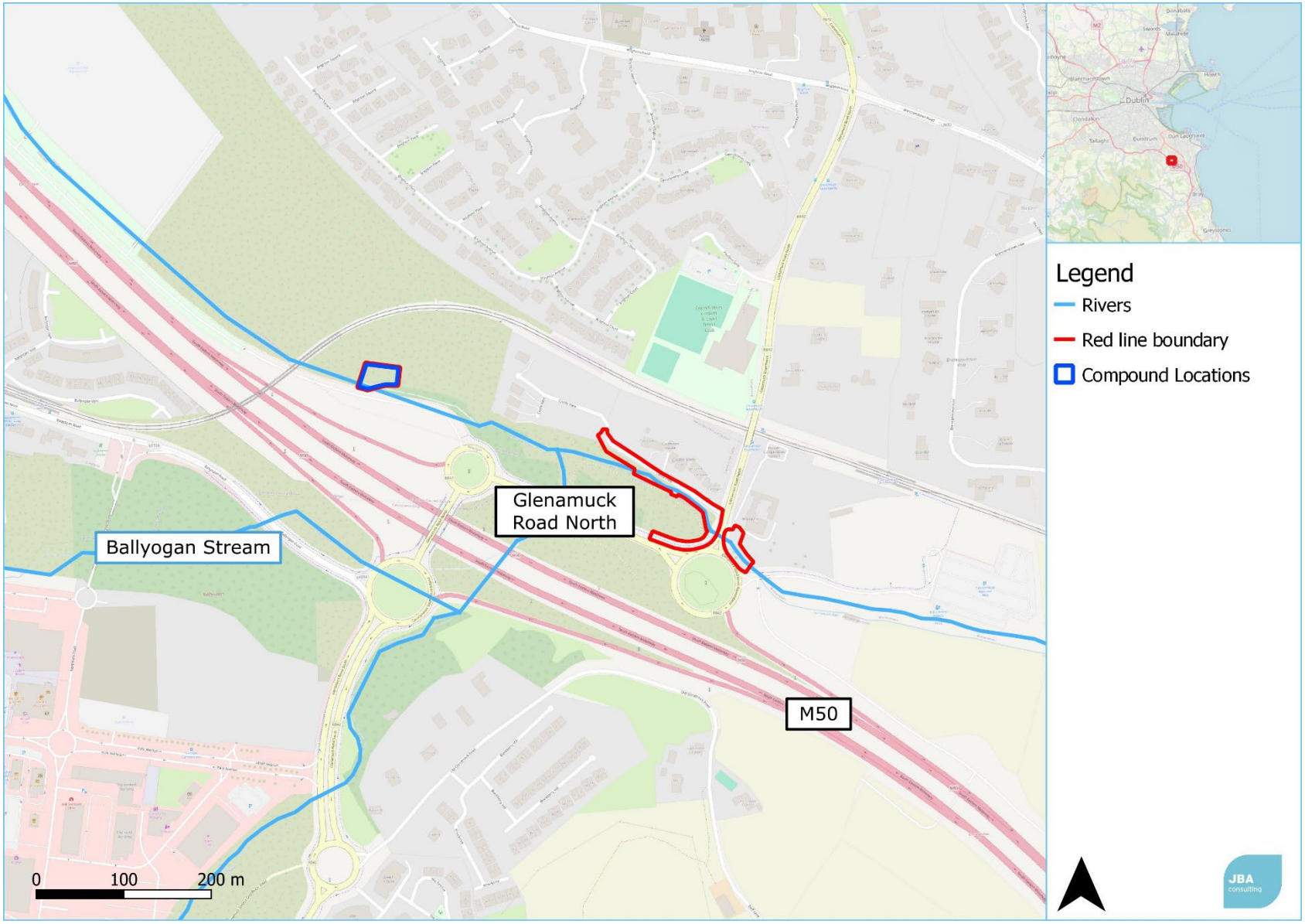

Figure 3.10: Compound location at Glenamuck Road North (3.A)

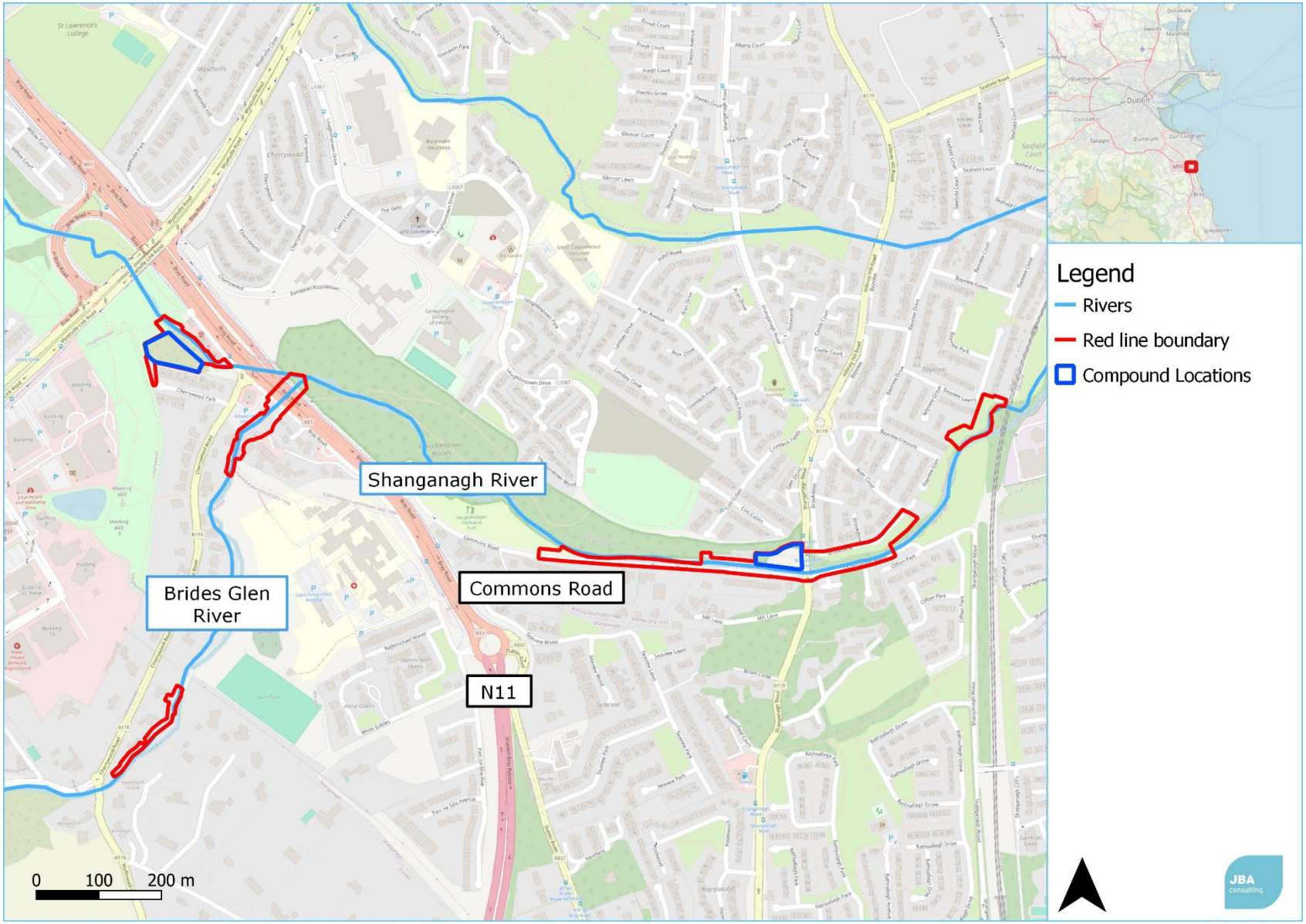

Figure 3.11: Compound locations at Bray Road (5.D) and Commons Road (5.A)

3.4.2 Construction Traffic Route

Construction traffic will travel to and from the site via the M50, N11, and local roads. Further construction traffic details and the associated impacts are described in Chapter 11 Material Assets – Traffic and Transport of this EIAR.

3.4.3 Excavation and Infilling

Excavation and import of soil and other materials will be required for construction of the walls and foundations. The Design Team has calculated that approx. 12,438 m^3 of material will be excavated and removed from site. Approx. 6,822 m^3 of soils will be imported for the backfill, and in addition to this, approx. 1,456.5 m^3 of other construction materials will be imported to site for roadworks.

3.4.4 Instream Works and Works Near Water

There will be instream works at Belarmine Culvert, Kilgobbin, Glenamuck Road North, Bray Road, N11 Culvert, and Shanganagh Road Bridge. Works will take place near water throughout the scheme. Mitigation measures for these works are outlined in Chapter 10 of this EIAR.

At Belarmine Park, instream works will be necessary for the installation of the culvert upgrade and wall foundations. The instream phase will consist of:

- Installing protections prior to works commencing.
- Regrading the inlet structure and upgrading the existing screen.
- Excavating and installing wall foundations.
- Removing temporary works following construction.

At Kilgobbin Road, instream works will be required for the installation of the new weir structure. The instream phase of the works will consist of:

- Installing protections prior to works commencing
- Installing a reinforced concrete weir structure, including excavation of the river bedding, foundations, superstructure, scour protection and reinstatement of the river bedding.
- Removing temporary works following construction.

At Glenamuck Road North, instrewam works will be required for the construction of the debris screen. The instream phase of the works will consist of:

- Installing protections prior to works commencing
- Installing the proposed debris screen.
- Removing temporary works following construction.

At Cherrywood Road, instream works will be required for the installation of the new flood wall. The instream phase of the works will consist of:

- Installing protections prior to works commencing.
- Excavating and installing wall foundations.
- Removing temporary works following construction.

At Bray Road, instream works will be required for the installation of wall foundations and for channel widening. The instream phase of the works will consist of:

- Installing protections prior to works commencing.
- Excavating the left bank upstream of the footbridge to foundation level, stabilisation works may be required.
- Installing the flood defence walls, including any joint installation and treatment between the sections.
- Reinstate the sides of the left bank to the new design level.
- Rearranging protections as may be required to allow for the channel realignment.

- Excavating the realigned section of the stream.
- Planting vegetation along the new riverbank as required.
- Removing temporary works following construction.

At the N11 culvert and Lower Brides Glen, instream works will be necessary for the installation of the new weir structure and new flood defence wall. The instream phase of the works will consist of:

- Installing protections prior to works commencing.
- Installing the new flood defence wall.
- Installing a reinforced concrete weir structure, including excavation of the river bedding, foundations, superstructure, scour protection and reinstatement of the river bedding.
- Removing temporary works following construction.

At Commons Road, instream works will be necessary for the bridge reinforcement works and installation of flood defences. The instream phase of the works will consist of:

- Installing protections prior to works commencing.
- Carry out reinforcement works to bridge foundations and masonry and works on walls.
- Reinstate soil removed for instream works.
- After the concrete has reached its design strength, remove temporary supports.
- Relocate instream protection elements to the other half of the riverbed.
- Repeat steps above in the other half of the stream.

At Bayview, instream works will be necessary at the interface with the existing culvert beneath the railway line. The instream phase of works will consist of:

- Installing protections prior to works commencing.
- Temporary trench supports (e.g. sheet piles) or other temporary works (cofferdam) may be required to accommodate a safe working for construction of the flood defence walls. Continual over pumping of water will be required to maintain the safe working space. A cofferdam for instream works will create a temporary restriction of the existing channel width.
- Liaison with Íarnród Eireann and CIE will be necessary prior to works commencing close to the railway line.

3.5 Maintenance and Operational Activities

Following construction, each proposed measure will have its own bespoke management plan.

Regular inspections of the proposed structures will take place, together with investigations of their performance after each flood event.

A routine inspection and maintenance plan will be developed whereby Dún Laoghaire Rathdown County Council and/or nominated maintenance contractors will inspect and maintain the proposed structures once per year to examine them for any defects and to ensure that staff are trained and familiar with the operational process for them. It is assumed that this will primarily be a combination of visual inspection for any damage, spot repairs to walls where needed, and removal of materials which could act as blockages, e.g., large tree branches which have fallen into the river or waste. Maintenance will not include removal of natural sediment deposition or in-channel or riparian vegetation. If such removal of sediment or vegetation is required in order to ensure proper conveyance, mitigation measures outlined in Section 10.4.4 will be followed.

3.6 Decommissioning

Decommissioning of the proposed development is not expected to occur. Regular maintenance of structures will take place to identify any damage or deterioration. The proposed development has been designed to be

adaptable to changing conditions as a result of climate change. This will allow it to remain in use in the future and be adapted when necessary.

4 Legislation and Planning Policy

4.1 Introduction

This section of the EIAR considers the proposed development in the context of national, regional, and local planning policy, and the legislation governing the proposed works.

4.2 European Union (EU) Law and Policy

4.2.1 EU 'Floods' Directive 2007

The EU Directive on the assessment and management of flood risk, often referred to as the 'Floods Directive', came into force in 2007 and works in tandem with the Water Framework Directive for the protection of water quality.

The requirements of the EU 'Floods' Directive, have been implemented in Ireland as the assessment and management of floods through the Catchment Flood Risk Assessment and Management (CFRAM) Programme. Under CFRAM the Office of Public Works has published a series of documents and policies and plans that set out measures flood risk and the most at-risk communities. CFRAM recommends a proactive approach to flood risk and protection.

In terms of major Flood Relief Schemes, works are typically designed and built to a standard that protects against the 1 in 100-year flood event, and for coastal areas the 1 in 200-year flood event. As the areas subject of this EIAR are highly susceptible to fluvial flooding the 1 in 100-year standard is considered appropriate for these works. Consistent with the Directive, the proposed development is defined to provide protection to properties in the study area from the 1 in 100-year fluvial flood event.

Carrickmines – Shanganagh River is detailed within the Eastern Flood Risk Management Plan, this is set out in detail in section 4.3.3. The plan sets out specific details in relation to flood risk management for the southwest region to meet Ireland's obligations under the 2007 EU 'Floods' Directive.

4.3 Planning Legislation and Policy Provisions

This section sets out the relevant guidance and policy objectives that have been considered in relation to the proposed flood defence works at Carrickmines - Shanganagh. Firstly, this section considers the legislation governing the Irish planning system, specifically as it relates to flood management works, then moving on to discuss the broad level national strategic objectives, guidelines and policies adopted by the Irish Government in relation to spatial development, physical infrastructure and climate change agreements. Secondly, this section provides an overview of the regional context of the proposed works, and lastly will consider local objectives and development standards as indicated within the city development plan.

4.3.1 The Planning and Development Act 2000 (as amended), and the Planning and Development Regulations 2001, as amended

The Planning and Development Act 2000 (as amended) forms the basis of the Irish planning system, setting out the detail of for planning guidelines, obtaining planning permission and the process for Environmental Impact Assessment.

Dún Laoghaire-Rathdown County Council wishes to prepare a Planning Application to An Bord Pleanála, under Section 175 of the Planning and Development Act, 2000 (as amended), for the construction of a Flood Relief Scheme for Carrickmines - Shanganagh.

The prescribed classes of development and thresholds that trigger a mandatory Environmental Impact Assessment (EIA) are set out in Schedule 5 of the Planning and Development Regulations, 2001, as amended. The most relevant criterion is Class 10 of Part 2 of Schedule 5 which states:

10. Infrastructure projects

(f) (ii) Canalisation and flood relief works, where the immediate contributing sub-catchment of the proposed works (i.e. the difference between the contributing catchments at the upper and lower extent of the works) would exceed 100 hectares or where more than 2 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 kilometres (S.I. No.600/2001- Planning and Development Regulations 2001).

The requirements in respect of Environmental Impact Assessment are contained within the Planning Act and these are described in detail in Chapter 1.

4.3.2 National Policy

National Planning Framework (NPF)

The NPF sets out a framework of policy objectives to help Ireland achieve its long-term sustainable goals. The strategic plan focuses on integrating Ireland's economic development, spatial planning, infrastructure planning and social considerations. It promotes environmentally focused planning at local level to tackle climate change and the implementation of appropriate measures to mitigate existing issues.

The plan aims to align itself with the UN Sustainable Development Goals, by ensuring that the decision process will safeguard the needs of future generations. These objectives are integrated as part of the National Strategic Outcomes [NSOs] in areas such as climate action, sustainable cities and innovation and infrastructure.

National Strategic Outcome 9 outlines the urgency of upgrading and investing in water management and environmental resources. In which it states;

Coordinate EU Flood Directive and Water Framework Directive implementation and statutory plans across the planning hierarchy, including national guidance on the relationship between the planning system and river basin management. Local authorities, DHPLG, OPW and other relevant Departments and agencies working together to implement the recommendations of the CFRAM programme will ensure that flood risk management policies and infrastructure are progressively implemented.

Flood relief measures are further highlighted under Section 9 of the NPF, titled *Realising our Sustainable Future*. It is envisioned that planning will play a vital role in mitigating development in inappropriate or vulnerable areas and will aid the delivery and design of necessary infrastructure in our towns and cities.

The proposed development will deliver flood defences to protect from flood events, the proposed works have been developed in a manner which is consistent with NSO 9 of the NPF.

The Planning System and Flood Risk Management 2009

The Office of Public Works [OPW] in conjunction with the Department of Environment, Heritage and Local Government [DEHLG] published a set of guidelines in relation to flood risk management. Subject to which the plan advocates a proactive approach to prevent flooding from occurring. This includes, for example, adopting general policies for protection, improve or restore floodplains and the upgrading of flood barriers. Under these guidelines Planning Authorities have a key role in the delivery of effective measures, policies and infrastructure to minimise the risk of flooding.

In this regard, the proposed development by Dún Laoghaire-Rathdown County Council acknowledges the key role of the Council in minimising flood risk.

Climate Change Sectoral Adaptation Plan for Flood Risk Management, 2015

The Climate Change Sectoral Adaptation Plan for Flood Risk Management, 2015, sets out the policy on climate change adaptation of the OPW, the lead agency for flood risk management in Ireland, based on a

current understanding of the potential consequences of climate change for flooding and flood risk in Ireland, and the adaptation actions to be implemented by the OPW and other responsible Departments and agencies in the flood risk management sector.

Our Sustainable Future: Framework for Sustainable Development

The Our Sustainable Future: Framework for Sustainable Development paper sets out the national vision to enhance Ireland's sustainable future, sets out the challenges and targets to be adhered to. In terms of flood management and flood risk assessment, the framework acknowledges this as one of the largest challenges to be addressed in the coming years. As most cities and towns on the island have developed along rivers and coastal areas, the majority of urban centres are exposed to flood risk. As national economic prosperity is heavily reliant on the success of cities, and towns, the adoption of flood relief and protection is vital for future growth and will require the integration of comprehensive infrastructure as part of the built environment.

The proposed development is aligned with this policy.

Climate Action Plan 2024

Annually, the Climate Action Plan is published by the Government of Ireland which sets out carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve our emissions by 2030. The Climate Action Plan 2024 identifies the role flood risk mitigation can play in how Ireland adapts as a result of climate change and in mitigating the implications of such, the plan outlines the urgent need to accelerate efforts to mitigate and adapt to flood risk. The Plan sets out the Office of Public works will seek to support the development of appropriate flood mitigation and adaption scheme.

4.3.3 Regional Policy

Eastern and Midland Regional Assembly, Regional Spatial and Economic Strategy 2019

The Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region was adopted in 2020. The plan provides a long-term regional level strategic plan for physical growth, economic investment and social development for the Eastern and Midland Region and seeks to align national goals set out in the NPF with local considerations, subject to which flooding is identified as key challenge facing cities and towns in the region.

The RSES supports measures that address climate action, as outlined in the NPF, these will include Renewable Energy, Sustainable Transport and Climate Resilience through Flood Defence. The latter to also provide for Flood Risk Management and to help reduce vulnerability in known flood zones.

The following objectives contained within the RSES are of note:

> **RPO 10.15**: Support the relevant local authorities (and Irish Water where relevant) in the Region to improve storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in the urban environment and in the development and provision at a local level of Sustainable Urban Drainage solutions.

Section 7.4 of the Strategy relates to Flood Risk Management in the region. It notes that the region has experienced a number of severe flood events and acknowledges the role of local authorities and public bodies in preventing future flood events through the planning system and through the delivery of infrastructure.

The following policies relate to Flood Risk Management:

> **RPO 7.13:** EMRA will work with local authorities, the OPW and other relevant departments and agencies to implement the recommendations of the CFRAM programme to ensure that flood risk management policies and infrastructure are progressively implemented.

> **RPO 7.14:** Local authorities shall take account of and incorporate into the development of local planning policy and decision making the recommendations of the Flood Risk Management Plans (FRMPs), including planned investment measures for managing and reducing flood risk.

The Flood Relief Works proposed by Dún Laoghaire-Rathdown County Council are in keeping with policies and objectives set out within the Eastern and Midland Regional Spatial and Economic Strategic as they will see the implementation of the CFRAM programme recommendations reduce future flood risk.

Eastern Flood Risk Management Plan (CFRAM)

The CFRAM Programme, prepared by the OPW, has examined the flood risk, and possible measures to address the risk, in 300 communities throughout the country at potentially significant flood risk. The Eastern Flood Risk Management Plan (the 'Plan') sets out the feasible flood risk mitigation measures for the river basin network for the Eastern Region and Greater Dublin Area.

The CFRAM UoM10 Flood Risk Management Plan identifies a number of areas within Dun Laoghaire-Rathdown which require flood risk mitigation. This includes Loughlinstown. The CFRAM UoM10 identifies that Loughlinstown has experienced flooding events in the past and some flood relief works have been carried out. However, it notes that the area is currently at risk arising from the surcharging of culverted watercourses, and flood relief works are required.

4.3.4 Local Policy

Dún Laoghaire-Rathdown County Development Plan 2022-2028

The Dún Laoghaire-Rathdown County Development Plan came into effect on the 21st of April 2022. The Plan sets out the policies and objectives for the development of the County over the Plan period with regard to both National and Regional policies.

The Plan acknowledges the significant role flood risk management plays in the planning process and the requirement to consider flood risks at all stages of the planning process. The Plan notes that this is of significant importance having regard to the risks associated with climate change. The plan sets out to, where possible to, avoid, substitute, justify and mitigate against flood risks. Having regard to this, the Plan sets out the following policies and objectives:

> **Policy Objective EI21: Catchment Flood Risk Assessment and Management (CFRAM):** It is a Policy Objective to assist the Office of Public Works (OPW) in the design and construction of flood relief schemes approved in the ten-year Programme of Investment in Flood Relief Measures following from the recommendations and outputsof the CFRAM for the Eastern District that are relevant for DLR.
>
> **Policy Objective EI22: Flood Risk Management**: It is a Policy Objective to support, in cooperation with the OPW, the implementation of the EU Flood Risk Directive (20010/60/EC) on the assessment and management of flood risks, the Flood Risk Regulations (SI No 122 of 2010) and the Department of the Environment, Heritage and Local Government and the Office of Public Works Guidelines on 'The Planning System and Flood Risk Management' (2009) and relevant outputs of the Eastern District Catchment and Flood Risk Assessment and Management Study (ECFRAMS Study). Implementation of the above shall be via the policies and objectives, and all measures to mitigate identified flood risk, including those recommended under part 3 (flood risk considerations) of the Justification Tests, in the Strategic Flood Risk Assessment set out in Appendix 15 of this Plan.

Chapter 10 of the Plan, Environmental Infrastructure and Flood Risk, identifies that one of the key overall objectives of the plan is to provide flood protection measures and reduce flood risk as far as possible.

The proposed works and subject of this EIAR, seeks to deliver works which would be entirely consistent with the climate change adaptation and flood risk management objectives outlined in the County Development Plan.

The proposed works are to be developed across a number of sites and consist of 13 no. flood defences. The location of works is outlined below in relation to the land use zoning objectives for the sites below:

Table 4.1: Land Use Zoning Objectives in relation to Proposed Works

Flood Defence	Land Use Zoning Objective
1 A	Objective A & Objective F
1 B	Objective A & Objective F
2 B	Objective F
2 D	Objective F
2 E	Objective F & Objective A
2 G	Objective F & Objective A
3 A	Objective A
4 A	Objective A1
4 B	Objective A1
4 C	Objective A1
5 A	Objective F
5 C	Objective F
5 D	Objective NC & Objective F

Chapter 13 of the Plan outlines the objectives of each land use zoning identified under the Plan, these are as follows:

- **Objective A:** To provide residential development and improve residential amenity while protecting the existing residential amenities.
- **Objective A1:** To provide for new residential communities and Sustainable Neighbourhood Infrastructure in accordance with approved local area plans.
- **Objective F:** To preserve and provide for open space with ancillary active recreational amenities.
- **Objective NC:** To protect, provide for and/or improve mixed-use neighbourhood centre facilities.

A manner of different development types is identified as being permitted under these land use zonings. While the development of flood relief works is not identified as being permissible or open for consideration under this land use zoning.

The Plan does identify that the development of Public Services is permissible or open for consideration in lands zoned: A1, A, F and NC. Under the Plan Public Services are defined as:

> *'A building or part thereof, a roadway or land used for the provision of 'Public Services'. 'Public Services' include all service installations necessarily required by electricity, gas, telephone, radio, telecommunications, television, data transmission, water, drainage and other statutory undertakers; it includes public lavatories, public telephone boxes, bus shelters, bring centres, green waste composting facilities, etc. it can be concluded that the proposed works are in keeping with the overall objective of each land use zoning and would not be contrary to these objectives'.*

While flood defence works are not included in this definition, it is clear the civic works of a similar nature are considered permissible in these land use zoning objectives.

Notwithstanding this, the proposed works would not result in the undermining of the key objectives of the land use zoning objectives.

Further to this, the proposed works interact with 3no. sites with site specific objectives, these are as follows:

> ***Specific Local Objective 68:*** *To create a linear park along the Loughlinstown river incorporating a pedestrian route and cycleway (greenway), which will link Cabinteely Park to the sea at Rathsallagh.*

Special Local Objective 81: *To ensure the provision of a combined pedestrian footpath/cycleway connection between Belarmine and Kilgobbin Road to improve overall local permeability and to facilitate direct access from new residential communities to the Luas Line B1 public transport corridor.*

Specific Local Objective 84: *To conserve and protect Carrickmines Castle site and to proceed to implement the Carrickmines Castle Conservation Plan 2015-2025.*

The proposed development will not result in any negative impact on these site objectives.

The Development Plan sets out the structures which have been designated under the Record of Protected Structures within the Plan. The Plan indicates that the proposed development is adjacent to a number of protected structures and Recorded Monuments and Places. The relationship between the proposed development and these structures is fully outlined and assessed in the Cultural Heritage chapter of this EIAR.

Areas identified as the location of defence 5A are located adjacent to lands which are identified as the Loughlinstown Wood Proposed Natural Heritage Area (pNHA). As such, the following objective is of relevance:

Policy Objective GIB18 Protection of Natural Heritage and the Environment: *It is a Policy Objective to protect and conserve the environment including, in particular, the natural heritage of the County and to conserve and manage Nationally and Internationally important and EU designated sites - such as Special Protection Areas (SPAs), Special Areas of Conservations (SACs), proposed Natural Heritage Areas (pNHAs) and Ramsar sites (wetlands) - as well as non-designated areas of high nature conservation value known as locally important areas which also serve as 'Stepping Stones' for the purposes of Article 10 of the Habitats Directive.*

The sites identified for the proposed flood defences are not located within or adjacent to any Special Areas of Conservation or Special Protection Areas.

4.4 Planning History

There are a number of recent planning applications in the vicinity of works. Table 4.2 below sets out any planning history within the last six years which directly abuts the sites of the proposed FRS.

Table 4.2: Planning History abutting Proposed Works

Defence 1A & 1B		
APP REF	Description	Decision
D20A/0698 / ABP-310009-21	Retention and completion of a retaining wall in the residential development, permitted under planning reg. ref. D16A/0393, and subsequent planning reg. ref. D18A/0509. Permission is sought to retain and complete a partially built retaining wall along the western part of the site, along with all associated site works.	Grant
Defence 2B & 2D		
APP REF	Description	Decision
ABP31454622	Development of a Strategic Housing Development consisting of 346 no. apartment units.	Grant
Defence 2E & 2G		

APP REF	Description	Decision
D24A/0341/WEB	The construction of 89 no. residential units, comprising 39 no. houses and 50 no. apartments	Awaiting Decision
D21B/0346	Permission for the demolition of a conservatory and construction of a ground-floor extension at the side and rear, demolish a flat roof, and construction of a new warm roof raised up to obtain extra ceiling height, increase the height of the walls, windows & doors to fit under new roof, demolition of a porch and construction of a new porch, provision of additional windows & doors, internal layout reconfiguration, and all ancillary works necessary to facilitate the development.	Grant
Defence 3A		
APP REF	Description	Decision
D20B/0101	Permission for new raised pitched roof with dormer window to the side over existing single storey detached bungalow to accommodate 3no. of bedrooms and bathrooms at attic level; single storey extension with flat roof to the rear; alterations to elevations and internal layout; 6 No. of roof lights and all associated site development works.	Grant
DZ17A/0114	Planning permission is sought for a permanent park and ride facility within the Cherrywood Planning Scheme, adjacent to the existing temporary park and ride facility situated off the Glenamuck Road	Grant
Defence 4A		
APP REF	Description	Decision
D23A/0583	Planning permission for development which consists of: The demolition of two existing single-storey extensions to the rear of the property; Construction of two smaller, single-storey extensions to the rear of the property; Construction of an internal single storey corridor to replace an existing outdoor courtyard; Construction of a new two storey element to facilitate a new entrance area and first floor bedroom	Grant
D21B/0658	Permission sought for Garden Studio/Office and all associated site works in rear garden of existing dwelling house.	Grant
D21B/0488	permission sought for conversion of the attic space with dormer type flat roofs to the front and rear, southwest and northeast. Works to include new window to side, southeast, and all associated site works to existing dwelling house.	Grant
Defence 4B & 4C		
APP REF	Description	Decision
D23A/0054 / ABP-316429-23	Permission sought for the development of a 120no. bed Nursing Home Facility	Refuse. Appeal Decision Pending
Defence 5A		
APP REF	Description	Decision

D21B/0709	Retention permission is sought for part dormer dwelling with two-storey extension on rear and single-storey extension on side with roof garden, with open sided canopy above front door.	Refuse
D19A/0433	Permission for Retention of construction of a single storey flat roof structure c/w 1 no. roof light containing office and storage/utility areas in rear garden of previously approved development (Reg. Ref. D09A/0800, 0800/E), together with all ancillary site works, landscaping and site drainage.	Refuse
D19A/0082	Permission & Retention Permission to complete amendments to previously granted planning permission (Reg. Ref. D09A/0800, 0800/E) for a 2 storey detached dwelling	Grant
D24A/0214	Retention Permission is sought for the construction of a vehicular entrance gate (of 3.5m width) which fronts onto the Commons Road at the northwestern corner of the site and a pedestrian gate (of 0.9m width) fronting at the northeastern corner. Planning permission is also sought for the replacement of existing vehicular entrance gate, which fronts onto the Commons Road at the northeastern corner of the site, with a fixed railing boundary treatment.	Grant
D22A/0687 / ABP-315270-22	Retention permission is sought for amendments to previously granted planning permission (Reg Ref D09A/0800, 0800E, 19A/0082) for a 2 storey detached dwelling at this site. The amendments for which retention permission is sought include (1) Construction of a single storey flat roof structure c/w 1 No. roof light containing office and storage areas in rear garden of previously approved development together with all ancillary site works, landscaping and site drainage. (2) Alterations to previously approved splayed vehicular entrance arrangement and front/part side boundary treatment (extending as far as entrance gate to Lisnaroe & Brookfield). Works include provision of 1 Nr vehicular entrance from Commons Road,	Refuse
Defence 5C		
APP REF	Description	Decision
D18A/0880	Permission sought for construction of single storey extension to rear, side and front of house with connected canopy over front door, associated internal alterations, drainage and external works.	Grant
Defence 5D		
APP REF	Description	Decision
D21A/0700	Permission is being sought for the demolition of the existing flat roof extensions to the front, side and chimney, the erection of a new single storey extension to the eastern side containing a garage and living space, internal alterations to the existing dwelling, conversion of existing garage to bedroom including alterations to front elevation fenestration, and the repositioning of the vehicular access on Cherrywood Park with double car parking bay and associated site works.	Grant

The review of the planning history of the lands abutting the sites of the proposed works does not indicate any history which would suggest any negative interface with the proposed flood relief works.

4.5 Conclusion

Having regard to the provisions of:

- EU 'Floods' Directive 2007
- The National Planning Framework

- The Regional Spatial and Economic Strategy for the Eastern and Midlands Region
- The Planning System and Flood Risk Management 2009
- Climate Change Sectoral Adaptation Plan for Flood Risk Management, 2015
- Our Sustainable Future: Framework for Sustainable Development
- National Climate Action Plan
- Eastern Flood Risk Management Plan
- Dún Laoghaire-Rathdown County Development Plan 2022-2028

It is concluded that the proposed development complies with national, regional and local planning policy provisions and would not seriously injure the amenities of the area or significantly impact the current land use objectives in Dún Laoghaire-Rathdown and is therefore in accordance with the proper planning and sustainable development of the area.

5 Consultation

5.1 Introduction

Consultation is an on-going part of the EIA process. There are two elements of consultation which take place prior to the submission of an EIAR. The first avenue for consultation is to seek opinions and input from statutory bodies that have an interest or who may be affected by parts of the development, including government bodies and regulatory bodies. Non-governmental organisations and other relevant organisations were also contacted as part of this consultation process. These consultees were identified in the Informal Scoping stage of the EIAR and were contacted as specified below. The second avenue is to consult with local residents, business owners, and locals who may be impacted by the development or any member of the public who has an interest in the proposed FRS. This was undertaken through public consultation events held throughout the scheme process.

5.2 Consultation on Scoping Stage

In accordance with the EIA Directive (85/337/EEC) as amended in 2011 Directive (2011/92/EU) and 2014 Directive (2014/52/EU) under Article 6 and the Aarhus Convention, statutory and non-statutory bodies, local authorities, and relevant stakeholders must be consulted on the specific characteristics of the project and its likely impacts on the environment.

The EIAR requirements for consultation are defined in the EIA Directive (85/337/EEC) as amended in 2011 Directive 2011/92/EU and 2014 Directive 2014/52/EU under Article 6.

Article 6 (1)

Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities are given an opportunity to express their opinion on the information supplied by the developer and on the request for development consent.

Statutory and non-statutory consultees were issued the EIAR Scoping Report via email and were asked to submit any comments, observations, or submissions in relation to the proposed scope and level of information to be included in the EIAR.

The list of consultees who were sent a copy of the Scoping Report are:

- An Taisce - The National Trust for Ireland;
- Bat Conservation Ireland;
- Birdwatch Ireland;
- Coillte;
- Dept. of Agriculture, Food, and Marine;
- Dept. of Environment, Climate and Communications;
- Dept. of Housing, Planning, and Local Government;
- Dept. of Transport, Tourism, and Sport;
- Environmental Protection Agency (EPA);
- Failte Ireland;
- Geological Survey Ireland (GSI);
- Health Service Executive (HSE);
- Inland Fisheries Ireland (IFI);
- Irish Environmental Network;
- Irish Heritage Trust;
- Irish Wildlife Trust;
- Local Authorities Water Programme (LAWPRO);
- National Monuments Service;
- National Parks and Wildlife Service;

- National Transport Authority;
- Office of Public Works (OPW) Heritage Section;
- Sustainable Water Network Ireland (SWAN);
- Teagasc;
- The Heritage Council;
- Transport Infrastructure Ireland; and
- Uisce Éireann.

5.2.1 Consultation Responses

Of the consultees contacted, the following responses were submitted (Table 5.1).

Table 5.1: List of responses received from EIAR Scoping Consultation

Consultee	Response	Response Date
Geological Survey Ireland	Email response with dataset sheet and EIAR recommendations	06/03/2024
Uisce Éireann	Email response with recommendations relevant to water services infrastructure	13/03/2024
Inland Fisheries Ireland	Email response with initial comments, invite for further on-site meeting	15/03/2024
Transport Infrastructure Ireland	Email response with general EIAR guidelines	21/03/2024
National Transport Authority	Email response with letter submission on EIAR Scoping	04/04/2024
HSE National Environmental Health Service	Email response with letter submission on EIAR Scoping	05/04/2024
Development Applications Unit (DAU) National Monuments Service	Email response with letter submission on EIAR Scoping	08/04/2024

Responses are further summarised and addressed in Table 5.2. The full submissions from the above bodies are included in Volume 3 of this EIAR, Appendix 5.

Table 5.2: Detailed summary of EIAR Scoping Responses

Consultee	Summary of issues raised	How the issue is addressed in the EIAR
Development Applications Unit (DAU) National Monuments Service	**Archaeology and Flood Relief Schemes: Guidelines (NMS 2023):** The Archaeology and Flood Relief Scheme guidelines have been developed by the NMS and OPW Flood Relief Team, to support the efficient planning and development of Flood Relief Schemes and the protection of archaeological heritage. It is vital that their methodologies for assessment and attendant mitigation proposals are closely followed in compiling the EIAR. The Guidelines provide a framework for the effective integration of archaeological heritage into the design and construction of Flood Relief Schemes and describe the unique and broad range of terrestrial, underwater, industrial and vernacular archaeological heritage that these schemes typically encompass. Finally, they detail the critical role of advance, early-design stage, pre consent and pre-construction stage archaeological assessment and mitigation of FRS projects in diminishing effects on archaeological heritage and avoiding delays to progressing projects. Archaeology and Flood Relief Schemes.	Noted. The Cultural Heritage chapter of the EIAR was prepared with reference to the 2023 Guidelines.
	The National Monuments Services advises that the following specific investigations are undertaken prior to applying for planning permission. It is critical that these investigations are undertaken pre consent in order to inform the engineering and architectural design of the FRS, the contents of the Cultural Heritage assessment in the EIAR and its attendant mitigation proposals. • A desk based assessment should address the cultural heritage (archaeological, built, vernacular, riverine and industrial heritage) of the proposed development area and its environs, to include a full inventory, mapping and surveys (photographic, descriptive, photogrammetric, as appropriate) of all archaeological, underwater and cultural heritage features and structures identified by field inspections, cartographic analysis, historical and archival research and prior archaeological investigations. The field survey should include a visual inspection of any riverbanks and riverbeds and other waterbodies, where they are visible. This is best carried out following vegetation clearance (where permitted) or during winter, when vegetation cover is less dense. The desk-study, supported by comprehensive archival and historical research and detailed field inspection should inform (as appropriate), the scope and range of further archaeological investigations to be undertaken.	This cultural heritage baseline is assessed in the Cultural Heritage chapter of the EIAR.
	Targeted non-intrusive advance geophysical survey or prospection (where practicable) of all areas where largescale ground disturbances are proposed.	Advance geophysical survey took place where feasible, as described in the Cultural Heritage chapter.
	Targeted advance archaeological test excavation (where practicable) of all impacted areas of archaeological potential identified in the desk study and/or advance geophysical surveys.	As outlined in the Cultural Heritage chapter and discussed with NMS, advance archaeological test excavation was not practicable.
	Advance Underwater Archaeological Impact Assessment (UAIA), to include dive/wade, metal detection surveys of all areas where in-stream works are proposed, in order to adequately assess the nature, depth, extent and artefact-bearing potential of the riverine stratigraphy, to assess the potential for the remains of bridges, fording points and other riverine structures and features, and to facilitate further characterisation of underwater cultural heritage features and structures that have been identified in prior research.	Advance UAIA took place. The results are outlined in the Cultural Heritage chapter.
	Comprehensive buildings archaeology assessments of built heritage structures and features within the proposed development area. To inform an overall appraisal of the historical, archaeological and built heritage significance of any built heritage structures proposed for removal, it is vital that detailed buildings archaeology assessment including measured survey is undertaken at the earliest opportunity.	This is considered and assessed in the Cultural Heritage chapter of the EIAR.
	All intrusive advance investigations (such as, but not limited to, ground investigations for soils/geology/hydrogeology) carried out as part of the EIA or design process should be subject to advance archaeological screening (to be agreed with the Department) and a programme of archaeological monitoring and metal detection by a suitably qualified archaeologist.	Noted.

Uisce Éireann	Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no adverse impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report.	This was considered In the baseline assessment of the receiving environment and no Uisce Éireann's Drinking Water Source(s) will be impacted from the proposed FRS.
	Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.	This is considered in the Mitigation measures section of the Land and Soil chapter.
	Mitigations should be proposed for any potential adverse impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.	Mitigation measures are outlined in the Water chapter.
	Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.	Location of reservoirs are identified in the Material Assets – Utilities and Waste chapter. Impacts on hydrogeology and groundwater surface water are included in the Water chapter.
	Impacts of the development on the capacity of water services (i.e. do existing water services have the capacity to cater for the new development). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Uisce Éireann network.	The proposed FRS does not affect the capacity of water services. No connection to public water supply or sewerage system are required by the scheme.
	The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.	The proposed FRS does not require any upgrade of water services infrastructure.
	In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network	The FRS will not discharge any effluents.
	In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.	Hydraulic modelling took place during the development of the proposed works to ensure that no surcharging of the stormwater network would take place as a result of the proposed FRS.
	Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.	Potential impacts to Uisce Éireann assets are discussed in the Material Assets - Utilities and Waste chapter.
	When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.	The EIAR includes a desk-based study and consultation of utilities mapping to identify utilities within the proposed FRS area. Prior to construction test trenching will be carried out on site by the utilities companies to accurately locate services in proximity to proposed construction excavation sites.
	Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report	These are discussed in the Water chapter of the EIAR.
	Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report	This was considered in the baseline assessment and no drinking water source will be impacted by the proposed FRS.

	Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report	The proposed FRS does not require water abstraction or wastewater discharges.
	Uisce Éireann does not permit building over of its assets. As an applicant you are required to; - survey the site to determine the exact location of the assets. Any trial investigations should be carried out with the agreement and in the presence of Uisce Éireann. - Provide evidence of separation distances between the existing Uisce Éireann assets and proposed structures, other services, trees, etc. must be in accordance with the Irish Water Codes of Practice and Standard Details	Assets are identified through a desk-based study, included in the Material Assets - Utilities and Waste chapter of the EIAR.
	Where a diversion of Public Infrastructure may be required subject to layout proposal of the development and separation distances, the applicant is required to submit a Diversions Enquiry to diversions@water.ie Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water).	Two water mains will be diverted in advance of the works at the N11 Overflow Culvert. The foul sewer under the N11 northbound lane will not be impacted by the works, however protection measures may be installed to avoid any damage.
Transport Infrastructure Ireland	Interactions of the proposed scheme construction and operation with the national road and light rail networks should be identified and mitigated as appropriate as part of consideration of the material assets assessments in the EIAR.	Potential impacts on transport infrastructure are discussed in the Material Assets – Traffic and Transport chapter of the EIAR.

	The developer/scheme promoter should have regard, inter alia, to the following: Official policy for development at or near national roads is set out in the DEHLGSpatial Planning and National Roads Guidelines for Planning Authorities (2012) available at https://www.gov.ie/en/collection/85b83-planning-guidelines-standards/ For general guidance for any proposed development in close proximity to an existing Luas Line; any prospective development should ensure there is no adverse impact on Luas operation and safety including its infrastructure. Observing the requirements of the following guidance will inform the type of assessments required to demonstrate no adverse impact from intended development: - TII's 'Code of Engineering Practice for works on, near, or adjacent to the Luas light rail system' is available at https://www.luas.ie/work-safety-permits.html - Light Rail Environment - Technical Guidelines for Development, TII Publication no. PE-PDV-00001 available at https://www.tiipublications.ie/ In addition, as part of TII's responsibilities for managing and improving the country's national road and light rail networks, TII sets development guidance and standards for traffic and road assessments and construction that may be necessary by reason of proposed development location, scale, or typology to be prepared to accompany applications for developments or works. Technical guidance and standards are contained in TII Publications, available at https://www.tiipublications.ie/, There is a requirement for the protection of the national road network function that all the works proposed under, over and in the vicinity of the N11, be identified and undergo detailed design and execution in accordance with TII Publications that include TII structures technical acceptance as required under TII Publication DN-STR-03001, Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes, TII would be specifically concerned with potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development, The developer should have regard to any Environmental Impact Statement or Assessment Report and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should have regard for any potential cumulative impacts, The developer, in conducting an Environmental Impact Assessment, should have regard to TII's Guidelines, including the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014),	These points were considered in the development of the Material Assets – Traffic and Transport chapter.
	The EIAR should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and in particular how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014),	Relevant noise legislation was considered in the Construction Impacts chapter of the EIAR.
	It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. TII's Traffic and Transport Assessment Guidelines (TII Publication No. PE-PDV-02045) should be referred to in relation to the proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the Guidelines which addresses requirements for sub-threshold TTA, The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required,	These points were considered in the development of the Material Assets – Traffic and Transport chapter.
	In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network	These have been identified in the Material Assets – Traffic and Transport chapter of the EIAR.
	In relation to haul route identification, the applicant/developer should clearly identify the haul routes proposed and fully	These have been identified in the Material Assets –

	assess the network to be traversed. Separate structure approvals/permits, and other licences may be required in connection with the proposed haul route, including where temporary modification to the road network may be required. Consultation with relevant local authorities, PPP Companies and MMaRC Contractors may also be required. All structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load proposed, including abnormal weight load.	Traffic and Transport chapter of the EIAR.
National Transport Authority	The proposed closure of the N11 at its junction with Cherrywood Road for a period of up to two months is a matter of significant concern to the NTA, notwithstanding the statement that the closure would be 'partial'. The N11 at this location is used by national and regional bus services, buses in the Dublin area service network, cyclists and pedestrians, as well as by emergency vehicles and general vehicular traffic. The quoted extracts above state that traffic would be '[diverted] onto other adjoining roads', and that the traffic assessment will identify 'alternative routes for the duration' of the works to accommodate all affected modes. The management of all modes of transport that currently travel along the N11 will be a critical consideration in the EIAR. However, diversion of all modes during the construction phase has been assumed, and that the task for the EIAR is to identify the most suitable alternative routes. It is not clear whether the maintenance of accessibility through this location for any mode has already been considered and has been found to be unworkable, or if such an approach is not among the options under consideration. The NTA would not be of the view that the closure of the N11 is required for the purposes of this scheme. The NTA also advises that agreement must be sought from Transport Infrastructure Ireland for works proposed to a national road and would assume that this matter is under active consideration.	Potential impacts on the N11 during construction are addressed fully in the Material Assets – Traffic and Transport chapter of the EIAR.
	The NTA would strongly favour options that would maintain provision for sustainable transport modes through the subject area; in particular, for walking, cycling and Dublin area bus services.	Potential for impacts on sustainable transport modes are assessed in the Material Assets – Traffic and Transport chapter of the EIAR.
	The NTA notes that the Glenamuck Rd North Roundabout and Priorsland are areas of particular relevance to sustainable transport. The Carrickmines Park & Ride facility at Carrickmines Luas stop, which is accessed from the Glenamuck Road North Roundabout, is a critical piece of supporting infrastructure in the Luas network. Priorsland has recently been identified as the new terminus point in the Cherrywood SDZ for the extended Dublin Bus route 7 service. It is imperative, therefore, that existing access arrangements are maintained, or that adequate alternative access arrangements put in place, to ensure continuity of service at both locations	Public transport provision and access will remain in place throughout the construction and operational phases. Potential impacts are assessed in the Material Assets – Traffic and Transport chapter.
	The NTA recommends that the EIAR preparation should include a broader range of options for consideration than that currently identified in Section 4.8.3 of the scoping document. In particular, the NTA strongly favours continued provision for public transport, cycling, walking and emergency vehicles through the proposed works site on the N11 at Cherrywood Road, as opposed to alternative alignments that would undermine the utility of the sustainable transport networks, reduce patronage on public transport and compromise active travel in the area. In the absence of adequate provision for non-car modes, use of private car for a range of trip purposes would be expected to increase, with consequent impacts not only on Traffic but also on other factors under examination including Human Health, Air Quality, Biodiversity and Noise.	These modes of public transport will continue to be available throughout the construction phase at the N11. Potential impacts on this corridor are assessed in the Material Assets – Traffic and Transport chapter of the EIAR.
Inland Fisheries Ireland	Surface Water- The proposed FRS scheme will require construction works in or adjacent to surface watercourses at nine separate locations, which will be either Conveyance or Containment mechanisms. There is potential for emissions to water during the construction phase of the scheme which can impact water quality, which should be identified, and mitigation measures considered. There is further potential for this FRS to impact on the Hydromorphology of the watercourses which will result in a potential downgrading of fish status and the ability of both rivers to achieve Good Ecological Status. Changes in the Hydromorphology should also be considered in the EIAR and appropriate mitigation measures at both the construction and operational phase of the scheme should be proposed. The EIAR must consider the long-term health and quality of the aquatic environment and the potential impact on fish species post construction phase.	Impacts on surface water and fisheries, during the construction phase and operational phase of the proposed FRS assessed fully in the Water chapter of the EIAR, and also addressed in the Biodiversity chapter.
	The proposed works at all nine locations will be subject to site specific Method statements and instream works can only	Seasonal restrictions on instream works will be in

	be undertaken in the period between July and September.	place, as outlined in the Biodiversity chapter of the EIAR. Site-specific method statements will be prepared by the appointed contractor for IFI approval, and will include all relevant mitigation measures included in this EIAR and included in the preliminary Construction Environmental Management Plan (CEMP).
	Derogations in accordance with the Local Authorities (Works) Ac, 1949 may be applicable in certain specific circumstances, and will be on a case-by-case basis.	Noted.
	Both the Carrickmines and Shanganagh rivers contain migratory salmonid species and any development within these catchments, either alone or in combination with other developments cannot impact on this status.	Noted. Potential impacts on these species are addressed in the Biodiversity chapter of the EIAR.
	There may be opportunities to improve and protect the hydromorphology within the rivers and IFI will co-operate fully where there is this potential. The proposed meeting between stakeholders to look at the locations where works are proposed, is the first stage in hopefully preventing any short- or long-term damage to the aquatic environment while also providing flood protection.	Opportunities to improve hydromorphology are considered In the Water Chapter of the EIAR. An on-site meeting between the EIAR team and an IFI representative took place on 30th June 2024, outlined below in Section 5.7.
National Office for Environmental Health Services	The following documents should be taken into consideration when preparing the Environmental Impact Assessment Report (EIAR): • Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022), EPA. • Advice Notes on Current Practice in the preparation of EIS (2003), 435kb • Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment EU publication: Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report, EU, 2017 http://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf • Adoption of the Directive (2014/52/EU) in April 2014 initiated a review of the above guidelines. The draft new guidelines can be seen at http://www.epa.ie/pubs/consultation/reviewofdrafteisguidelinesadvicenotes	The recommended documents have been taken into consideration and referenced in the EIAR.
	Generally the Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each: a) Description of the receiving environment; b) The nature and scale of the impact; c) An assessment of the significance of the impact; d) Proposed mitigation measures; e) Residual Effects.	Noted. The EIAR follows the recommended format.
	Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the National Environmental Health Service (NEHS) that impacts on human health are often inadequately assessed in EIAs in Ireland. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. In addition to any likely significant adverse impacts	Noted. These points have been assessed in the EIAR.

	from the proposed development, any positive likely significant impacts should also be assessed. The HSE will consider the final EIAR accompanying the planning application and will make comments to An Bord Pleanála/Local Planning Authority on the methodology used for assessing the likely significant impacts and the evaluation criteria used in assessing the significance of the impact. This report only comments on Environmental Health Impacts of the proposed development. It is based on an assessment of the correspondence submitted to this office dated 1st March 2024. The Environmental Health Service (EHS) recommends that the following matters are included and assessed in the EIAR • Public Consultation • Population and Human Health • Noise & Vibration • Air Quality • Surface and Groundwater Quality • Climate Change • Material Assets (including waste) • Ancillary facilities • Cumulative impacts	
	Public Consultation Section 3 Consultation process of the scoping report refers to a number of consultation processes followed to date including consultation with the public. Reference is made to an initial recorded presentation in October 2021 followed by a questionnaire and an in-person event at a local school in December 2023 plus a Flood Relief Scheme (FRS) website that the public have access too. The NEHS recommends at a broader level that additional detail is provided in the full EIAR on the process of public consultation. Details of numbers reached, the type of feedback received and a breakdown of those reached, such as sensitive receptors, older persons, and other stakeholders etc. is included to give a detailed picture of how well the process was conducted and the level of participation from the local community. The National Environmental Health Service recommends that the public are consulted specifically on the public health aspects of the scheme by asking questions for example, such as 'what are the potential health benefits/challenges from the scheme' and 'what opportunities the scheme can deliver for health gain.	Early and meaningful public consultation has been integral throughout the proposed development process. The outcomes of these consultations are discussed in this chapter, Section 5.3 and in the Options report. During the public consultation events, members of the public were asked about the importance of human health and quality of life for residents. They were also invited to provide comments and suggestions regarding the proposed FRS.
	Assessment of Consideration of Alternatives Reference to the consideration of alternatives was not found in the scoping report. It was noted that the list of measures included for the proposed development are construction of defences orientated and apparently singular in focus. The NEHS would like to see if a more 'nature-based solution' was assessed as an option for the proposed development. The NEHS recommends that the EIAR further assess the potential opportunities the proposed scheme offers to protect and promote public health. Aspects to consider include ways to enhance the sequestration of carbon, ways to better adapt to climate change for other types of severe weather events (e.g. dry spells) and ways to create opportunity for recreation and active travel	As assessment of the alternatives is included in Chapter 3 of the EIAR, and in the Options Report. Nature based solutions were considered for the scheme. However, the overall opportunities for NBS to provide floods protection within the wider catchment are limited. A Test was carried out where all available storage measures identified for each Flood Cell were included to see whether a full NBS storage solution could achieve the desired standard of protection. The result showed that flood would not be alleviated without the need of hard defences. NBS were examined to potentially be part of the scheme along with the structural measures. Storage and other nature-based solutions will likely form part of future climate change adaptation of the FRS.

	Population and Human Health It is noted in the scoping report that "maintaining access and the amenity value of these areas for residents is an important aspect of the FRS". The scoping report also refers to the fact that the rivers flow through lands primarily zoned for residential or open space plus other areas zoned for economic development and employment plus key public infrastructure such as schools and a hospital are at potential risk. The potential impact on health (injuries, illness and even death) are not referred to in the context of population and human health. There is some reference to the risks to construction workers during the construction phase. The section does conclude there are likely to be potential impacts on population and human health in both construction and operational phases. The National Environmental Health Service (EHS) wishes to highlight the importance of protecting amenity areas in the context of supporting health and well-being. Measures to minimise disruption to amenity or recreational space during the construction phase should be put in place. The NEHS recommends that opportunities are identified to enhance potential health gain by perhaps enhancing the recreational value of the area.	Impacts on population and human health are assessed in Chapter 7 of the EIAR. Mitigation measures for any risk on human health and safety during construction are considered in Chapter 7 as well as mitigation measures to minimise disruption to amenity or recreational spaces. Mitigation measures are considered to minimise and avoid impacts during construction to maintain recreational values of the area. These are mentioned where relevant throughout the EIAR.
	Water The scoping report identified both surface water and ground water waterbodies where potential impact is possible. The report indicates that the potential impact will be most felt during the construction phase. The NEHS recommends that the full EIAR detail the mitigation measures to be deployed to protect both surface water and ground water waterbodies during the construction phase. Potential sources of contamination are to be detailed and should include risks associated with spills of hydrocarbons used by vehicles and machinery as well as potential contamination from a construction compound. Mitigation measures for all of the issues of relevance to population health should be contained in a Construction Environmental Management Plan or CEMP.	These are considered in the Water chapter. A preliminary CEMP has been prepared and will be adapted and put in place by the appointed contractor.
	Air Quality The primary air quality issue raised in the scoping report is dust during the construction phase. Some reference is also made to vehicle emissions during construction which may relate to both air quality and green-house gas emissions in the context of climate change. The NEHS recommends that background air quality data be accessed via the EPA and that Dust Control Measures alongside other air quality mitigation measures are included in the aforementioned CEMP Dust control measures to include are: • Sweeping of hard road surfaces • Provision of a water bowser on site, regular spraying of haul roads • Wheel washing facilities at site exit • Restrict speed on site • Provide covers to all delivery trucks to minimise dust generation • Inspect and clean public roads in the vicinity if necessary • Material stockpiling provided with adequate protection from the wind • Dust monitoring at the site boundary • Truck inspection and maintenance plan • Details of a road maintenance agreement between the developer/contractor and the Local Roads Authority to clarify responsibility for the upkeep and repair of access roads during the construction phase of the project	An assessment of air quality is included in the Construction Impacts chapter of the EIAR. Mitigation measures developed in the chapter related to dust control and air quality are included in the preliminary CEMP.
	Climate Change Climate is contained under the Air and Climate section of the scoping report but is separated out here to help ensure adequate attention is provided to the issue in the full EIAR. Very little reference could be found on the issue of climate change in the scoping report despite assuming the project is in large part a response to climate change as an adaptation measure to present and future climate risks. The underlying rationale for the scheme in the context of climate change was not identified in the scoping report. One may have expected to find details of not only historical flooding events in this area but also projections of flooding risk into the future. One may also have expected to find an	The proposed FRS has been developed with Climate adaptability in mind, while potential climate impacts during construction are outlined in the Construction Impacts chapter.

	assessment of the carbon footprint generated by the scheme and how the project intends to mitigate the production of green- house gases during each phase of the development as well as ways in which carbon may be captured. The NEHS recommends that the full EIAR devote considerable space to climate action (the greatest threat to global health this century) both in terms of how the project will contribute to delivering on Ireland's obligations under the Climate Action and Low Carbon Development Act 2015 – 2021 as well as how the project will adapt and build resilience locally to climate threats and potentially enable health gain. In brief the section should examine both Mitigation and Adaptation aspects. Mitigation relates to how the proposed development may contribute to the generation of greenhouse gases, primarily during construction and how the project will aim to minimise those emissions during construction, but also look to sequester carbon during operation, as Ireland moves to being a net zero economy by 2050. Adaptation relates to how the proposed development adapts/builds resilience to our changing climate in order to protect public health both locally and more widely. Predictive computer modelling should be included to assess vulnerability and potential exposure in the years and decades to come. The EHS service recommends that the full EIAR assess a wider range of threats that make people and places vulnerable to climate breakdown. Floods, dry spells/heat, wind-storms should be included in the assessment. Measures to mitigate vulnerability should be included as should opportunities to deliver health gain. For example, attenuation of flood waters could be used to combat dry spells or the provision of trees could be used to provide shade in heatwave events, as well as sequester carbon.	
	Noise and Vibration The scoping report recognises potential noise and vibration impacts associated with the proposed development and that those impacts will be at their most significant close to the construction works boundary. The scoping reports says noise impact is to be assessed during construction and operational phases. The NEHS recommends the principle point of assessment for noise and vibration is to be in relation to the construction phase. All potential sensitive receptors should be identified and the potential impact on them should be assessed. As with other environmental determinants of health it is expected that Noise and Vibration including mitigation measures to be adopted will be included in the CEMP. Particular attention should be paid to limiting the hours in which construction activities can take place.	These are considered and assessed In the Construction Impacts chapter of the EIAR. A preliminary CEMP has been prepared and will be adapted and put in place by the contractor.
	Traffic and Waste The section on material assets covers a number of aspects relevant to public health namely Traffic and Waste. Reference is made in the scoping report to a Construction Waste Management Plan. Most of the potential impact is likely during the construction phase of the proposed development. The NEHS recommends that the full EIAR assess the potential effect of the proposed development on the footpaths and cycleways, which may be disruptive to recreation and active travel. In the context of the Construction Waste Management Plan the NEHS recommends that the proposed development start by trying to eliminate the generation of waste in the first place and follow the principles of the waste hierarchy and the Circular Economy and Miscellaneous Provisions Act of 2022.	These are assessed in the Material Assets chapters of the EIAR.
	Ancillary Facilities The EIAR should include details of the location of all site office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen.	These are detailed in the Description of the Proposed Development chapter.
Geological Survey Ireland	The audit for Dún Laoghaire-Rathdown was carried in 2014. The full report details can be found here. Our records show that there is a CGS in the vicinity of the proposed FRS. Killiney Bay, Co Dublin. (Central ITM: 326272, 222516). Under IGH theme 'IGH 7 Quaternary'. Link to site report at DLR007. A 5 kilometres long coastal section exposes a succession of several units of glacial till. A particularly impressive exposure into deep till with many sedimentological characteristics exposed. The site is effectively included within the existing proposed Dalkey Coastal Zone and Killiney Hill NHA. Coastal erosion is a threat at Killiney Bay, as are the controlling measures such as erection of baffles and mesh-wire structures to stop recession of the cliffs. With the current plan, there are no envisaged impacts on the integrity of current CGSs by the proposed development. However, if the proposed development plan is altered, please contact Clare Glanville (Clare.Glanville@gsi.ie) for further information and possible mitigation measures if applicable	Noted. The CGS is assessed in the Land and Soils chapter of the EIAR.

	Groundwater Geological Survey Ireland's Groundwater and Geothermal Unit, provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems. Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our Map viewer which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps. For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels (gwlevel.ie). Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data. The Groundwater Data Viewer indicates aquifers classed as a 'Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones' and a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' underlie the proposed development. The Groundwater Vulnerability map indicates the range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas **Geological Mapping** Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found here, in your future assessments. Please note we have recently launched QGIS compatible bedrock (100K) and Quaternary geology map data, with instructional manuals and videos. This makes our data more accessible to general public and external stakeholders. QGIS compatible data can be found in our downloadable bedrock 100k .zip file on the Data & Maps section of our website. Our 3D models can help stakeholders visualize, understand and characterise geology, for deposit and resource mapping, for flooding and for urban geology applications including basement impact assessment, Sustainable Drainage Systems (SuDS), and subsurface management. Our 3D models offer a key element of geotechnical risk management by identifying areas requiring further site investigation. Further information on the bedrock and Quaternary 3D models of Dublin is available here and here. Geotechnical Database Resources Geological Survey Ireland continues to populate and develop our national geotechnical database and viewer with site investigation data submitted voluntarily by industry. The current database holding is over 7500 reports with 134,000 boreholes; 31,000 of which are digitised which can be accessed through downloads from our Geotechnical Map Viewer. We would encourage the use of this database as part of any baseline geological assessment of the proposed development as it can provide invaluable baseline data for the region or vicinity of proposed development areas. This information may be beneficial and cost saving for any site-specific investigations that may be designed as part of the project **Geochemistry of soils, surface waters and sediments for Dublin Region** Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Data is available at https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx. This page also hosts urban geochemistry mapping (Dublin SURGE project) which may be useful to the project. Geological Survey Ireland has completed a geochemical characterisation of the subsoil beneath large parts of Dublin, known colloquially as the Dublin Boulder Clay. The report documents the analysis completed on a third-party geochemical dataset obtained from the private sector and is accompanied by an excel spreadsheet containing the database of geochemical observations. Further details can be found at: https://www.gsi.ie/en-ie/publications/Pages/Geochemical-characterization-of the-Dublin-Boulder-Clay.aspx	Noted. These sources were used for the Land and Soils chapter of the EIAR.
	National Coastal Change Assessment Geological Survey Ireland is undertaking a National Coastal Change Assessment. As part of this initiative two mapping products will be delivered for the entire Irish coastline: coastal vulnerability mapping and shoreline change. Coastal vulnerability maps will provide an insight into the relative susceptibility of the Irish coast to adverse impacts of sea level rise through the use of a Coastal Vulnerability Index (CVI). Currently the project is being carried out on the east coast and will be rolled out nationally over the next couple of years, detailed information and maps are available	Noted.

	here. Shoreline change rates for the period 2000 to 2023 are being prioritised and will be released by county on a rolling basis over the next 12 months. Shoreline change rates database and reports will be accessible from GSI web mapping viewers. These suite of coastal mapping products are aimed at coastal managers to prioritise or concentrate efforts on adaptation.	
	The following guidelines may also be of assistance: • Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements. • EPA, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)	Noted. These guidelines were used in the preparation of the Land and Soils chapter.
	Other Comments Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at mailto:GeologicalMappingInfo@gsi.ie, 01-678 2795. I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to the Geological Survey Ireland Planning Team at GSIPlanning@gsi.ie	Noted. Copies of reports will be shared when available.

5.3 Public Consultation

Consultation has taken place throughout the development of the FRS. This included formal consultation (as detailed below), site meetings, Teams meetings and email liaison with affected landowners, as well as the sharing of information and updates through the scheme's dedicated website. Newsletters were issued throughout the project to provide an update on project progress, and these were posted to the scheme website.

5.3.1 Public Consultation Event 1

A Public Consultation Event (PCE) was held in October 2021, during the Covid-19 pandemic. Due to the pandemic restrictions, the event took place online, with information brochures and questionnaires circulated to the public. The purposes of the event were to:

- To introduce the project team
- Collect information from the public about any previous flooding experienced
- Welcoming thoughts from public on options for a flood relief scheme
- View progress on the detailed assessments undertaken since the completion of the Flood Risk Management Plan

Fliers and posters were also distributed for display in local businesses. Residents and community groups were asked to return their completed questionnaires with feedback regarding previous flood events and the importance of various aspects relating to any potential scheme.

5.3.2 Preferred Option Public Consultation Event 2

The second PPD was held on 13th of December 2023, at the Rathmichael Parish National School, Shankill. In conjunction with the event, information was provided on the project website and an online feedback form was available for responses up to 13th January 2024. The event was advertised in an issue of the Dublin Gazette dated 7th December 2023. The purpose of the event was to:

- Engage with the public and other interested parties
- Update them of progress on the project
- Provide the relevant information about the preferred option
- Highlight to the public the main areas where works are likely to happen and where the flood relief provided by the scheme will have the most positive impact
- Seek feedback from the public and other interested parties in relation to the preferred option, including potential constraints
- Collate information on any flood events that have occurred since the first PC.

Supporting materials provided at the PCE were posters, newsletters and questionnaires. Representatives from the project steering group were present throughout the day, and 43 attendees were recorded on the sign-in sheet. There may have been a small number of additional attendees that did not register. Nine people completed questionnaires on the evening and feedback form 28 members of the public was received in the 4-week period after the PCE. The feedback was analysed, and 78% of participants perceived the preferred option to meet the project objectives.

Comments received verbally and through the questionnaires were taken into consideration by the team for the final design.

5.3.3 Landowner liaison

In advance of submitting the scheme for planning, there has been continued liaison between the landowners directly impacted by the scheme (both in a temporary or permanent capacity) and the local authority and the Design Team. This provided a direct line of contact for those affected properties to input to the scheme. This liaison will continue through the planning and detailed design processes.

5.4 Additional Consultation with National Monuments Service - First meeting

A meeting between members of the Design Team, Courtney Deery Heritage Consultancy Ltd, and the Department of Housing, Local Government and Heritage's National Monuments Service and Built Heritage Policy Team took place on the 9th of February 2024. The purpose of the meeting was to discuss the cultural heritage assessment of the proposed FRS. Courtney Deery (Cultural Heritage consultants) described the work underlying the Cultural Heritage Chapter, assessing impacts on cultural heritage, mitigation measures and methodology used.

General Archaeological Heritage in the study area was discussed including concentration of sites close to the watercourse (47 within 100m of a proposed watercourse measure). Discussions took place around the below measures:

5.4.1 Defence 2: Belarmine Park 2B, 2D, Kilgobbin 2E, 2G

In Kilgobbin and Newtown Little townlands, archaeological excavations have taken place for residential and infrastructure development applications. The results of these investigations reinforce the greenfield archaeological potential of the river and its environs in this location – these previous investigations are discussed further in Chapter 13 Cultural Heritage. Instream works will be required here. It was noted that there will be no direct works to Kilgobbin House, but the stone boundary wall to Kilgobbin House on the left bank will need to be upgraded to act as a flood defence wall. Following discussion with the NMS representatives, it was agreed that the design team would engage with a Conservation Engineer for this feature.

5.4.2 Defence 3: Glenamuck Road North 3A

For Defence 3A along Ballyogan Grove, it was agreed that the design team will engage with a Conservation Engineer to explore the potential for retaining the existing stone wall and strengthening it.

5.4.3 Defence 4 - Cherrywood Road 4A Lower Brides Glen 4B and N11 Crossing 4C, Bray Road 5D

Courtney Deery explained that the area for the proposed N11 overflow culvert has already been extensively excavated and tested as part of the N11 road widening.

For Bray Road 5D, it is proposed to build a new instream wall and carry out riverbank works. It was agreed that underwater archaeological investigations would take place at this location.

5.4.4 Defence 5 - Commons Road and Brookdene 5A, Bayview 5C

Shanganagh Bridge is a protected structure with evidence of scour. The Design Team explained the proposed works, which include underpinning the bridge, scour remediation, and removing the parapet to pump grout to strengthen it. The NMS requested drawings to show the extent of the works to the bridge foundation and evidence of scour. DLRCC stated that it is hoped to avoid underpinning, aiming instead to reinforce the parapet and address the existing scour issue.

The NMS asked that the design team engage with a Conservation Engineer for the bridge works. From an underwater archaeology perspective, a wade dive survey was suggested to check for other bridges or fording points near the bridge.

5.4.5 Mitigation Strategy

NMS emphasised the importance of de-risking the project from the potential discovery of terrestrial and underwater archaeological assets during construction. NMS recommended pre-consent investigations, including a wade dive survey in areas of instream work, as well as geophysical surveys and archaeological testing.

Courtney Deery noted that there are no obvious areas along the scheme where a geophysical survey would be beneficial or practical for data collection. This is due to existing stone walls, the proximity to the river's edge, and mature trees located in the areas of the proposed flood walls. It was subsequently agreed that a geophysical survey could take place at Bray Road, at the location of a proposed construction compound. It was agreed that the other proposed works areas are not practical in terms of geophysical survey.

NMS inquired about any Archaeological Impact Assessment and monitoring for the recent Geotechnical Investigation. The Design Team confirmed that archaeological monitoring had been carried out as part of the GI, and a monitoring report is available.

A walkover with members of the Design Team and the NMS followed the meeting to provide an opportunity to further discuss the potential for pre-consent surveys and mitigation for the scheme. This is outlined in Section 5.5 below.

5.5 Additional Consultation with National Monuments Service - Second meeting

A second consultation with the NMS was held as a site walkover on the 30th of April 2024. Attending were members of the Design Team, Courtney Deery Heritage Consultancy Ltd, Southgate Associates Heritage Conservation Specialists, and a representative from the National Monuments Service. The discussion was held for different structures of interest detailed in the below sections.

5.5.1 Kilgobbin House

The potential for retaining part of the original stone boundary wall at Kilgobbin House was explained. This was positively received by NMS, who emphasised that this contributes to the character of the area.

NMS noted that retaining part of the stone wall on the right bank upstream of Kilgobbin Road Bridge would also be a positive. The Design Team agreed to examine the feasibility of this in terms of hydraulics and constructability. It was subsequently determined that the proposed measure could be moved upstream slightly, allowing for the retention of part of the stone wall closest to the bridge.

NMS would also like access to the river retained at the slipway/low point on the northern side of the river. This could be in the form of a demountable flood barrier, or stile. This was agreed to be incorporated into the design.

NMS noted the jostle stones (painted white) at the curve at the top of the private laneway where the culvert is proposed – these should remain in situ and protected during construction works. NMS also pointed to the wall running along the private laneway as potentially vulnerable to damage or collapse during the construction of the culvert pipe. These are considered in the Cultural Heritage chapter of the EIAR.

5.5.2 Bray Road Arch

Southgate Associates explained the proposals for strengthening and retaining the stone arch structure at Bray Road, which NMS was in favour of.

Courtney Deery noted that the structure is part of a boundary wall, not a bridge, and appears to have been partially refurbished or repaired at some stage.

5.5.3 Shanganagh Road Bridge

The Design Team presented the proposals for strengthening the bridge parapets and base, which NMS were in favour of. NMS raised concerns about the bridge character area, highlighting that the current tie-ins between the bridge and the flood wall were inadequate, and requested detailed plans for the tie-ins, suggesting they be included in the overall strategy for the area.

NMS suggested several potential elements for visual upgrade, such as Corten Steel planters, and emphasized that a minimum of 10 meters on either side of the bridge approach should be considered part of the bridge character area and should be retained and enhanced by the bridge works. NMS noted that the granite stone kerbstones on the northern footpath (east side) would be better placed on the footpath of the bridge structure.

NMS also identified the rubble stone boundary wall on the west side of the road as part of the character area, recommending that cleaning this wall should be included in the bridge works to enhance the area's character, particularly on DLR lands.

While some aspects fall outside the scope of the Flood Relief Scheme (FRS), the Design Team will strive to address these within the project's capacity. Regarding the concrete apron, NMS suggested embedding larger stones on its surface to achieve a rougher, more natural look. Any proposals would need to be assessed for their impact on aquatic ecology and discussed with Inland Fisheries Ireland (IFI).

At the construction stage, NMS will require a dedicated conservation method statement for each area. NMS also noted that the three locations are unique in terms of typology and may be considered culturally significant, with heritage potential that should be flagged to Dún Laoghaire-Rathdown County Council (DLRCC).

5.6 Additional Consultation with National Parks and Wildlife Services

An online meeting was held with the Divisional Ecologist for Dublin and the District Conservation Ranger from the NPWS, Department of Housing, Local Government and Heritage, on the 12th of March 2024.

The meeting started with an introduction to the project and its aims from JBA including a presentation of the programme and update on the work done to that date. NPWS requested that all earlier documents be sent to them including any other relevant documentation. JBA and Egis took action on that point following the meeting.

NPWS raised the following points:

- Requested that the defence at Brookdene remain as a wall rather than an embankment, which would allow for greater retention of trees. This was adopted by the Design Team.
- Reassurance that any culverts (in particular at the N11) would have mammal ledges due to the high levels of activity in the study area. This was adopted by the Design Team.
- Expressed their concern about screens at culverts and that we confirm that they are passable by mammals. Mammal passibility has been assessed in Chapter 8, Biodiversity.

As a general comment NPWS noted that due to the built-up nature of the site there are not many opportunities for enhancement or improvements to biodiversity, though the Design Team agreed to investigate any opportunities for enhancement as they arise.

Other specific discussion was done on the following:

5.6.1 Natura Sites and AA Screening

The results of the AA Screening process were discussed, with no significant impacts to any Natura 2000 sites anticipated.

5.6.2 Biodiversity Surveys

JBA presented results of all surveys carried out to that date. These included aquatic surveys, invasive species surveys, riparian bird surveys, and mammal surveys - including otters and amphibians.

NPWS noted other locations with mammal activity, which were shared with the Design Team. Finally, plans for additional surveys were also discussed:

- Additional otter surveys
- Camera trap surveys
- Preliminary bat surveys
- Riparian bird surveys
- Habitat & dedicated invasive surveys
- Tree surveys (ongoing) by Arbor Care Ltd

5.7 Additional Consultation with Inland Fisheries Ireland

An on-site meeting took place on the 30th of July 2024 between members of the Design Team, and a representative from IFI. The purpose of this meeting was to discuss the fisheries, water, and hydromorphology assessments to date, the proposed measures, and their potential impact on same, and proposed mitigation measures.

The proposed measures at a number of key areas were discussed, in particular Shanganagh Bridge, Glenamuck Road North, and Belarmine Park. The proposed mitigation measures at these locations were discussed, with no major concerns raised by IFI at that time. IFI noted that discussion with the appointed contractor following the planning application stage would be important in terms of fisheries protection.

6 Construction Impacts – Air Quality and Dust, Climate, and Noise and Vibration

The project Scoping Report identified that the proposed development would affect the following areas of the EIAR only during construction and that it would result in no operational impacts on these environmental factors. These are:

- Air Quality and Dust;
- Climate; and
- Noise and Vibration.

These factors are assessed in this chapter. Impacts arising from the construction phase on other environmental factors are dealt with in Chapters 7 to 14 of the EIAR.

6.1 Air Quality and Dust

This section of the EIAR assesses the air quality and dust impact of the proposed development during the construction phase.

6.1.1 Construction Dust Assessment Methodology

For the Construction Phase assessment, the focus is on air quality sensitive receptors adjacent to the proposed works that are susceptible to dust impacts. The greatest potential impact on air quality during the Construction Phase will be related to construction dust.

As prescribed within Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017) the proposed Mountmellick Flood Relief Scheme has been assessed in accordance to the "*Guidance on the Assessment of Dust from Demolition and Construction (IAQM) January 2024 (Version 2.2)* (hereafter referred to as the 'IAQM guidance').

The construction effects have been assessed using the qualitative approach described in the IAQM guidance, which applies to the assessment of dust from construction and demolition activities. The IAQM guidance has been referenced to assess the potential impact of the vehicle movements and the earthworks phase of the proposed works. Good practice construction mitigation measures are recommended to be implemented to minimise emission quantities during construction

Dust Deposition Guidelines

Dust particles can be classified into those that are easily deposited and those that remain suspended in the air for long periods. This division is useful as deposited dust is usually the coarse fraction of particulates that causes dust annoyance, whereas suspended particulate matter is implicated more in exposure impacts. Airborne particles have a large range of diameters, from nanoparticles and ultrafine particles (diameters less than 0.1µm) to the very large particles with diameters up towards 100µm. There is no clear dividing line between the sizes of suspended particulates and deposited particulates, although particles with diameters >50µm tend to be deposited quickly and particles of diameter <10µm (PM_{10}) have an extremely low deposition rate in comparison. Therefore, the size of suspended and deposited dust particles affects their distribution and as such requires two very different approaches to sampling these fractions. PM_{10} is the fraction of airborne (suspended) particulates which contains particles of diameter less than 10µm. $PM_{2.5}$ is the fraction of airborne (suspended) particulates which contains particles of diameter less than 2.5µm. PM_{10} and $PM_{2.5}$ particles can penetrate deep into the respiratory system increasing the risk of respiratory and cardiovascular disorders. Total Suspended Particles (TSP) is the term used when referring to larger particles which do not have a specified size limit. It is common for TSP to be measured alongside PM_{10} and $PM_{2.5}$ particularly at industrial sites when dust monitoring is undertaken.

Particulate matter can emanate from natural and anthropogenic sources. Natural sources include sea salt, forest fires, pollen and moulds. Natural sources are unregulated and harder to control. Anthropogenic sources can be regulated and understanding the sources of particulate matter is very important. PM10 is most commonly associated with road dust and construction activities. Wear and tear of brakes and tyres on vehicles and crushing activities at construction sites can all contribute to a rise in PM_{10}. $PM_{2.5}$ is associated with fuel burning, industrial combustion processes and vehicle emissions. Larger particles (100µm diameter) are likely to settle within 5-10m of their source under a typical mean wind speed of 4-5 m/s, and particles between 30-100µm diameter are likely to settle within 100m of the source. Smaller particles, particularly those <10µm in diameter, i.e. PM_{10}, have a greater potential to have their settling rate impeded by atmospheric turbulence and to be transported further from their source. Dust emissions are exacerbated by dry weather and high wind speeds. The impact of dust, therefore, also depends on the wind direction and the relative location of the dust source and receiver.

Currently no Irish statutory standards or limits exist for the assessment of dust deposition and its tendency for causing nuisance. Similarly, no official air quality criterion has been set at a European or World Health Organisation (WHO) level.

The Quarries and Ancillary Activities, Guidelines for Planning Authorities states that following with regard to the control of dust;

"There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral/aggregate dust. (See, however, the Air Quality Standards Regulations 2011 for measurement standards). There are a number of methods to measure dust deposition (such as the Frisbee method) but only the German TA Luft Air Quality Standard relates a specific method (i.e. Bergerhoff) of measuring dust deposition with dust nuisance. On this basis it is recommended that the following TA Luft dust deposition limit value be adopted at site boundaries near quarry developments:

Total dust deposition (soluble and insoluble): 350 milligram per square metre per day (when averaged over a 30-day period).

Best practice dust control measures should be proposed by the applicant".

The German TA Luft Regulations, "Technical Instructions on Air Quality Control" state that total dust deposition (soluble and insoluble, measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, VDI 2119) should not exceed a dust deposition rate of 350 mg/m^2/day (when averaged over a 30+/- 2-day period). The use of this limit value is appropriate to minimise the impact of airborne dust levels on the receiving environment beyond the site boundary. The German TA Luft criteria for '*possible nuisance'* and *'very likely nuisance'* are 350 mg/m^2/day and 650 mg/m^2/day, respectively.

In 2005, the UK Highways Agency released an Interim Advice Note 61/05 *'Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSIs'* as a supplement to the Design Manual for Roads and Bridges (DMRB) Guidelines. This interim guidance states that dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration. The literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 1,000 mg/m2/day which is considerably greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. As such, once dust deposition rates are maintained within the guidelines for human nuisance the impact of dust deposition on sensitive ecosystems is considered negligible. Therefore, the following dust deposition limits are typically recommended;

- Dust Deposition Rate limit = 350 mg/m^2/day (averaged over a 30 +/- 2-day period using Bergerhoff Gauge Method).
- Dust Deposition Rate limit affecting sensitive ecological receivers = 1,000 mg/m^2/day
- PM_{10} 24 Hour Mean concentration limit = 50 µg/m^3 not to be exceeded more than 35 times a calendar year

- PM_{10} Annual Mean concentration limit = 40 µg/m^3
- $PM_{2.5}$ Annual Mean concentration limit = 25 µg/m^3

For the Construction Phase, an assessment of air quality impacts from the vehicle emissions has been screened out on the basis that these activities have a low potential for air pollutant and/or dust release and are likely to have a negligible impact on air quality sensitive receptors. The TII Air Quality Assessment Specified Infrastructure Projects PE-ENV-01106-01 (hereafter referred to as the 'TII guidelines') state that increases in annual average daily traffic (AADT) flows of 1,000 vehicles or 200 heavy duty vehicles (HDV) (greater than 3.5 tonnes) during the Construction Phase are unlikely to result in significant air quality effects. Likely significant effects on air quality are, therefore, assessed when the AADT flows are projected to increase above these thresholds. As traffic volumes are not projected to increase by 1,000 vehicles or 200 HDVs during the Construction Phase of the proposed development, traffic related air quality impacts have been screened out of the assessment

6.1.2 Operational Air Quality Assessment Methodology

The operational phase of the proposed Mountmellick Flood Relief Scheme has been assessed in accordance with the Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017). These guidelines provide a methodology for the assessment, management and mitigation of air quality that can be adapted accordingly, depending on the type, scale and nature of the proposed project. The IAQM guidance, Land-use Planning & Development Control: Planning for Air Quality (January 2017) *Table 6.2: Indicative criteria for requiring an air quality assessment*, outlines the following screening criteria;

The development will:	**Indicative Criteria to Proceed to an Air Quality Assessment**
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.

Note: AQMA = Air Quality Management Area.

Based on the above criteria, the Operational Phase is unlikely to result in significant air quality effects, because the increase in annual average daily traffic (AADT) flows will be less than 500 vehicles or 100 heavy duty vehicles (HDV) (greater than 3.5 tonnes) during the Operational Phase.

The TII guidelines state that increases in annual average daily traffic (AADT) flows of 1,000 vehicles or 200 heavy duty vehicles (HDV) (greater than 3.5 tonnes) during the Operational Phase are unlikely to result in significant air quality effects. Likely significant effects on air quality are, therefore, assessed when the AADT flows are projected to increase above these thresholds. As traffic volumes are not projected to increase by 1,000 vehicles or 200 HDVs during the Operational Phase of the proposed development, traffic related air quality impacts have been screened out of the assessment. In accordance with TII guidelines, operational phase traffic related air quality impacts have been screened out of the assessment.

For the Operational Phase, an assessment of air quality and dust impacts from the maintenance of the proposed development has been screened out on the basis that these activities have a low potential for air pollutant and/or dust release and are likely to have a negligible impact on air quality sensitive receptors.

6.1.3 Receiving Environment

Baseline Air Quality

No baseline air quality or dust deposition survey has been undertaken. Reference has been made to EPA data to quantify the existing air quality in proximity to the proposed development site.

The EPA has divided the country into zones for the assessment and management of air quality. The zones adopted in Ireland are Zone A, the Dublin conurbation; Zone B, the Cork conurbation; Zone C, comprising 21 large towns in Ireland with a population >15,000; and Zone D, the remaining area of Ireland. The background air quality in the area of the development is of good quality and the site is located in the Dublin Conurbation 'Zone A' as denoted by the EPA.

The EPA, working with local authorities and other public/semi state bodies, has established 116 ambient air quality monitoring stations nationwide. Monitoring data from these stations is available in real time on the website, www.EPA.ie and the data is used to inform national policy, meet Ireland's commitments to European reporting and is now used as one of the key inputs to the air quality forecast.

Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10} & $PM_{2.5}$.) background concentrations from the EPA Air Quality monitoring station on the Glenageary Road, Dun Laoghaire (53°17'09.6 -6°07'55.2), located approximately 2km north northeast of the proposed FRS has been referenced. Also referenced is an EPA Air Quality monitoring station in Bray, Co. Wicklow (IGR: 53.1873°N, -6.1220°E) located approximately 6 km south southeast of the proposed FRS, where Particulate Matter (PM_{10} & $PM_{2.5}$.) and Ozone (O_3) background concentrations are recorded. The most recent year of data has been summarised and referenced [16th May 2023 – 16th May 2024] in Table 6.1 below.

The CAFE (Clean Air for Europe) Directive sets air quality standards for member states in Europe and has been transposed into Irish legislation by the Air Quality Standards Regulations 2011. Table 6.1 shows 2023 concentration levels to date (16th May 2023 – 16th May 2024). Results show that there were no exceedances of these EU CAFE directive annual mean limits for NO_2, O_3, PM_{10}. or $PM_{2.5}$.

The World Health Organization (WHO) guidelines on ambient air pollution levels, which are widely used as reference tools by policymakers across the world to set standards and goals for air quality management, were updated in September 2021. Across nearly all pollutants, the new recommended limits for concentrations and exposures are lower than the previous guidelines. The 2021 update reflects far-reaching evidence that shows how air pollution affects many aspects of health, even at low levels. The monitoring results at the EPA Air Quality monitoring station on the Glenageary Road, Dun Laoghaire do show a marginal exceedance of the WHO guidelines annual mean limits for NO_2 and $PM_{2.5}$. However, the Air Quality Standards Regulations 2011 limit values are not exceeded.

Table 6.1: Annual Average Nitrogen Dioxide (NO_2), Ozone (O_3), and Particulate Matter (PM_{10} and $PM_{2.5}$) concentrations at Dun Laoghaire and Bray, (16th May 2023 – 16th May 2024).

Station	Period	Measured Concentration (µg/m³)			
		NO_2	O_3	PM_{10}	$PM_{2.5}$
Dun Laoghaire	16th May 2023 – 16th May 2024	12.77 µg/m³	-	11.97 µg/m³	7.50 µg/m³
Bray	16th May 2023 – 16th May 2024	-	56.17 µg/m³	9.79 µg/m³	5.62 µg/m³
Annual Mean Limit Value (Annual limit for protection of human health)		*40 µg/m³*		*40 µg/m³*	*20 µg/m³*
Annual Mean Limit Value (Annual limit for protection of vegetation)		*30 µg/m³*			
Maximum Daily 8 hr Mean Limit			*120 µg/m³*		
WHO 2021 AQG levels		*10 µg/m³*	*100 µg/m³*	*15 µg/m³*	*5 µg/m³*

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that identifies the current air quality currently in a region and whether or not this might affect human health. This reading is updated twice a day, once in the morning (by 9.30am) and once in the evening (by 19.30pm). A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air

quality is good. The AQIH readings are based on five air pollutants which can harm human health: Ozone gas, nitrogen dioxide gas, sulphur dioxide gas, $PM_{2.5}$ particles and PM_{10} particles. The AQIH at the monitoring stations in Bray, Co. Wicklow has a current rating of 2, meaning 'Good' air quality [index as of 13.00 hours, Tuesday, May 28th, 2024] (EPA, 2024)). The monitoring station in Dun Laoghaire, Co. Dublin is currently out of commission, since 16th May 2024, and therefore no current index is available. Previous to 16th May the rating was 1, meaning 'Good' air quality.

6.1.4 Potential Impact of the Proposed Development

Do Nothing Scenario

The 'Do Nothing' scenario is defined as the option involving no future expenditure on flood defences or maintenance of existing defences/channels. There is **no air quality and dust impact** from the 'Do Nothing scenario'.

Construction Dust Impacts

There will be no operational air quality and/ or dust impact from the operation of the proposed development. Therefore, this chapter further summarises and assesses the nature of proposed construction works in each area only during construction. No significant difficulties were encountered when preparing this Air Quality and Dust impact assessment.

The Dust Impact Assessment has been undertaken in accordance with Guidance on the Assessment of Dust from Demolition and Construction (IAQM) January 2024 (Version 2.2). to predict the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is "not significant".

Activities on construction sites have been divided into four types:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions is assessed for each activity that is likely to take place., If an activity is not taking place, e.g. demolition, then it does not need to be assessed. The risk assessment categories assume that the most basic project controls are applied to every project.

The assessment methodology considers three separate dust impacts:

- Annoyance due to dust soiling;
- The risk of health effects due to an increase in exposure to PM_{10}; and
- Harm to ecological receptors with account being taken of the sensitivity of the area that may experience these effects.

The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effect. The assessment steps are:

- STEP 1 is to screen the requirement for a more detailed assessment. No further assessment is required if there are no receptors within a certain distance of the works.
- STEP 2 is to assess the risk of dust impacts. This is done separately for each of the four activities (demolition; earthworks; construction; and trackout)
- STEP 3 is to determine the site-specific mitigation (in addition to basic project controls) for each of the four potential activities in STEP 2. This will be based on the risk of dust impacts identified in STEP 2.
- STEP 4 is to examine the residual effects and to determine whether or not these are significant.
- STEP 5 is to prepare the dust assessment report.

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STEP 1: Screening the Need for a Detailed Assessment

An assessment will normally be required where there is:

- a 'human receptor' within:
  - 250m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s)
- an 'ecological receptor' within:
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s)

There are> 380 human receptors within 350m of the boundary of the site. There are approximately ~180 sensitive receptors within 50 m from the proposed works. There is an ecological receptor within 50m of the boundary of the site (the downstream end of the proposed N11 culvert overflow works is within Loughlinstown Woods pNHA). Therefore, the assessment proceeds to STEP 2.

STEP 2: Assess the Risk of Dust Impacts

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (STEP 2A); and
- the sensitivity of the area to dust impacts (STEP 2B), which is defined as low, medium or high sensitivity.

These two factors are combined in STEP 2C to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time. Where appropriate, the site can be divided into 'zones' for the dust risk assessment.

STEP 2A: Define the Potential Dust Emission Magnitude

Demolition, earthworks, construction and trackout will occur during the construction phase. Table 6.2 describes the potential dust emission class criteria for each outlined construction activity.

Table 6.2: Criteria Used in the Determination of Dust Emission Class

Activity	Criteria used to Determine Dust Emission Class		
	Small	**Medium**	**Large**
Demolition	▪ Total building volume <12,000 m^3 ▪ Construction material with low potential for dust release (e.g. metal cladding or timber ▪ Demolition activities <6m above ground level ▪ Demolition during wetter months	▪ Total building volume 12,000 m^3 - 75,000m^3 ▪ Potentially dusty construction material. ▪ Demolition activities 6-12m above ground level	▪ Total building volume >75,000m^3 ▪ Potentially dusty construction material (e.g. concrete) ▪ On-site crushing and screening, ▪ Demolition activities >12m above ground level

Earthworks	▪ Total site area <18,000m^2 ▪ soil type with large grain size (e.g. sand), ▪ <5 heavy moving earth vehicles active at any one time ▪ formation of bunds <3m in height	▪ Total site area 18,000 – 110,000m^2 ▪ Moderately dusty soil type (e.g. silt) ▪ 5-10 heavy moving earth moving vehicles active at any one time. ▪ formation of bunds 3m - 6m in height,	▪ Total site area >110,000m^2 ▪ potentially dusty soil type (e.g. clay) ▪ >10 heavy earth moving vehicles active at any one time. ▪ formation of bunds >6m in height
Construction	▪ Total building volume <12,000m^3 ▪ Construction material with low potential for dust release	▪ Total building volume 12,000 – 75,000m^3 ▪ Potentially dusty construction material (e.g. concrete) ▪ On-site concrete batching	▪ Total building volume >75,000m^3 ▪ On-site concrete batching ▪ Sandblasting
Trackout	▪ <20 outward HDV trips in any one day ▪ surface material with low potential for dust release, ▪ Unpaved road length <50m	▪ 20 - 50 outward HDV trips in any one day ▪ moderately dusty surface material (e.g. high clay content), ▪ Unpaved road length 50-100m	▪ >50 outward HDV trips in any one day ▪ potentially dusty surface material (e.g. high clay content ▪ Unpaved road length >100m

The potential dust emission magnitudes for the proposed development were estimated based on the construction quantity information provided by the project engineers and determined using the criteria detailed in Table 6.2 as follows;

Demolition:

Demolition includes any activity involved with the removal of an existing structure (or structures).

Volume of demolition works:

Area of works	Stone walls	Concrete	Paving / Road works	Total Volume (m^3)
Clon Brugh	10.00	7.00	5.00	**22.00**
Belarmine Park		93.00		**93.00**
Kilgobbin	253.00		5680.00	**5933.00**
Glenamuck Road North	58.00			**58.00**
Cherrywood Road				**0.00**
Bray Road				**0.00**
Lower Brides Glen	91.00			**91.00**
N11 Crossing			1394.00	**1394.00**
Commons Road	184.00			**184.00**
Brookdene				**0.00**
Bayview		17.00		**17.00**
Total Volume (m^3)	**596.00**	**117.00**	**7079.00**	**7792.00**

Therefore:

- Total building volume <12,000 m^3
- Potentially dusty construction material (concrete)
- Demolition activities <6m above ground level

Therefore, considering the total volume of demolition required for the construction of all the proposed works (7792 m^3) and the type of materials demolished, according to Table 6.2 the dust emission magnitude for Demolition is defined as **Small.**

Earthworks:

Earthworks covers the processes of soil-stripping, ground-levelling, excavation, and landscaping.

Area for earthworks:

Area of works	Excavation area (m^2)	Works area (m^2)
Clon Brugh	**272.00**	**1123.00**
Belarmine Park	**295.00**	**1205.00**
Kilgobbin	**2028.00**	**4135.00**
Glenamuck Road North	**327.00**	**1499.00**
Cherrywood Road	**362.00**	**1603.00**
Bray Road	**1521.00**	**2669.00**
Lower Brides Glen	**256.00**	**1107.00**
N11 Crossing	**311.00**	**1317.00**
Commons Road	**1502.00**	**4881.00**
Brookdene	**367.00**	**1588.00**
Bayview	**238.00**	**1030.00**
Total Area (m^2)	**7479.00**	**22157.00**

Therefore:

- Total site area where earthworks will occur is 18,000 – 110,000m^2.
- The underlying bedrock of the site is mainly composed in the centre and western region of granite with muscovite phenocrysts, and pale grey fine to coarse-grained granite. In the southern and eastern region, the bedrock is composed of a small extension of granite with microcline phenocrysts and slate, phyllite and dark blue-grey schist. There are several subsoils present within the study area, these are: made ground; granite till; limestone till (Carboniferous); undifferentiated alluvium; granite sands and gravel; phyllite and schist.
- It can be expected that HGV vehicle movements may be in the region of 5-10 vehicles per hour at each works site during the busiest period of construction works. HGV vehicle movements will be required for bulk excavation works and importation of concrete materials for wall construction. This will generate the most HGV movements during the anticipated works and the busiest construction periods.

Therefore, considering the above, based on Table 6.2 the dust emission magnitude for Earthworks is defined as **Medium**.

Construction:

Construction covers any activity involved with the provision of a new structure (or structures), its modification or refurbishment.

Total building volumes:

Area of works	Concrete	Steel Sheet Piles	Stone Cladding	Paving	Backfilling	Layer works for roadworks	Asphalt Road Surfacing	Precast Concrete	Gabions	Total Volume (m^3)
Clon Brugh	111.00		55.00	5.00	152.00					**323.00**
Belarmine Park	147.00		80.00		188.00				22.00	**437.00**
Kilgobbin	293.00		142.00		336.00	949.00	38.00	176.00		**1934.00**
Glenamuck Road North	168.00		87.00		213.00					**468.00**
Cherrywood Road	205.00		112.00		130.00					**447.00**
Bray Road	227.00		97.00		488.00					**812.00**
Lower Brides Glen	178.00		113.00		92.00					**383.00**
N11 Crossing	23.00		225.00		658.00	151.00	83.00	125.00		**1265.00**
Commons Road	1114.00		225.00		926.00					**2265.00**
Brookdene	181.00		89.00		132.00					**402.00**
Bayview	138.00		78.00		151.00					**367.00**
Total Volume (m^3)	**2785.00**	**0.00**	**1303.00**	**5.00**	**3466.00**	**1100.00**	**121.00**	**301.00**	**22.00**	**9103.00**

Area of works	Steel reinforcements (t)	Decorative railings (m)	Flood gates (m^2)	Screen bars (m^3)
Clon Brugh	14.00		1.98	
Belarmine Park	19.00		4.2	
Kilgobbin	37.00	86.00		
Glenamuck Road North	21.00	169.00		0.51
Cherrywood Road	26.00		1.71	0.85
Bray Road	29.00		6.9	
Lower Brides Glen	23.00	129.00	3	
N11 Crossing	4.00	12.00		
Commons Road	139.00			
Brookdene	23.00	185.00		
Bayview	18.00			
Sub-totals	**353.00**	**581.00**	**17.79**	**1.36**

Therefore:

- Total building volume is <12,000m^3
- Potentially dusty construction material (small amount of concrete).

Therefore, considering the above and based on Table 6.2, the dust emission magnitude for Construction is defined as **Small**

Trackout:

Trackout covers the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.

- Therefore, there will be <20 outward HDV trips in any one day.
- Surface material with low potential for dust release
- Unpaved road length, some elements are <50m.

Therefore, considering the above and based on Table 6.2 the dust emission magnitude for Trackout is defined as **Small**.

STEP 2B: Define the Sensitivity of the Area

The sensitivity of the area takes account of several factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The criteria for determining the sensitivity of receptors are detailed in Table 6.3 for dust soiling effects and health effects of PM_{10}.

Table 6.3: Criteria for Determining Sensitivity of Receivers

Sensitivity of Receiver	Criteria for Determining Sensitivity	
	Dust Soiling Effects	**Health Effects of PM_{10}**
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets

The criteria detailed in Table 6.4, Table 6.5, and Table 6.6 were used to determine the sensitivity of the area to dust soiling effects, human health impacts and ecological impacts.

Table 6.4: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receiver Sensitivity	Number of Receivers	Distance from Source (m)			
		<20m	**<50m**	**<100m**	**250m**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 6.5: Sensitivity of the Area to Human Health Impacts

Receiver Sensitivity	Annual Mean PM_{10} Conc	Number of Receivers	Distance from Source (m)			
			<20m	**<50m**	**<100m**	**<250m**
High	>32 µg/m^3	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low

		1-10	Medium	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Table 6.6: Sensitivity of the Area to Ecological Impacts

Receiver Sensitivity	**Distance from Source (m)**	
	<20	**<50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Sensitivity of Receivers

The waterbodies in the study area flow primarily through several different parks and amenity areas. Maintaining access and the amenity value of these areas for residents is an important aspect of the FRS. These include, from upstream to downstream, Fernhill Park, Jamestown Park, Cabinteely Park, and Loughlinstown Woods, plus other smaller amenity areas.

The rivers in the scheme area flow primarily through land zoned for residential or open space. In the upper part of the watercourse there is also land zoned for economic development and employment. In lower parts of the catchment, east of the M50, there is land zoned for the provision of new residential communities, as well as mixed-use facilities and hospital services.

Various housing estates close to the watercourses are concentrated to a greater extent in Brennanstown, Loughlinstown, Cherrywood and Hackettsland. Important public facilities such as St Brigid' Boys national school and St Columcille's Hospital are also within the receiving environment.

Table 6.7 outlines the range of numbers of properties within specific distance bands from the proposed construction activities to determine the receptor sensitivity of the area to Dust Soiling Effects on People and Property.

Table 6.7: Cumulative number of sensitive receivers within 20m, 50m, 100m and 250m of the site

Parameter	Number of Receivers within Distance from Site (m)			
	<20m	**<50m**	**<100m**	**<250m**
Clon Brugh (Defence 1A and 1B)	>25	>50	>100	>100
Belarmine Park (Defence 2B and 2D)	~5	~40	>100	>100
Kilgobbin Road (Defence 2E and 2G)	~10	~15	>20	>20
Glenamuck Rd North Roundabout (Defence 3A)	3	8	12	>20
Cherrywood Road (Defence 4A)	3	3	~10	>10
Bray Road (Defence 5D)	7	~10	>10	>10
Lower Brides Glen (Defence 4B)	~5	~10	>10	>30
N11 Overflow Culvert (Defence 4)	0	1	3	>10
Commons Road and Brookdene (Defence 5A)	>20	>30	>50	>50
Bayview (Defence 5C)	~5	~10	>10	>30
Total No. of receivers in proximity to Site	~85	~180	>300	>380
Receiver Sensitivity	High	High	Medium	Low

Sensitivity of People to Dust Soiling

- Demolition, Earthworks and Construction: Table 6.7 above estimates the number of receivers within distance from the proposed works for each defence works/area. There are approx. 85 sensitive residential properties within 20m of the proposed construction activities on the site. (*The IAQM guidance states that a high sensitivity receptor is where: users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land)*. Many of the residential properties adjacent to the proposed works are apartment blocks. In accordance with IAQM guidance; in the case of high sensitivity receptors with high occupancy (such as schools or hospitals) the number of people likely to be present are approximated. In the case of residential dwellings, the number of properties is included. There are approx. an additional 95 dwellings within 50m of the proposed works.

Therefore, based on Table 6.4 the sensitivity of the Area to Dust Soiling Effects on People and Property is **High,** in terms of potential demolition, earthworks and construction dust impacts.

- Trackout: For trackout the distances should be measured from the side of the roads used by the construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road, there are approximately ~180 sensitive receptors

within 50 m from the proposed works. It is estimated that there are <100 of these sensitive properties within 50m from the edge of the road haul roads used by construction traffic.

Therefore, as shown in Table 6.4, the sensitivity of the Area to Dust Soiling Effects on People and Property is **Medium**; in terms of potential trackout dust impacts.

Sensitivity of the Area to Human Health Impacts

Section 6.1 outlines baseline air quality in the study area. The PM_{10} concentrations recorded at the EPA monitoring station in Dun Laoghaire Co. Dublin located 2km north northeast of the proposed FRS, and in Bray Co. Wicklow, located approximately 2km north northeast of the proposed FRS has been referenced for the year 16th May 2023 - 16th May 2024. These concentration values are 11.97 µg/m^3 and 9.79 µg/m^3 respectively, which are well below the Air Quality Standard annual limit value of 40µg/m^3 and below the recent 2021 WHO air quality guideline value of 15 µg/m^3.

There are ~85 sensitive receptors within 20 m of the proposed works. As shown in Table 6.5, the sensitivity of the Area to Human Health Impacts is **Low**; in terms of potential demolition, earthworks, construction and trackout dust impacts.

Sensitivity of the Area to Ecological Impacts

Dust deposition due to demolition, earthworks, construction and trackout has the potential to affect sensitive habitats and plant communities. Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis, respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and construction works.

The proposed scheme has a distant hydrological connection with the Dalkey Island SPA and Rockabill to Dalkey Island SAC, both of which are present within Killiney Bay. The outfall for the Shanganagh River is also in Killiney Bay. Although the South Dublin Bay SAC and the South Dublin Bay and River Tolka Estuary SPA are within 15km of the Zone of Influence (ZoI) both are found north of the Sorento Point headland and do not have a direct hydrological connection with the proposed scheme. An AA Screening report has been prepared and it concluded that the possibility of any significant negative effects on the Natura 2000 sites within the ZoI, whether arising from the project itself or in combination with other plans and projects, can be excluded beyond a reasonable scientific doubt on the basis of the best scientific knowledge available.

The project ecological team has carried out habitat surveys of the study area, which has assisted in identifying and defining the various types of habitats found in the area. Of particular importance includes Loughlinstown Wood pNHA (Site Code: 001211), the EU Habitats Directive Annex I listed habitat 'Perennial vegetation of stony banks [1220], and the sensitive Annex II & IV listed species Otter *Lutra lutra*. Loughlinstown Wood pNHA is found on the northern bank of the Shanganagh River near Commons Road. This pNHA is an important mixed woodland site with Alder and Willow present.

The Shanganagh River is known to be an active salmonid fishery, and the river itself is considered to be a sensitive receptor. In the absence of appropriate mitigation there is potential for negative impacts on this habitat and dependent species such as Brown Trout, Eel and the Annex II & IV species, lamprey spp. and Salmon. Bats (Annex IV listed species) are also known to use tree lines and the riparian corridors within the scheme as commuting and foraging features.

Table 6.8 outlines Sensitivity of the Area to Ecological Impacts. A high sensitivity receptor is those locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particular dust sensitive species. A medium sensitivity receptor is those locations ere there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition. A

low sensitivity receptor is those locations with a local designation where the features may be affected by dust deposition.

The downstream end of the proposed N11 culvert overflow works is within Loughlinstown Woods pNHA. Also works will take place along the Shanganagh river at Commons Road and Bayview. In relation to ecological impact, these receptors are considered to be of medium sensitivity. Therefore, the risk associated with demolition, construction, earthworks, and trackout is **Medium**.

The sensitivity of the area to dust soiling, human health impacts and ecological impacts for each activity is summarised in Table 6.8.

Table 6.8: Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	Medium
Human Health	Low	Low	Low	Low
Ecological	Medium	Medium	Medium	Medium

Step 2C: Define the Risk of Impacts

In accordance with the IAQM Guidance, the dust emission magnitude (Step 2A) and sensitivity of the area (Step 2B) have been combined and the risk of impacts from demolition, construction, earthworks and trackout determined (before mitigation is applied). The risk of dust soiling, impact on human health and ecological impact before mitigation, is summarised in Table 6.9.

Table 6.9: Summary Dust Risk to Define Site-specific Mitigation

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Low Risk	Low Risk
Human Health	Negligible	Low Risk	Negligible	Negligible
Ecological	Low Risk	Medium Risk	Low Risk	Low Risk

Step 3: Site-Specific Mitigation

In accordance with the IAQM Guidance, for proposed mitigation measures, the highest risk category should be applied. Therefore, the mitigation measures applicable to a **Medium Risk Site** should be applied as outlined in Section 6.1.5 below.

Operational Dust Impacts

For the Operational Phase, an assessment of air quality and dust impacts from the maintenance of the proposed development has been screened out on the basis that these activities have low potential for dust release and are likely to have a negligible impact on air quality sensitive receptors. In accordance with the IAQM guidance and TII guidelines, operational phase traffic related air quality impacts have been screened out of the impact assessment.

6.1.5 Mitigation Measures

Construction Mitigation

The following mitigation measures are to be implemented during the construction phase:

STEP 3: Site-Specific Mitigation

In accordance with the IAQM Guidance, the highest risk category should be applied when determining proposed mitigation measures. Therefore, the mitigation measures applicable to a **Medium Risk site** will be applied. The proposed mitigation measures in the IAQM guidance are as follows:

General Measures

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Implement a Dust Management Plan (DMP), to include the dust mitigation measures and monitoring as outlined in this report.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
- If applicable, hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas.

Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Waste Material to be disposed of at an appropriately licensed facility.

Measures specific to demolition

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

Measures specific to earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

Measures specific to construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures specific to trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site logbook.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Where space allows, implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). This will only be possible in larger site compounds, i.e., those at Bray Road and Commons Road.

- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permit.
- Access gates to be located at least 10 m from receptors where possible.

Monitoring

The following monitoring measure will be implemented for the Construction Phase of the proposed development:

- The contractor will undertake daily on-site and off-site inspection, where receptors (including roads) are within 100 m of site boundary, to monitor dust, record inspection results, and make the log available to the local authority on request. If the daily on-site and off-site inspection indicate significant dust soiling of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, the contractor will provide cleaning as necessary. The frequency of the inspections will be increased during site activities which have a high potential to generate dust.

- Agree dust deposition and/or real-time PM_{10} continuous monitoring locations with the local authority. Where possible commence baseline monitoring at least three months before work commences on site. This programme of air quality monitoring implemented at the site boundaries for the duration of the construction phase activities is to ensure that the air quality standards relating to dust deposition and PM_{10} are not exceeded. The following limits are recommended;
  - Dust Deposition Rate limit = 350 mg/m^2/day (averaged over a 30+/-2 day period using Bergerhoff Gauge Method).
  - Dust Deposition Rate limit affecting sensitive ecological receivers = 1,000 mg/m^2/day
  - PM_{10} 24 Hour Mean concentration limit = 50 µg/m^3 not to be exceeded more than 35 times a calendar year
  - PM_{10} Annual Mean concentration limit = 40 µg/m^3
  - $PM_{2.5}$ Annual Mean concentration limit = 25 µg/m^3

Where levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented. A complaints log shall be maintained by the construction site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

Operational Mitigation

As there are no significant negative effects on air quality predicted during the Operational Phase of the Proposed Development, no mitigation measures are proposed.

6.1.6 Residual Effects

STEP 4 - Construction site dust control measures and good construction site management and practice is capable of effectively mitigating the potential for significant impact of fugitive dust emissions. Therefore, the potential for fugitive dust emission effects at the nearest residential properties will be controlled to ensure impacts are of negligible significance.

The IAQM Guidance recommends that significance is only assigned to the effect after considering the construction activity with mitigation. Therefore, the detailed mitigation measures have been defined in a form suitable for implementation by way of inclusion within the EIAR which makes up part of the planning consent.

Using the IAQM methodology for the assessment of impacts from construction activities, the following is indicated in Table 6.10;

- the risk of dust soiling impacts is medium risk for demolition and earthworks, and low risk for construction and trackout;

- the impacts on human health are low risk for earthworks, and negligible for demolition, construction and trackout; and
- the ecological impacts are medium risk for earthworks, and low risk for demolition, construction and trackout;

In accordance with the IAQM Guidance, the highest risk category measures have been applied in the determination of appropriate mitigation measures. The significance of effects arising from the risks identified together with the proposed mitigation measures are summarised in Table 6.10.

Together with the proposed mitigation measures and the existing low background particulate (PM_{10}) concentrations, the construction phase activities on the proposed site will not cause an exceedance of the air quality objectives at receptor locations.

Table 6.10: Summary of Significance of Effect including Site-specific Mitigation.

Potential Impact	Significance			
	Demolition	**Construction**	**Earthworks**	**Trackout**
Dust Soiling	Negligible	Negligible	Negligible	Negligible
Human Health	Negligible	Negligible	Negligible	Negligible
Ecological	Negligible	Negligible	Negligible	Negligible

6.1.7 Interactions and Potential Cumulative Impacts

Interactions

The environmental effects on air quality are interlinked with the environmental effects of:

- Chapter 7 – Population and Human Health
- Chapter 8 – Biodiversity
- Chapter 9 – Land and Soil
- Chapter 10 – Water – Surface and Groundwater
- Chapter 11 – Material Assets
- Chapter 14 – Landscape & Visual Impact Assessment

Combined effects are by their nature interactive, the effect of one impact is dependent or influenced by another effect. Earthworks during the construction phase has the potential to give rise to dust impacts, potentially giving rise to water pollution and impacts on flora and fauna and the visual landscape. Mitigation of combined effects is best achieved through management and control measures to prevent the individual impacts in the first instance or reduce the impacts themselves and therefore reduce the likelihood of such interactions occurring.

An assessment of the potential impact of dust deposition on ecological receptors in proximity to the proposed works has been undertaken. Some of the proposed works occur within Loughlinstown woods pNHA and within 20m of the Shanganagh River and Carrickmines River. Earthworks during the construction phase has the potential to give rise to dust impacts, potentially giving rise to water pollution and impacts on flora and fauna. Appropriate construction phase mitigation measures have been outlined in Section 6.1.5 to ensure that the potential impact on these areas of medium ecological sensitivity will be negligible. In addition, with the implementation of mitigation measures described in EIAR Chapter 8 Biodiversity, impacts on biodiversity associated with the construction and operation of the proposed development are considered unlikely to constitute a significant effect.

Potential interactive negative impacts have been identified in Chapter 15 Interactions. All mitigation measures outlined in the respective chapters of this EIAR will be implemented in full to ensure the potential impact is minimised in relation to construction impacts.

Potential Cumulative Impacts

In relation to the in-combination construction and/or operational impact of the proposed Flood Relief Scheme, with other proposed schemes planned in the area, the list of proposed projects noted from Chapter 16 has been reviewed. Only those projects whose duration of permission overlaps with the likely construction period of the proposed development (i.e., 2025 onwards) are included. Small developments such as house extensions and alterations, or the construction of a single dwelling or structure, have been excluded as the likely effects of such developments will not be significant either in isolation or cumulatively with the proposed development, except where they are taking place adjacent to or in close proximity to the proposed defences.

In Section 6.1.5 Mitigation Measures above it states:

- If applicable, hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

A list of projects presented in Chapter 16, Figures 16.1 to 16.3 and Table 16.1 within 500m from the proposed Flood Relief Scheme have been considered and assessed:

- Planning Ref: D20A/0698 **-** At Dun Gaoithe at Aikens Village, Village Road, Sandyford, Dublin 18**.** Permission granted 30/07/2021, for retention and completion of a retaining wall in the residential development, permitted under planning reg. ref. D16A/0393, and subsequent planning reg. ref. D18A/0509. This development is located adjacent to proposed FRS works at Clon Brugh. It is believed construction is underway on this and may possibly be completed before construction of the FRS starts. This development is required to make suitable provision for dust minimisation during construction works in accordance with its own planning conditions. This is not considered a high-risk construction site at present and will not result in any significant additional construction/operational air quality impact.
- Planning Ref: D24A/0341 **–** Site at Oldtown House, Kilgobbin road, Dublin 18**.** Permission to construct 89 no. residential units. The proposal includes associated internal roads, pedestrian and cycle paths, and the provision of the proposed infrastructure up to the application site boundary to facilitate future connections to adjoining lands. The proposal also incorporates alterations and improvements to Kilgobbin Road, including relocation of a bus stop, 2 no. pedestrian crossings, and raised tables/ramps for the purpose of traffic calming. Permission was refused 09/07/2024 and an appeal was lodged on 6.8.2024 (Ref; ABP-320491-24). If granted permission, this development would be considered a high-risk site. If the construction period of this development is to overlap with the proposed FRS, there is a potential to impact on air quality in the area, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.
- Planning Ref: ABP31334122 – At Glenamuck Road North, Carrickmines, Dublin 18. Permission for a strategic housing development comprising 118 no. residential apartment units. A decision was due on this development on 3.8.2022 but no such decision has been made. This development is approximately 235m away from the proposed FRS works at Glenamuck Road North Roundabout. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a high-risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development if granted permission will be required to make suitable provision for dust minimisation during construction works, in accordance with its own planning conditions including implementation of the dust control measures, as outlined within the Preliminary Construction Management Plan (Preliminary CMP), by Waterman Moylan Consulting Engineers Limited, (February 2022) for the proposed site.
- Planning Ref: ABP31332222 – At Priorsland, Within the Townsland of Carrickmines Great and Brennanstown, Dublin 18. Permission sought to develop a mixed-use Village Centre and residential

development. A decision was due on this development on 2.8.2022 but no such decision has been made. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a high-risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development if granted permission, will be required to make suitable provision for dust minimisation during construction works, in accordance with its own planning conditions.

- Planning Ref: ABP31328122 – This development is >500m away from the proposed FRS works at Glenamuck Road North Roundabout and is therefore not considered to result in any cumulative impact on air quality.
- Planning Ref: DZ24A/0017 – At Townlands of Laughanstown and Cherrywood, Macnebury - Development Area 7 - Cherrywood, Dublin 18. Permission granted to construct a residential development consisting of 200 no. residential apartment units. Permission was granted on 11/06/2024. Although, this development is considered a high-risk site, it is >500m away from the proposed FRS works and is therefore not considered to result in any cumulative impact on air quality. This development as part of their planning conditions has been required to make suitable provision for dust minimisation during construction works, including submitting a Construction Management Plan to the local authority pre-construction.
- Planning Ref: D23A/0583 - At Riverwood, Cherrywood Road, Shankill, Dublin 18, D18R2V5. Permission granted 11/04/2024**.** This development is located adjacent to a proposed Flood Wall at Cherrrywood. This is not considered a high-risk construction site and will not result in any significant additional construction/operational air quality impact.
- Planning Ref: ABP30841820 – On a 1.4 ha site to the south of Abingdon, Shanganagh Road, Shankill, Dublin 18. Permission granted to construct a Build to Rent (BTR) residential scheme comprising 193 no. apartments. Permission granted 11/02/2021. This development is located <100m from proposed Flood Walls and compound along Commons Road/River Lane. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a high-risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development as part of their planning conditions has been required to make suitable provision for dust minimisation during construction works, including submitting a Construction Management Plan to the local authority pre-construction.
- Planning Ref: D21A/1082 – At Conna, Abingdon Park, Shanganagh Road, Shanganagh, Shankill. Co. Dublin, D18WF54. Permission sought for construction of 32 apartments with all relevant associated site works. The case was due to be decided by 08/05/2023. It is unclear if a decision has been made with the Board regarding this appeal. This development is located adjacent to the development **(**Planning Ref: ABP30841820) listed above. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a medium/high risk site, cumulatively with the development south of it, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.
- D24A/0492 – At 60, Roseville Cottage, Commons Road, Dublin 18, D18NXR6. Planning permission is being sought for retention and alterations to development of part dormer dwelling with two storey extension to north rear side and single-storey extension on west side with open canopy over entrance door. Although adjacent to proposed FRS works, this is not considered a high-risk construction site and will not result in any significant additional construction/operational air quality impact.
- Bray to City Centre Core Bus Corridor Scheme - This development is considered a high-risk site and if the construction period of this development overlaps with the proposed FRS regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development is required to make suitable provision for dust minimisation during construction works in accordance with its own planning conditions.

6.2 Climate

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the climate impact of the Carrickmines Flood Relief Scheme, Co. Dublin during the Construction Phase. The Flood Relief Scheme relates to the Carrickmines-Shanganagh River within Dun Laoghaire-Rathdown Council area.

This climate impact assessment has been prepared to assess the potential climate impact of the proposed flood relief scheme. The climate assessment for the proposed development in this chapter estimates the potential for greenhouse gas (GHG) emissions, i.e., carbon emissions.

It is envisaged that the future operation and maintenance of the proposed development will not have a significant climate impact. Provision is made in the design of the scheme in the present day to allow it to be adapted or enhanced in the future to address climate change. The operational phase of the proposed development may involve water pumps/generators in emergencies only and the maintenance of debris screens, silt traps, and flood walls, and as such its impact is not considered significant. In fact, there are climatic benefits, in that lands that are at risk of flooding due to climate change will benefit from the proposed development and the associated environmental, health, social and economic impacts of flooding due to climate change will be mitigated. This constitutes a permanent and significant positive impact during the operation phase of the proposed development. This benefit is assessed in detail in the Flood Risk Assessment.

The construction activities of the proposed development have been examined to identify those that have the potential to give rise to a short-term climate impact in terms of 'embodied carbon' and 'construction activities' carbon emissions.

The assessment and evaluation of the potential climate impact arising from the proposed flood relief scheme was based on reference to the relevant Transport Infrastructure Ireland (TII) Publications and TII Carbon Tool, for use in the assessment of climate effects for national road schemes and these are described in the SD and OTD for climate, as follows:

- Climate Assessment of Proposed National Roads, December 2022. This Standard Document (SD), PE-ENV-01105 sets out the required approach for Climate Practitioners to identify significant climate effects; in terms of both Greenhouse Gas (GHG) emissions and climate resilience, associated with all stages of proposed national road developments: the design, construction, and operation of national roads in accordance with TII's project planning and national planning requirements.
- The methodology outlined in this SD and the theory of climate assessment are presented in an "Overarching Technical Document" (OTD), PE-ENV-01104. The OTD should be read in conjunction with this SD. The OTD provides best practice methodology and processes for climate assessment for proposed national road developments, as well as light railway and rural cycleways (offline & greenways) projects.
- Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document, GE-ENV-01106; and

In accordance with the TII Guidelines outlined above, the climate impact assessment has included a Greenhouse Gas (GHG) Assessment Process as follows;

- Using Table 3.21 Phase 2, Stage 2 GHG Assessment Instructions, it is a requirement to quantify available GHG data using the TII Carbon Assessment Tool. This process should include available major sources of GHGs provided to the climate practitioner by the project engineers including:
  - Cut and fill balance, etc.
  - Main materials for construction – these include pavement, earthworks, concrete, and steel, etc.

A Climate Change Risk (CCR) Assessment Process has been undertaken elsewhere in the EIAR in the form of detailed flood risk assessment, etc.

6.2.1 Methodology

Greenhouse Gas (GHG) Assessment

The GHG impact assessment for the proposed scheme has been assessed using the TII Carbon Assessment Tool. The Carbon Assessment Tool has been used for the calculation of emissions arising from the construction of the proposed scheme. The Carbon Assessment Tool aligns with TII's project phases as well as the latest standard Carbon management in buildings and infrastructure[2] (PAS 2080:2023). The tool includes an emission factors library using factors developed by relevant industry bodies. The outputs from the Carbon Assessment Tool allow for comparison and evaluation of the lifecycle carbon impacts for any given national road project.

Using the Transport Infrastructure Ireland (TII) Carbon Tool for Road and Light Rail Projects: Guidance, the lifecycle carbon emissions for the flood relief scheme have been calculated. The calculation tool for lifecycle carbon emissions assesses various stages of the project as follows;

- "**Pre-Construction"** stage considers activities that will take place at the pre-construction stage of a project, specifically clearance and demolition works.
- **"Embodied Carbon"** stage considers the product stage, including materials that will be used during the construction process, their lifetime (to determine replacement cycles) and details of material transportation.
- **"Construction Activities"** stage considers construction activities that will take place during infrastructure development, including excavation activities, energy use of construction activities, water use and landscaping and vegetation.
- The **"Operational Use Carbon"** stage considers emissions associated with the operation of the infrastructure scheme such as energy, water and waste.
- The **"Operational Carbon Emissions"** of a project considers emissions associated with the use of the scheme.
- The **"Maintenance Carbon"** stage of a project considers emissions associated with the fuel used for the maintenance of the infrastructure scheme during its use.
- "**End of Life Carbon**" stage considers the decommissioning of the scheme, including deconstruction and demolition activities and waste disposal.

During the construction phase of the proposed Flood Relief Scheme, GHG emissions will potentially be generated by site preparation works, excavation, infilling works, construction activities, energy usage, etc. During the operational phase for the proposed Flood Relief Scheme, no climate impacts will result from carbon emissions. Therefore, the potential climate impacts in terms of carbon emissions (tCO_{2e}) during construction have been considered for the proposed Flood Relief Scheme.

6.2.2 Receiving Environment

Baseline Climate Survey

''Ireland, National Inventory Report 2024' as published by the EPA in March 2024, indicates that in 2022, total emissions of greenhouse gases including indirect emissions from solvent use (without LULUCF) in Ireland were 60,604.9 kt CO_2 equivalent, and the total with LULUCF 64,588.2 kt CO_2 equivalent. This value is 9.7% higher than emissions in 1990 but the total for 2021 is 15.2% lower than the peak of 71,814.5 kt CO_2 equivalent in 2001 when emissions reached a maximum following a period of unprecedented economic growth.

The EPA reported total emissions of greenhouse gases in 2021, including indirect emissions from solvent use (without LULUCF), in Ireland were 62,109.9 kt CO_2 equivalent and the total with LULUCF 69,448.1 kt

[2] PAS 2080:2023, BSI, ISBN:978 0 539 18034 3

CO_2 equivalent. This value is 11.6% higher than emissions in 1990 but the total for 2021 is 13.5% lower than the peak of 71,814.5 kt CO_2 equivalent in 2001.

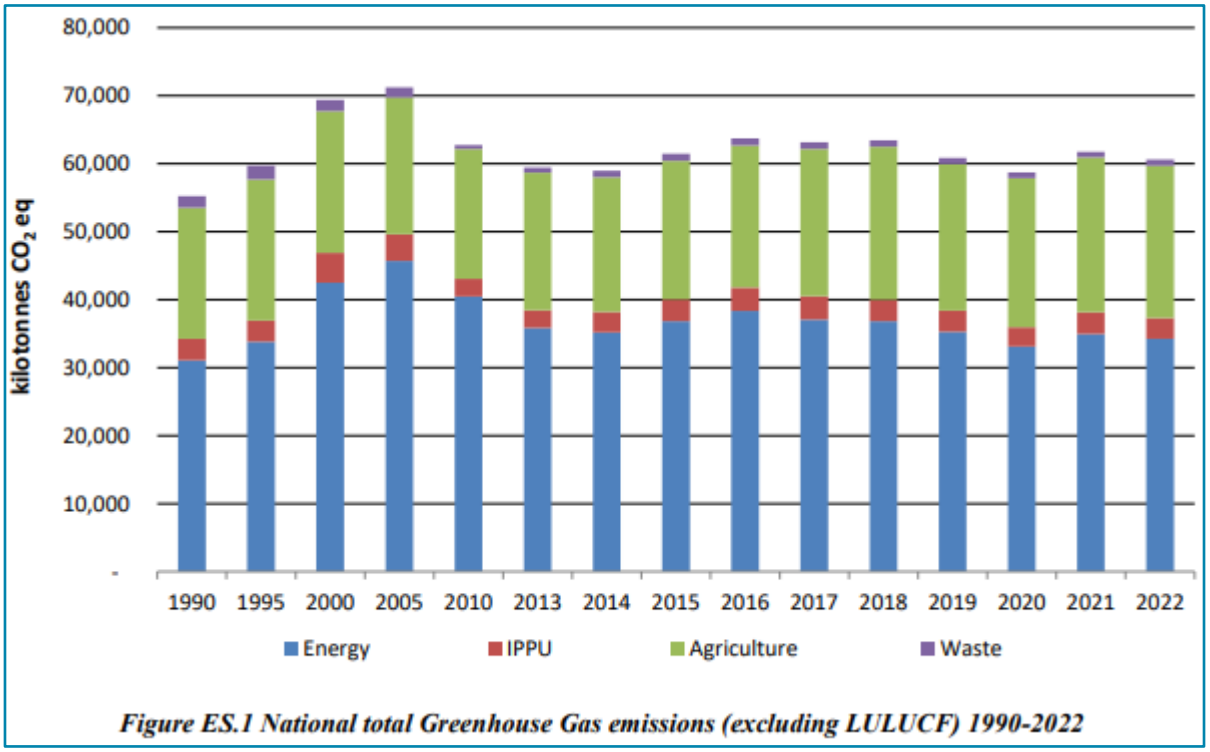


Figure 6.1: National Total GHG Emissions (Excluding LULUCF) 1990-2022

The Government's Climate Action Plan 2024 (CAP24) is the third annual update to Ireland's Climate Action Plan 2019. CAP23 was the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and following the introduction, in 2022, of economy-wide carbon budgets and sectoral emissions ceilings. The plan implements the carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve emissions by 2030 and reach net zero no later than 2050, as committed to in the Programme for Government

Climate Action Plan 2024 builds upon CAP23 by refining and updating the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings. The Plan provides a roadmap for taking decisive action to halve Ireland's emissions by 2030 and reach net zero by no later than 2050, as committed to in the Climate Action and Low Carbon Development (Amendment) Act 2021.

CAP 23 and CAP 24 outline that Flood Risk Management is the responsibility of the Office of Public Works. The detailed implementation maps for actions, including timelines and responsible organisations, are set out in the accompanying Annex. The relevant action numbers and actions for CAP 23 and CAP 24 are shown in Table 6.11 below.

Table 6.11: CAP23 and CAP24 Actions relating to flood risk.

Action Number	Action
AD/24/2	Complete a review of the national Preliminary Flood Risk Assessment to assess the potential impacts of climate change on flooding and flood risk across Ireland
AD/24/3	Develop options for the delivery of a National Implementation Strategy for Nature-Based Solutions for the management of rainwater and surface water runoff in urban areas.

AD/23/2	Produce guidance on the assessment of adaptation measures and the development of Climate Change Adaptation Plans for past and new flood relief schemes.
AD/23/3	Update the existing Minor Works Programme to ensure applications consider the potential impacts of climate change and, where necessary, that any measures proposed provide for, or are adaptable to, possible future changes in flood risk

6.2.3 Potential Impact of the Proposed Development

Construction Climate Impacts

The quantification of carbon emissions and the associated climate impact as a result of the construction phase of the proposed flood relief scheme has been based on the construction quantity information provided by the project engineers. Therefore;

Volume of demolition works:

Area of works	Stone walls	Concrete	Paving / Road works	Total Volume (m^3)
Clon Brugh	10.00	7.00	5.00	**22.00**
Belarmine Park		93.00		**93.00**
Kilgobbin	253.00		5680.00	**5933.00**
Glenamuck Road North	58.00			**58.00**
Cherrywood Road				**0.00**
Bray Road				**0.00**
Lower Brides Glen	91.00			**91.00**
N11 Crossing			1394.00	**1394.00**
Commons Road	184.00			**184.00**
Brookdene				**0.00**
Bayview		17.00		**17.00**
Total Volume (m^3)	**596.00**	**117.00**	**7079.00**	**7792.00**

Area for earthworks:

Area of works	Excavation area (m^2)	Works area (m^2)
Clon Brugh	**272.00**	**1123.00**
Belarmine Park	**295.00**	**1205.00**
Kilgobbin	**2028.00**	**4135.00**
Glenamuck Road North	**327.00**	**1499.00**
Cherrywood Road	**362.00**	**1603.00**
Bray Road	**1521.00**	**2669.00**
Lower Brides Glen	**256.00**	**1107.00**
N11 Crossing	**311.00**	**1317.00**
Commons Road	**1502.00**	**4881.00**
Brookdene	**367.00**	**1588.00**
Bayview	**238.00**	**1030.00**
Total Area (m^2)	**7479.00**	**22157.00**

Volumes of material moved:

Volume of material moved	Excavate and spoil material	Remove spoiled material from site	Import backfill material	Import material for roadworks	Total Volume moved (m3)
Clon Brugh	277.00	277.00	189.00		**743.00**
Belarmine Park	380.00	380.00	255.00		**1015.00**
Kilgobbin	4416.00	4416.00	2933.00	1164.50	**12929.50**
Glenamuck Road North	387.00	387.00	266.00		**1040.00**
Cherrywood Road	291.00	291.00	162.00		**744.00**
Bray Road	2751.00	2751.00	610.00		**6112.00**
Lower Brides Glen	211.00	211.00	115.00		**537.00**
N11 Crossing	1283.00	1283.00	823.00	292.00	**3681.00**
Commons Road	1944.00	1944.00	1197.00		**5085.00**
Brookdene	302.00	302.00	165.00		**769.00**
Bayview	196.00	196.00	107.00		**499.00**
Total Volume (m3)	**12438.00**	**12438.00**	**6822.00**	**1456.50**	**33154.50**

Total building volumes:

Area of works	Concrete	Steel Sheet Piles	Stone Cladding	Paving	Backfilling	Layer works for roadworks	Asphalt Road Surfacing	Precast Concrete	Gabions	Total Volume (m^3)
Clon Brugh	111.00		55.00	5.00	152.00					**323.00**
Belarmine Park	147.00		80.00		188.00				22.00	**437.00**
Kilgobbin	293.00		142.00		336.00	949.00	38.00	176.00		**1934.00**
Glenamuck Road North	168.00		87.00		213.00					**468.00**
Cherrywood Road	205.00		112.00		130.00					**447.00**
Bray Road	227.00		97.00		488.00					**812.00**
Lower Brides Glen	178.00		113.00		92.00					**383.00**
N11 Crossing	23.00		225.00		658.00	151.00	83.00	125.00		**1265.00**
Commons Road	1114.00		225.00		926.00					**2265.00**
Brookdene	181.00		89.00		132.00					**402.00**
Bayview	138.00		78.00		151.00					**367.00**
Total Volume (m^3)	**2785.00**	**0.00**	**1303.00**	**5.00**	**3466.00**	**1100.00**	**121.00**	**301.00**	**22.00**	**9103.00**

Additional quantities (items not easily measurable by volume):

Area of works	Steel reinforcements (t)	Decorative railings (m)	Flood gates (m^2)	Screen bars (m^3)
Clon Brugh	14.00		1.98	
Belarmine Park	19.00		4.2	
Kilgobbin	37.00	86.00		
Glenamuck Road North	21.00	169.00		0.51
Cherrywood Road	26.00		1.71	0.85
Bray Road	29.00		6.9	
Lower Brides Glen	23.00	129.00	3	
N11 Crossing	4.00	12.00		
Commons Road	139.00			
Brookdene	23.00	185.00		
Bayview	18.00			
Sub-totals	**353.00**	**581.00**	**17.79**	**1.36**

It can be expected that HGV vehicle movements may be in the region of 5 to 10 vehicles per hour during the busiest period of construction works. HGV vehicle movements will be required for bulk excavation works and import of materials. This will generate the most HGV movements during the anticipated dig and replace works and be the busiest construction period. In terms of carbon emissions, this has been assessed assuming 20 litres of fuel usage per hour, for 10 hours per day and for 90 days of continuous operations.

Table 6.12 outlines the Total Greenhouse Gas Emissions due to the construction phase earthworks for the proposed development described above, as predicted using the TII Carbon Tool.

Table 6.12: Total Greenhouse Gas Emissions (tonnes CO2 equivalent) due to the construction phase of the proposed development.

Name	Pre-Construction	Embodied Carbon	Construction Activities	Construction Waste	Operational Use	Total (t CO_2 equivalent)
NA	342.07	2,113,383.67	49,581.69	0	0	2,163,307.43

Therefore, as a percentage of 2022 Annual Carbon Emissions of 69,448.1 kt CO2 equivalent, the proposed development will account for 0.0033% of annual CO_2 emissions. This represents a **negligible** impact.

Operational Stage

There will be no operational climate impact from the operation of the proposed development. The proposed development will provide tangible benefits in terms of reduced flood impacts, reduction of financial loss and disruption as well as alleviating future development restrictions.

There will be no significant operational climate impact from the operation of the proposed development. The proposed flood defence measures will require regular routine inspections to identify any damage or deterioration every 1 to 2 years or in the interim if accidental damage were to occur due to storms from debris, materials or other accidental damage (e.g. machinery/vehicles).

Emissions from emergency pumps/generator if required will be infrequent. During use, a diesel generator will emit carbon dioxide, nitrogen oxide and particulate matter, however, due to the low usage, the impact will be imperceptible. Maintenance vehicles will access the site at the most yearly, however, due to the low

and infrequent traffic movements involved, the impact will be imperceptible. The operational phase of the proposed development will result in **positive impacts** on climate as the proposed development will provide tangible benefits in terms of reduced flood impacts, reduction of financial loss and disruption as well as alleviating future development restrictions.

6.2.4 Mitigation Measures

Construction Mitigation

As no significant negative effects are predicted to occur during the construction phase, no specific construction phase mitigation measures are required.

Operational Mitigation

As the operation of the proposed development will have positive impacts on climate, mitigation measures are considered unnecessary.

6.2.5 Residual Effects

As no significant negative effects are predicted to occur during the construction or operation phase, no specific climate effects are predicted.

6.2.6 Interactions and Potential Cumulative Impacts

Interactions

No specific construction or operation phase mitigation measures have been outlined for the proposed flood relief scheme. A Climate Change Risk (CCR) Assessment Process has been undertaken elsewhere in the EIAR in the form of detailed flood risk assessment.

Potential Cumulative Impacts

The construction machinery and processes have the potential to give rise to Greenhouse Gas Emissions due to the construction phase of the proposed development as predicted using the TII Carbon Tool. In relation to the in-combination construction and/or operational impact of the proposed Flood Relief Scheme, with other proposed projects planned in the area, the list of schemes noted in Chapter 16 have been reviewed. A list of projects presented in Chapter 16, Figures 16.1 to 16.3 and Table 16.1 have been considered and assessed. None of these schemes will result in any significant additional construction and/or operational climate impacts.

6.3 Noise & Vibration

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the noise and vibration impact of the Carrickmines-Shanganagh Flood Relief Scheme during the construction phase. The Flood Relief Scheme relates to the Carrickmines-Shanganagh River within Dun Laoghaire-Rathdown Council area.

This noise and vibration impact assessment has been prepared to assess the potential noise and vibration impact of the proposed flood relief scheme on the nearest residential properties. It can be expected that the future operation of the proposed flood relief scheme will not have a significant noise impact. Therefore, the construction activities of the proposed flood relief scheme have been examined to identify those that have the potential to give rise to a short-term noise and vibration impact and a suitable construction impact assessment has been undertaken. As appropriate, construction phase mitigation measures have been outlined.

The assessment and evaluation of the potential noise and vibration impact arising from the proposed flood relief scheme involved the following:

- Baseline Noise Survey – noise monitoring survey representative of the daytime period to determine the existing noise climate in proximity to the residential receivers in the vicinity of the proposed flood relief scheme.
- Identification and assessment of potential noise and vibration sources from the construction of the proposed flood relief scheme.
- Construction noise impact prediction using the methodology outlined in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- An assessment of the predicted noise levels and the noise impact on the nearest residential receivers against relevant guidelines and standards.
- A recommendation of appropriate construction and operational noise and vibration mitigation measures.

6.3.1 Methodology

ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures

The *ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures* defines the basic quantities to be used for the description of noise in community environments and describes assessment procedures. It also specifies methods to assess environmental noise and gives guidance on predicting the potential annoyance response of a community to long-term exposure from various types of environmental noises. Application of the method to predict annoyance response is limited to areas where people reside and to related long-term land uses. ISO 1996: 2016 describes adjustments for sounds that have different characteristics. The term rating level is used to describe physical sound predictions or measurements to which one or more adjustments have been added. Based on these rating levels, the long-term community response can be estimated. The potential noise is assessed either singly or in combination, allowing for consideration, when deemed necessary by responsible authorities, of the special characteristics of their impulsiveness, tonality and low-frequency content, and for the different characteristics of road traffic noise, other forms of transportation noise (such as aircraft noise) and industrial noise.

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise

BS5228 gives recommendations for methods of noise control relating to construction sites, including sites where demolition, remediation, ground treatment or related civil engineering works are being carried out, and open sites, where work activities/operations generate significant noise levels, including industry-specific guidance. The legislative background to noise control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and local authorities. This part of BS5228 provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it.

Annex E of BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, provides guidance on assessing the potential significance of noise effects from construction activities. In relation to construction noise limits, BS 5228-1:2009+A1: 2014 Noise and Vibration Control on Construction and Open Sites Part 1: Noise details the 'ABC method', which recommends a construction noise limit based on the existing ambient noise level. General and short-term construction noise impacts that are deemed typical of any construction site noise sources, including activities such as ground preparation, site clearance, foundation earthworks, erection of new buildings, etc. are assessed in accordance with the 'ABC method' defined in BS 5228.

For the proposed flood relief scheme, the ambient noise levels have been determined through the baseline noise survey and then rounded to the nearest 5dB to determine the appropriate category (A, B or C) and subsequent threshold value. A potential significant effect is indicated if the construction noise level exceeds the appropriate category threshold value. If the existing ambient level exceeds the threshold category values, then a potential significant impact is indicated if the total noise level, including both the ambient noise and the various contributions of construction noise, is greater than the ambient noise level by more

than 3dB. Table 6.13 reproduced from BS5228, demonstrates the criteria for selection of a noise limit for a specific receiver location.

Table 6.13: Construction noise threshold levels based on the BS 5228 'ABC' method.

Assessment Category and Threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Nighttime (23.00 to 07.00)	45	50	55
Weekdays evening (19.00–23.00) Saturdays (13.00–23.00) and Sundays (07.00–23.00)	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 - 13.00)	65	70	75

Notes:
Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

TII Construction Guidelines

There are no national construction noise limit guidelines. Instead, there are indicative levels of acceptability for construction noise, as contained in the National Roads Authority (now Transport Infrastructure Ireland or TII) *"Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes"* (March 2014) and outlined in Table 6.14.

Table 6.14: Maximum permissible noise levels at the façade of dwellings during construction.

Days & Times	$L_{Aeq\ (1hr)}$ dB	L_{AMax} dB
Monday to Friday - 07.00 to 19.00	70	80*
Monday to Friday - 19.00 to 22.00	60*	65*
Saturday - 08.00 to 16.30	65	75

Notes:
** Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority. (Ref. TII Guidelines)*

Construction Vibration Guidelines

The relevant guidelines for vibration limits are the following:

- British Standards Institution. British Standard 7385: Evaluation and measurement for vibration in buildings. Part 1: Guide for measurement of vibration and evaluation of their effects on buildings. 1990.
- British Standards Institution. British Standard 7385: Evaluation and measurement for vibration in buildings. Part 2: Guide for damage levels from ground borne vibration. 1993.
- British Standards Institution. British Standard 6472: Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting. 2008.
- National Roads Authority (now TII), Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, March 2014.

Relevant vibration limits and guidelines can be divided into two categories: those dealing with human comfort, and those dealing with cosmetic or structural damage to buildings. Higher levels of vibration are

typically tolerated for single events or events of short duration such as during construction projects compared to permanent vibration from operational industrial sources. For example, blasting (an instantaneous activity) and piling (a repetitive/continuous activity), two of the primary sources of vibration during construction projects, are typically tolerated at vibration levels up to 12mm/s and 2.5mm/s, respectively.

The TII Guidelines (March 2014) identify limits for protection against cosmetic damage as a function of vibration frequency, and are:

- 8 mm/s (vibration frequency <10Hz)
- 12.5 mm/s (vibration frequency 10 to 50Hz)
- 20 mm/s (vibration frequency >50 Hz).

Guidance relevant to acceptable vibration at the foundation of buildings is contained within BS 7385 (1993): *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration*. This guidance states that there should typically be no cosmetic damage to buildings if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines refer to relatively modern buildings.

6.3.2 Receiving Environment

Baseline Noise Survey

A daytime baseline noise monitoring survey was undertaken in proximity to the residential properties close to the proposed works areas at the Clon Brugh, Belarmine Park, Kilgobbin, Glenamuck Road North Roundabout, Cherrywood Road, Bray Road, Lower Brides Glen, Commons Road and Brookdene and Bayview in Carrickmines on 16th May 2024.

The noise survey was undertaken in accordance with the methodologies outlined in ISO 1996 Description, measurement and assessment of environmental noise and BS 4142. A Norsonic Nor140 Sound Level Meter (Serial No. 1402988 – Calibration Date – 13/04/2023) was used during the noise monitoring survey. A wind shield was used on the microphone throughout the survey and the sound level meter was calibrated before and after the survey period. The sound level meter was placed at a height of approximately 1.25m at the selected monitoring locations. The noise monitoring survey durations in proximity to the nearest noise sensitive receiver locations were undertaken over consecutive 15-minute periods. The meteorological conditions during the noise survey periods were noted as ideal with no periods of rainfall or higher wind speeds. The weather conditions during the noise survey were noted to be relatively calm with a gentle breeze, a temperature of approximately 14°C and no rainfall.

The purpose of the noise survey was to determine a typical daytime background noise level in the area and the measurement parameters recorded and reported during the baseline noise survey are defined as follows:

- A-weighted Decibel (dBA): Decibels measured on a sound level meter incorporating a frequency weighting (A Weighting) which differentiates between sound of different frequency (pitch) in a similar way to the human ear. This takes account of the fact that the human ear has different sensitivities to sound at different frequencies.
- L_{Aeq} is the A-weighted equivalent continuous steady sound level during the sample period.
- L_{A10} is the A-weighted sound level that is exceeded for 10% of the sample period and is generally used to quantify traffic noise.
- L_{A90} is the A-weighted sound level that is exceeded for 90% of the sample period and is generally used to quantify background noise.
- L_{Amin} is the minimum A-weighted sound level measured during the sample period.
- L_{Amax} is the maximum A-weighted sound level measured during the sample period.

Baseline noise measurements were undertaken in proximity to the representative residential receivers in accordance with ISO 1996: 2016 as shown in Table 6.15. All noise measurement data was downloaded at the company office, exported from the manufacturer's software and stored as Microsoft Excel spreadsheet files.

Table 6.15: Baseline Noise Levels

Location	Time	L_{Aeq}	L_{AMax}	L_{AMin}	L_{A10}	L_{A90}	Sources
NML 1 – Clon Brugh (53.263276, -6.226472)	10:20	54.7	76.6	40.9	56.9	42.6	Distant traffic. Quiet area.
NML 2 – Belarmine Vale (53.260837, -6.216719)	11:04	49.9	77.1	38.5	50.8	41.7	Distant traffic. Quiet area.
NML 3 – Kilgobbin (53.260144, -6.211096)	11:53	59.7	82.6	43.1	61.9	50.6	Passing traffic
NML 4 – Ballyogan Grove (53.254063, -6.173687)	12:42	51.5	77.9	50.2	54	45.8	M50 traffic. Sheltered road
NML 5 – Cherrywood Park (53.245581, -6.135336)	13:33	74.1	80.9	59.7	78.1	66.3	N11 traffic constant
NML 6 – Commons Road (53.242442, -6.124090)	14:09	57.7	78.6	43.3	59.1	51.5	Distant traffic. Quiet road.
NML 7 – Bayview Lawns (53.244779, -6.117425)	14:52	49.7	73.7	38.4	50.3	40.2	Quiet estate area. Cars. Birdsong.

The baseline noise measurement data indicates that there is a very wide variation in noise levels across the area of the Carrickmines-Shanganagh River Flood Relief Scheme, in proximity to the proposed flood relief works to the Carrickmines-Shanganagh River within Dun Laoghaire-Rathdown Council area. In general, it is the passing traffic on the surrounding road network which is the dominant noise source at the selected noise monitoring locations.

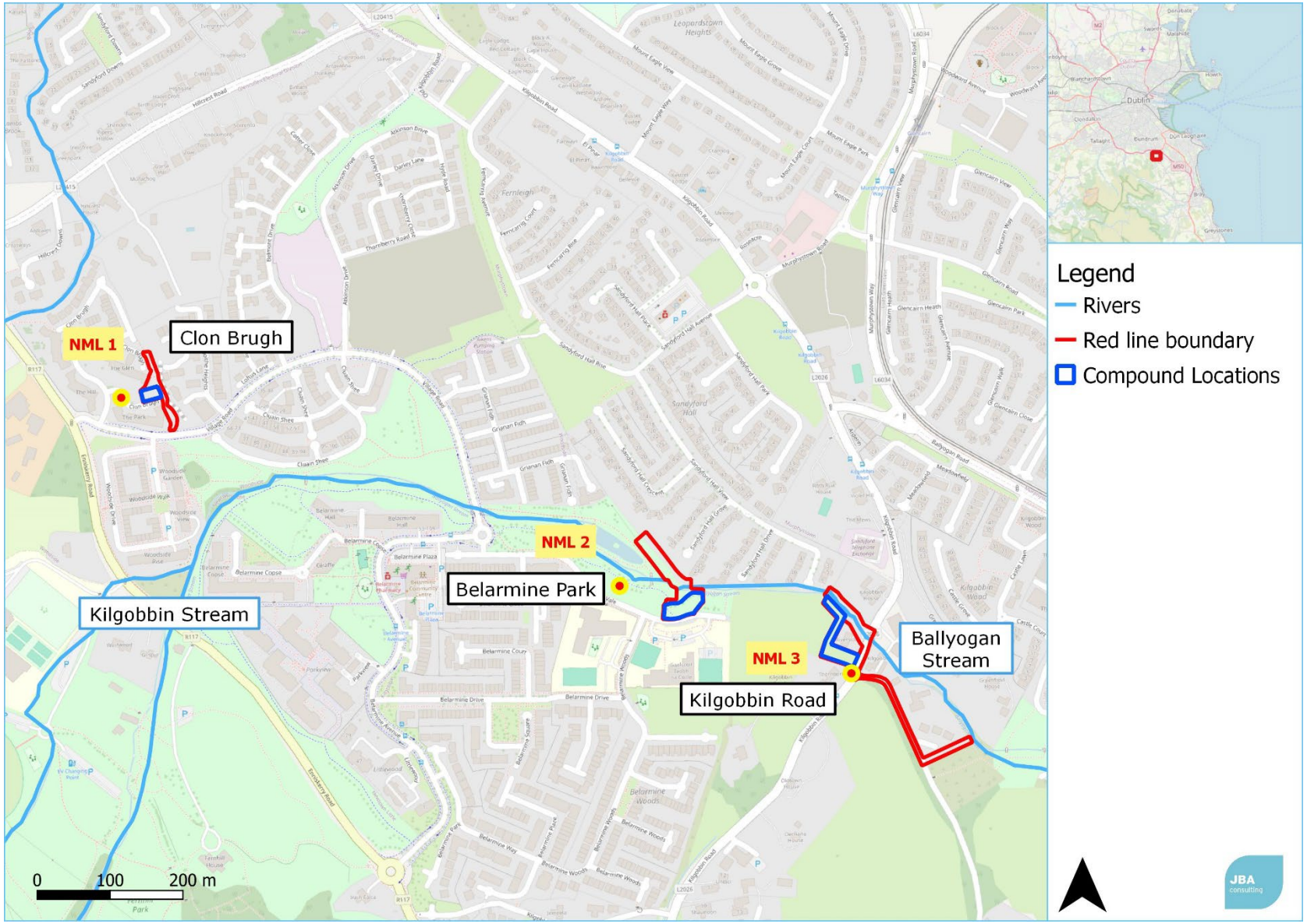


Figure 6.2: Noise Monitoring Locations (NML 1-3)

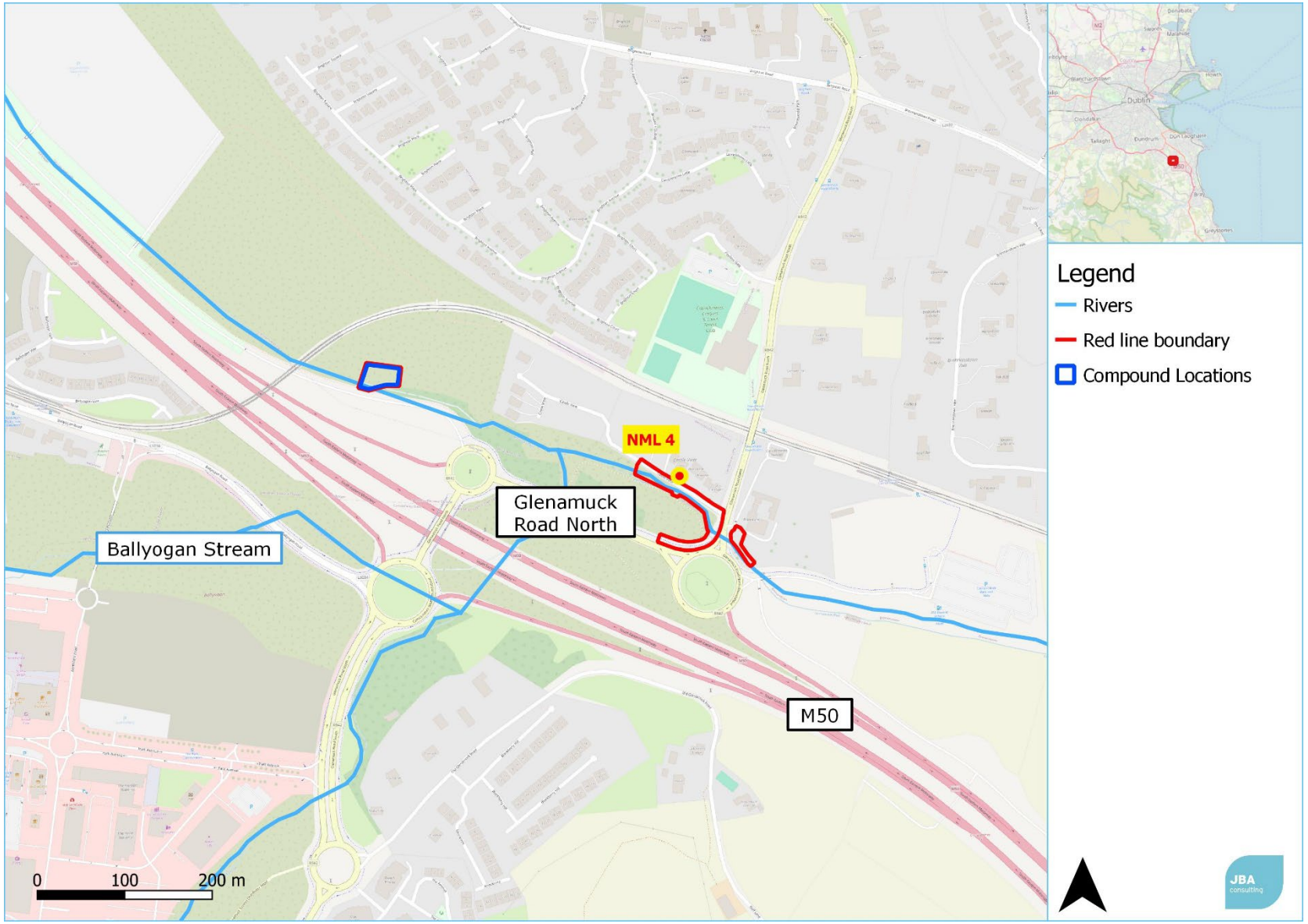


Figure 6.3: Noise Monitoring Locations (NML 4)

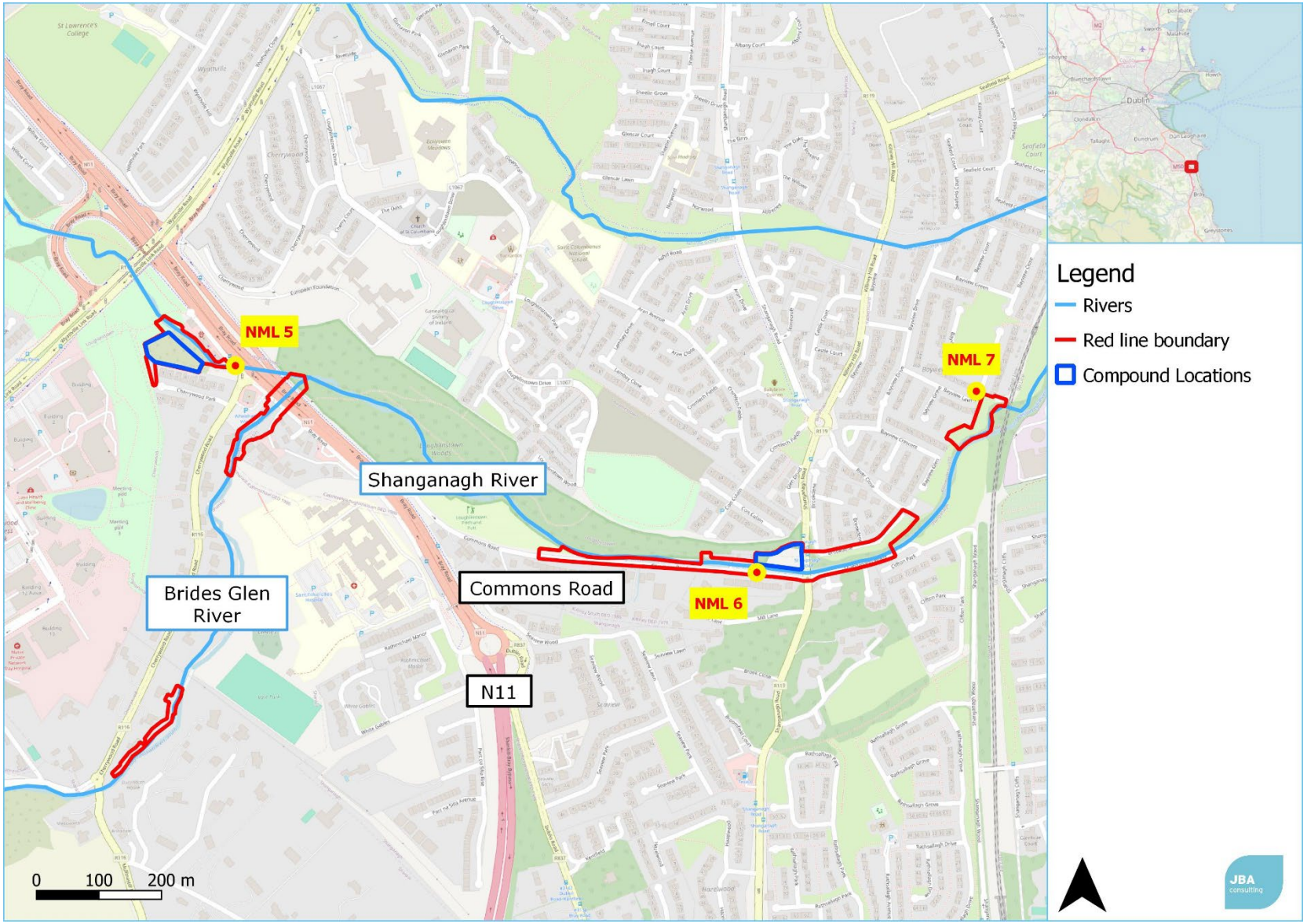


Figure 6.4: Noise Monitoring Locations (NML 5-7)

6.3.3 Potential Impact of the Proposed Development

Construction Noise Impacts

A full description of all proposed works can be found in Chapter 3.

This section further summarises and assesses the nature of only proposed construction works in each area and the approximate distance to the nearest noise sensitive receivers. No significant difficulties were encountered when preparing this Noise and Vibration impact assessment.

Noise impacts as a result of the construction phase of the proposed flood relief scheme will be perceptible at nearby properties but this will be intermittent and temporary. The following construction practices have the potential to produce intermittent and temporary noise impacts:

- Site Clearance & Excavation – dozers, tracked excavators & dump trucks;
- Infilling / Levelling – dozers, excavators, wheeled loaders, and rollers;
- Wall Removal & Construction – concrete mixer trucks & delivery vehicles; and
- General Construction – masonry wall construction, etc.

It can be expected that HGV vehicle movements may be in the region of 5-10 vehicles per hour during the busiest period of construction works. HGV vehicle movements will be required for bulk excavation works and importation of concrete materials for wall construction. This will generate the most HGV movements during the anticipated works and the busiest construction periods.

Construction works will take place for a short-term period during night-time hours at the proposed N11 overflow culvert. It is expected that at least 9 different works phases are expected to install the pipeline in its entirety. It is expected that the construction work phases will last for a total duration of less than month. The nearest residential property to this construction work location is located approximately 40m away on Bray Road. The construction works will be subject to a noise limit of 45 dB $L_{Aeq,\ Period}$ during the night-time, and as they will continue for a total duration of less than month take place over a short-term period, will not result in a significant noise impact.

Construction noise can be assessed in terms of the equivalent continuous sound level and/or in terms of the maximum level. The level of sound in the neighbourhood that arises from a construction site depends on a number of factors and the estimation procedures need to take into account the following significant factors;

- the sound power outputs of processes and plant;
- the periods of operation of processes and plant;
- the distances from sources to receiver;
- the presence of screening by barriers;
- the reflection of sound;
- ground attenuation;
- meteorological conditions (particularly wind speed and direction), and
- atmospheric absorption.

It is most likely that the above outlined construction activities will occur separately throughout periods of construction at each works location. The proposed construction works will not be continuous over the construction period at any one location. By its nature, construction phases of such a proposed development are transient in terms of locations of precise activities on site from time to time. Therefore, the predicted worst-case $L_{Aeq,1\ hour}$ noise levels at specific locations have been outlined to present a worst-case range of noise levels that have the potential to occur at various stages throughout the construction period.

Typical noise levels from construction works likely to take place during construction phase of proposed flood relief scheme are outlined in Table 6.16.

Table 6.16: Typical Noise Levels from Construction Works likely to take place during the construction of proposed development.

Ref No.	Equipment	A-weighted sound pressure level, L_{Aeq}, dB @ 10m
Table C.2 Sound level data on site preparation		
Clearing Site & Ground excavation/earthworks		
1	Dozer ж (142 kW, 20T)	75 ж
3	Tracked excavator (102 kW, 22T)	78
12	Dozer (142 kW, 20T)	80
14	Tracked excavator (226 kW, 40T)	79
Loading lorries		
27	Wheeled loader (493 kW)	80
Distribution of material		
30	Dump truck (tipping fill) (306 kW, 29T)	79
31	Dump truck (empty) (306 kW, 29T)	87
Rolling and compaction		
37	Roller (rolling fill) ж	79 ж
Table C.4 Sound level data on general site activities		
Distribution of materials		
1	Articulated dump truck ж	81 ж
Mixing & Pumping concrete		
20	Concrete mixer truck	80
Trenching		
63	Tracked excavator	77
Power for site cabins		
84	Diesel generator	74
Pumping water		
88	Water pump (diesel) (10 kW, 100Kg)	68
Sweeping and dust suppression		
90	Road sweeper (70 kW)	76
91	Dust suppression unit trailer	78
Table C.5 Sound level data on road construction works		
Breaking road surface & concrete		
1	Backhoe mounted hydraulic breaker	88
6	Hand-held pneumatic breaker	95

Notes:
ж Drive-by maximum sound pressure level in L_{Amax} (overall level) (Ref: BS 5228 Noise on Construction and Open sites)

The predicted worst-case construction noise levels at receiver locations within 50m and 100m in proximity to potential future proposed construction works are summarised in Table 6.17.

Table 6.17: Predicted worst-case 1-hour construction noise levels at receiver locations within 50m and 100m in proximity to short-term construction works.

Reference	Description	Likely Equipment / Plant expected to be required	Proximity of works to receiver and Predicted Worst-case 1 Hour Noise Level $L_{Aeq/1\ hour}$
1.A & 1.B	Addition of defences at Clon Brugh – New reinforced concrete flood relief walls along the southeastern part of Clon Brugh. Closing existing openings at walls at Clon Brugh – Partial demolition and realignment of existing reinforced concrete flood relief walls.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~15m - 73 dB(A) $L_{eq,\ 1\ Hr}$ ~50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 52 dB(A) $L_{eq,\ 1\ Hr}$
2.B & 2.D	Belarmine Park - Upgrade of Belarmine culvert inlet – New reinforced concrete flood relief walls along the left bank of the Kilgobbin Stream, at the back of the existing residential properties to the north of Belarmine Park. Addition of defences at Bellarmine culvert inlet. New flood defence wall and railing in Belarmine Park.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~25m - 67 dB(A) $L_{eq,\ 1\ Hr}$ ~50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 52 dB(A) $L_{eq,\ 1\ Hr}$
2.E & 2.G	Kilgobbin Road – Addition of defences upstream of Kilgobbin Road - reconstruct the existing historic boundary wall adjoining Kilgobbin House. New flood defence wall on the right bank upstream of Kilgobbin Road Bridge. New overflow pipe and flow control structure (weir) at Kilgobbin Bridge.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~15m - 73 dB(A) $L_{eq,\ 1\ Hr}$ ~50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 52 dB(A) $L_{eq,\ 1\ Hr}$
3.A	Glenamuck Rd North Roundabout – New reinforced concrete flood relief walls at Priorsland House. Upgrade of existing flood defence wall along Castle View and Glenamuck Road North. Upgrade of the existing bridge parapet at the upstream face of the Glenamuck Road North culvert.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~20m - 69 dB(A) $L_{eq,\ 1\ Hr}$ ~50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 52 dB(A) $L_{eq,\ 1\ Hr}$
4.A	Cherrywood Road – New reinforced concrete flood relief walls, installed over the existing retaining walls and slopes along the left bank of the Brides Glen River, within the gardens of 3 no. existing residential properties.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~10m - 77 dB(A) $L_{eq,\ 1\ Hr}$ ~50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 52 dB(A) $L_{eq,\ 1\ Hr}$

4.B	Cherrywood Road – New reinforced concrete flood relief walls, within a private garden (Waterfall Cottage).	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~10m - 77 dB(A) $L_{eq, 1 Hr}$ ~50m - 59 dB(A) $L_{eq, 1 Hr}$ ~100m - 52 dB(A) $L_{eq, 1 Hr}$
4.C	Cherrywood Road - Addition of flood relief culvert at the N11 crossing	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~25 - 67 dB(A) $L_{eq, 1 Hr}$ ~50m - 59 dB(A) $L_{eq, 1 Hr}$ ~100m - 52 dB(A) $L_{eq, 1 Hr}$
5.A	Raising and addition of walls at Commons Road and Brookdene – Construction of new reinforced concrete flood relief walls along the right bank of the Shanganagh River. Upgrade of existing flood defence wall along the right bank of the Shanganagh River by Commons Road. Upgrade of existing boundary wall along the left bank of the Shanganagh River along Commons Road.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~20m - 69 dB(A) $L_{eq, 1 Hr}$ ~50m - 59 dB(A) $L_{eq, 1 Hr}$ ~100m - 52 dB(A) $L_{eq, 1 Hr}$
5.C	Addition of defences upstream of railway line at Bayview – Construction of new reinforced concrete flood relief walls. Upgrade of boundary wall at the side of 20 Bayview Lawns	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~50m - 59 dB(A) $L_{eq, 1 Hr}$ ~100m - 52 dB(A) $L_{eq, 1 Hr}$
5.D	Addition of defences at Bray Road – New reinforced concrete flood relief walls along the left bank of the Brides Glen River, at the back of the existing residential and commercial properties. Realignment of the existing right bank river channel along approximately 75m length.	1 No. Excavator, 1 No. Dump Truck, Concrete Mixer Truck & Wall construction	~10m - 77 dB(A) $L_{eq, 1 Hr}$ ~50m - 59 dB(A) $L_{eq, 1 Hr}$ ~100m - 52 dB(A) $L_{eq, 1 Hr}$

6.3.4 Construction Noise Impact Significance

In accordance with the BS 5228-1:2009+A1: 2014 Noise and Vibration Control on Construction and Open Sites Part 1: Noise 'ABC method', the ambient noise levels (rounded to the nearest 5 dB) in the area of the proposed construction works range from 50 - 74 dB $L_{Aeq,T}$ during daytime. As a result, the noise sensitive receivers fall into Categories A, B & C of the BS 5228 'ABC' assessment methodology with relevant construction noise thresholds of 65 dB $L_{Aeq,T}$, 70 dB $L_{Aeq,T}$ and 75 dB $L_{Aeq,T}$.

It is important to note that most construction noise impacts will occur during daytime hours only and will be short-term at each area of construction along the proposed flood relief scheme. Not all construction noise sources will operate at once and construction noise levels are likely to vary throughout the typical working day. Night-time works are required at the N11 Overflow Culvert, however noise impacts there will be short-term and not significant.

A pragmatic approach needs to be taken when assessing the significance of noise effects of any construction project. The significance of the construction noise from the project has been determined by considering the change in the ambient noise level with the construction noise on-going. BS5228 states that noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient noise level plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,\ Period}$, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact. BS5228 also states that for public open space, impact might be deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise ($L_{Aeq,\ Period}$) by 5 dB or more for a period of one month or more.

Based on the BS5228 'ABC' assessment methodology, the contractor should aim to limit daytime construction noise to 65 dB $L_{Aeq,12\ Hour}$ at all works areas with the application of appropriate mitigation measures. (Note – noise threshold at Cherrywood is 75 dB $L_{Aeq,12\ Hour}$ on account of existing elevated noise level at receiver location due to proximity to N11 traffic flows)

Based on the expected relatively short-term duration of works at each location there will be a short-term noise impact at the nearest sensitive receivers to the proposed works. In some of the works areas, the predicted worst-case 1 hour construction noise levels may briefly be in excess of the recommended noise threshold levels of 65 – 75 dB $L_{Aeq,12\ Hour}$ (dependant on existing noise level at receiver location) at all works areas at the nearest residential properties.

Noise from construction works will fluctuate throughout the course of a typical working day as well as over the course of the construction works being undertaken in any one location. Therefore, the daytime construction noise thresholds of 65 – 75 dB $L_{Aeq,12\ Hour}$ (dependant on existing noise level at receiver location) should be achieved at the nearest residential properties. The construction noise impacts will be temporary in any one location and will not be significant, due to the typically linear nature of the works throughout the construction period.

Appropriate construction mitigation measures outlined below will be implemented as part of the Construction Environmental Management Plan (CEMP).

Construction Vibration at Sensitive Receivers

Construction noise and vibration impacts have the potential to occur if piling works are undertaken in very close proximity to sensitive receivers. Piling works are not proposed to be required for the Carrickmines FRS project. Therefore, in the absence of piling works, there will be no significant vibration impact as a result of the proposed scheme.

Operational Stage

There are no significant mechanical elements such as removable flood defences proposed in the proposed flood relief scheme. Therefore, there will be no operational noise impact.

6.3.5 Mitigation Measures

Construction Mitigation

Appropriate mitigation measures have been identified to ensure the Construction Phase target noise thresholds are not exceeded. The contractor will be required to implement the control measures recommended in BS 5228 and apply the appropriate measures where applicable. Other measures will include:

- Works during site construction operations will predominantly occur during typical daytime construction hours Monday to Friday and Saturday. Evening and night-time work will take place during very short periods at the N11 overflow culvert. This will only take place with the prior agreement of Dun Laoghaire Rathdown County Council and the NTA/TII.
- An on-site speed limit will be enforced for all traffic. Drivers of vehicles will be advised of the speed limits through the erection of signs *i.e*. a typically recommended on-site speed limit is 10 km/hr.
- Where practicable, the use of quiet working methods and the most suitable plant will be selected for each activity having due regard to the need for noise control.
- Best practicable means will be employed to minimise noise emissions and will comply with the general recommendations of BS 5228. To this end operators will use "*noise reduced"* plant and/or will modify their construction methods so that noisy plant is unnecessary.
- By positioning potentially noisy plant as far as possible from noise sensitive receivers the transmission of sound can be minimised. Earth mounds and/or stockpiles of material or perimeter hoarding on site can be used as a physical barrier between the source and the receiver.
- Mechanical plant used on site will be fitted with effective exhaust silencers. Vehicle reverse alarms will be silenced appropriately in order to minimise noise breakout from the site while still maintaining their effectiveness.
- All plant will be maintained in good working order. Where practicable, machines will be operated at low speeds and will be shut down when not in use.
- Compressors will be of the "noise reduced" variety and fitted with properly lined and sealed acoustic covers.
- In all cases engine and/or machinery covers will be closed whenever the machines or engines are in use.
- All pneumatic percussive tools will be fitted with mufflers or silencers as recommended by the equipment manufacturers. Where practicable, all mechanical static plant will be enclosed by acoustic sheds or screens.
- Employees working on the site will be informed about the requirement to minimise noise and will undergo training on the following aspects:
  - The proper use and maintenance of tools and equipment.
  - The positioning of machinery on-site to reduce the emission of noise to the noise sensitive receivers.
  - Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment.
  - The use and maintenance of sound reduction equipment fitted to power pressure tools and machines.
- Cognisance will also be taken of the *Environmental good practice site guide* 2005 compiled by CIRIA and the UK Environment Agency. This guide provides useful and practical information regarding the control of noise at construction sites.
- Where excessive noise levels are recorded, further mitigation measures will be employed which may include temporary wooden hoarding / acoustic screening to be installed to a height of no less than 2m around areas of construction where loud noise levels occur.
- If piling is determined to be required, the contractor will ensure that the TII Guidelines which identify thresholds for protection against cosmetic damage as a function of vibration frequency are not exceeded through the use of the selected low vibration piling method.
- Responsible Person –The Contractor will appoint a responsible and trained person who will be present on site and who will be willing to answer and act upon complaints and queries from the local public.

- Night-time Working - when items of plant are in use during night-time hours they will be chosen, sited and enclosed such that levels at the nearest properties do not exceed the measured background noise levels.

Monitoring

Where deemed necessary due to excessive impact or complaints received, noise monitoring will be undertaken during construction works to determine noise levels at noise sensitive receivers. On the basis of the findings of such noise monitoring, appropriate noise mitigation measures will be implemented to reduce noise impacts.

6.3.6 Operational Mitigation

The proposed flood relief scheme will not result in an operational noise impact. Therefore, no operational mitigation measures are deemed necessary.

6.3.7 Residual Effects

The assessment of construction noise impacts from the proposed flood relief scheme has indicated that construction noise threshold criteria may be exceeded at the nearest residential properties for short periods during daytime. This may occur on occasions when heavy construction activity occurs in close proximity to noise sensitive receivers. Noise from construction works will fluctuate throughout the course of a typical working day as well as over the course of the construction works being undertaken in any one location. Therefore, the daytime construction noise threshold of 65 dB $L_{Aeq,12\ Hour}$ - 75 dB $L_{Aeq,12\ Hour}$ should be achieved at the nearest residential properties. The construction noise impacts will be short-term and will not be significant. Also, while the overall construction activities for the proposed flood relief scheme will occur over several months, the nature of the proposed works and its duration at any one location will mean that noise sensitive receivers will not be exposed to continuous construction noise impact during the construction period.

Once the above mitigation measures have been implemented, the residual effects from the development will **not be significant**.

6.3.8 Interactions and Potential Cumulative Impacts

Interactions

Appropriate construction phase mitigation measures have been outlined to ensure that the potential impact on the human receivers and ecological receivers will be negligible. Therefore, the noise and vibration impact in combination with other environmental effects e.g. direct loss of habitat, pollution, etc will result in a negligible effect on human receivers and any ecological habitats of significance.

The proposed vehicular movements and construction machinery during the construction phase has the potential to give rise to noise impacts, potentially giving rise to impacts on humans and fauna. Potential interactive negative impacts have been identified in Chapter 15, and a full suite of appropriate mitigation measures have been included in the relevant sections of the EIAR.

Potential Cumulative Impacts

In relation to the in-combination construction and/or operational impact of the proposed Flood Relief Scheme, with other proposed projects planned in the area, a list of projects presented in Chapter 16, Figures 16.1 to 16.3 and Table 16.1 have been considered and assessed.

It is not considered that noise disturbance from the Proposed Developments listed in Chapter 16 will be significant during the construction works due to the urban nature of the surrounding environment. Any such disturbance will be temporary and limited to the construction period. The Proposed Developments will comply with BS 5228 “Noise Control on Construction and open sites Part 1: Code of practice for basic information and procedures for noise control” and most works will be limited to normal daytime working hours.

None of these schemes will result in any significant additional construction and/or operational noise and vibration impacts.

7 Population and Human Health

This chapter describes the likely significant effects of the proposed development on the human environment including the potential effects on human health and disruptions to the population of the areas surrounding the proposed works. This chapter primarily addresses the potential effects of the proposed scheme on human health, demographics, receptors such as schools and existing community facilities, recreation and tourism. Other chapters of the EIAR, such as Construction Impacts, are closely linked to effects on population and human health. All of these chapters should be read to gain a full understanding of the potential effect on human health.

7.1 Methodology

This chapter has been prepared having regard to the EIA Directive 2014/52/EU (and its parent directive 2011/92/EU) and the associated Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022), as well as the Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, 2018. It is noted that Article 3 of the 2014 Directive effectively defines the EIA process as identifying, describing and assessing in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on a series of specified environmental factors. The first of these is “population and human health” which replaces “human beings” in the 2011 Directive. The term “human health” is not defined in the 2014 Directive.

Consideration of human health effects resulting from the construction and operation of a project should focus on health issues arising in the context of the other environmental factors listed in Article 3 of the Directive/ Section 171A of the Act, namely:

- Population;
- Biodiversity, with particular attention to protected species and habitats;
- Land, soil, water, air and climate;
- Material assets, cultural heritage and the landscape; and
- Interaction between the above factors.

European Commission guidance[3] relating to the implementation of the 2014 Directive, in reference to “human health” states “*Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population*”.

A desk study has been carried out to establish the baseline associated with economic activity, employment opportunities, settlement, and social patterns. Noise and dust generation during construction has been assessed in the Construction Impacts chapter.

[3] European Commission (2017) ‘Guidance on the preparation of the environmental impact assessment report (Directive 2011/92/EU as amended by 2014/52/EU)’.

The Proposed Development is spread across a wide area of Dún Laoghaire-Rathdown and proposed works will take place in locations within the following Electoral Divisions (EDs): Glencullen, Cabinteely-Loughlinstown, Killiney South, Sankill-Rathsallagh, and Shankill-Rathmichael.

EDs were chosen as the statistical unit on which to base population analysis on the premise that a wide range of statistics is available on the Central Statistics Office (CSO) database for EDs. EDs were preferred over CSO 'Small Areas' as the collation of over 80 Small Areas would be required to accurately represent areas affected as a result of the proposed development. This could potentially introduce a greater margin of error. Although a significant percentage of the land of Glencullen and Shankill-Rathmichael is occupied by agricultural lands, woods, golf courses and the northeastern foothills of the Dublin Mountains, majority of the population is concentrated to the north of the EDs where proposed works will take place.

Information was sourced from the 2016 and 2022 Censuses from the CSO. The Dún Laoghaire-Rathdown Socio-economic Statement 2023-2028 was also used as a source of statistical data. As the proposed measures do not fall within a single ED or townland, no Local Area Plan could be used to derive statistics. The collection of EDs used for statistical analysis are herein referred to as 'Scheme EDs'.

7.2 Existing Environment

The Proposed Development spans across several areas in the Dún Laoghaire-Rathdown (DLR) County Council district. There is a variety of major transport links broadly serving the Proposed Development area including the M50 Southeastern Motorway, the N11, the Green Luas Line, and the DART. The Dublin Mountains lie to the south, the Irish Sea lies to the east, and Dublin suburbs including Killiney, Dalkey, Lucan, and Dún Laoghaire lie to the north.

The urban environment across the Scheme EDs is largely comprised of pockets of residential areas interspersed with industrial areas or large green spaces. To the north lands are increasingly urban and to the south lands are increasingly rural. The Proposed Development catchment area occupies the liminal space of the urban fringe. Broadly, the Scheme EDs cover areas that are undergoing rapid transformation from a mixed urban mosaic into a cohesive urban environment.

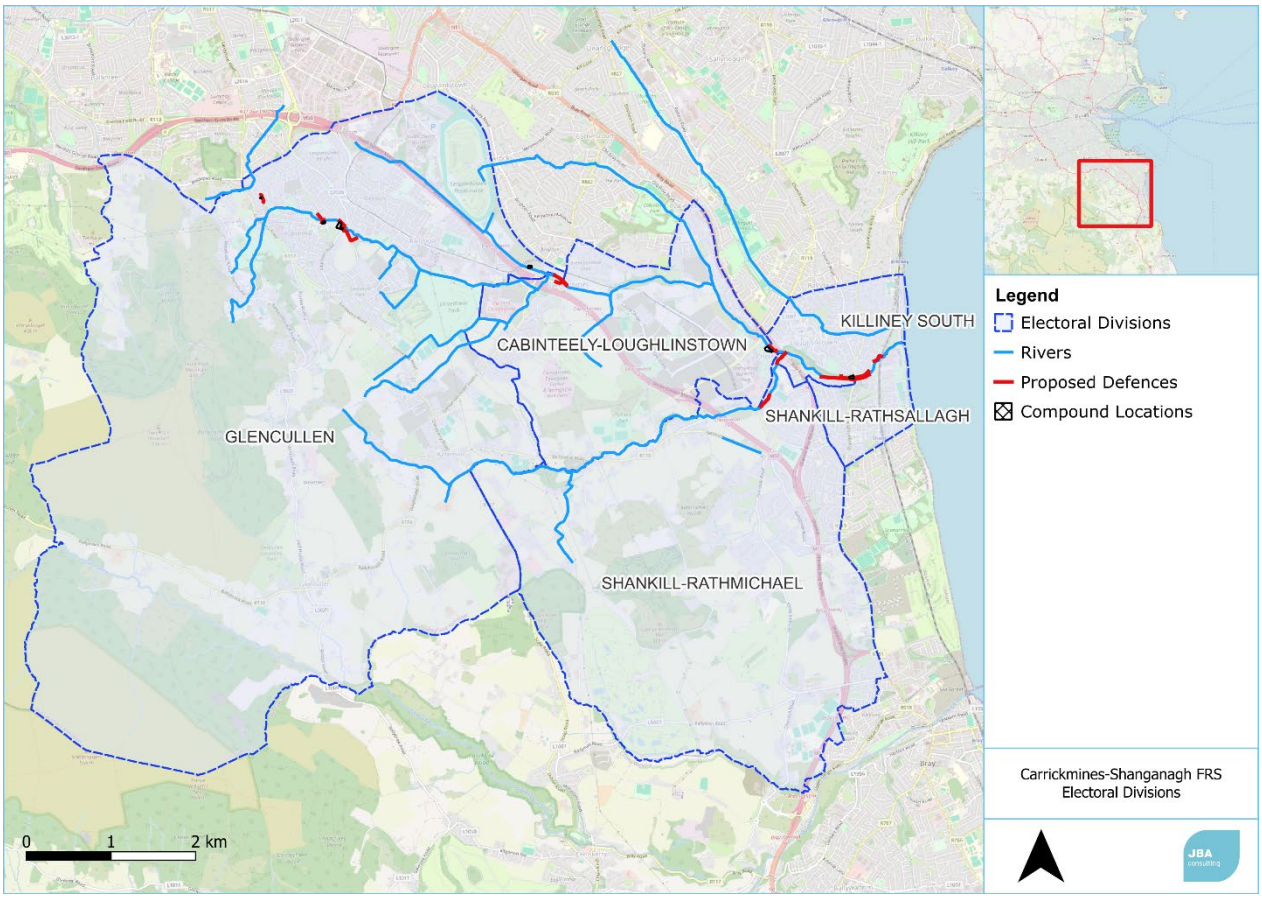


Figure 7.1 Electoral Divisions relevant to the proposed development

7.3 Demographics

Demographic statistics apply to the Scheme EDs and were retrieved from the CSO database.

Table 7.1: Population trends between 2016 and 2022

District	2016	2022	Change from 2016-2022 (%)
State	4,761,865	5,149,139	+8.1
DLR	218,018	233,457	+7.1
Scheme EDs	39,330	44,329	+12.71

Population growth across the Scheme EDs between 2016 and 2022 is higher than the national or regional averages. This may reflect an increase in the number of housing developments having completed construction during this period and could also be attributed to several other factors, such as a growth in employment opportunities.

Table 7.2: Proportion of the population in 2022 within primary age cohorts

Age Cohort	Value
Pre-school Children (0 – 4 years)	2,884 (6.51%)
School Children (5 – 19 years)	9,385 (21.17%)
Adults (20 – 64 years)	27,632 (62.33%)
Retired Adults (+65 years)	4,428 (9.99%)

7.3.1 Households

Household size is derived from the number of persons living in private housing divided by the number of private households.

The national and regional trends in household size show small decreases of <0.5%, however, across the 5 Scheme EDs the average household size has made a more significant decrease. This could be attributed to the recent construction of several housing developments within the areas.

Table 7.3: Average Household Size (persons per household)

District	2016	2022	% Change
State	2.75	2.74	-0.36
DLR	2.72	2.71	-0.37
Scheme EDs	2.86	2.82	-1.31

There were 12,143 households across the 5 EDs in 2022. This represents a 18.1% increase on the 2016 figure of 10,282 households.

7.3.2 Employment

Recent trends in employment were evaluated using CSO information generated from the 2016 and 2022 Census statistics. The information was compiled on the basis that:

- The labour force is defined as the sum of people aged 15 years and over who are at work or who are employed; and
- The participation rate is the proportion of persons in the labour force aged 15 years and over expressed as a percentage of all persons in that age group.

Table 7.4: Rates of Employment

District	2016	2022	Change from 2016-2022 (%)
DLR	95,925	99,500	+3.73
Scheme EDs	19,817	21,868	+21.57

Table 7.5: Rates of Unemployment

District	2016	2022	Change from 2016-2022 (%)
DLR	39,200	14,007	-64.3
Scheme EDs	1,581	1,372	-13.22

Table 7.6: Rates of Participation in the Labour Force

District	2016	2022
DLR	63.26%	69.43%
Scheme EDs	73.44%	71.48%

7.3.3 General Health

The population was surveyed in 2022 regarding their general health, with a 96.5% participation rate. Only 1.3% of those who answered across the Scheme EDs reported their general health to be ‘Bad’ or ‘Very Bad’ which represents 578 individuals.

7.4 Principal Potential Receptors

An assessment of the principal potential receptors within 500m of the proposed works including homes, schools, tourism, agriculture and commercial and industrial premises was conducted in detail below.

7.4.1 Homes

Clon Brugh – Measures 1.A and 1.B

No physical works are proposed to any residential properties; however, a construction compound is proposed at a green space between 'The Glen' and 'The Park' apartment buildings in Clon Brugh. This will result in a temporary loss of this amenity and the footpath east of Clon Brugh for the duration of the works. The impacts of noise, vibration and dust arising from the proposed works will be mitigated with standard construction practices, and the effect will be temporary and not significant.

The residential estate of Dun Gaoithe Heights is directly east of the proposed wall at Clon Brugh, and will not be directly impacted by the works. During construction, residents in Dun Gaoithe will experience some disruption related to construction activities. The effect of this will be temporary and not significant.

Once operational, 'The Glen' and 'The Park' will no longer be within the 1% AEP[4] flood extents and therefore will benefit from the proposed development. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Belarmine Park – Measures 2.B and 2.D

Three homes will be directly impacted by the works as a result of proposed removal of existing boundary walls and construction of new replacement flood walls. This impact will primarily be temporary, during construction. Once operational, the walls will be similar in appearance and extent to the existing garden boundaries.

Once construction of the proposed development is finished, 26 homes on Sandyford Hall Grove and Sandyford Hall Drive, previously at high risk of flooding (1% AEP)[4], will be protected. Flood waters will be directed to Belarmine Park, which means the park may be temporarily unavailable during flood events. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Kilgobbin Road – Measures 2.E and 2.G

The lands of Kilgobbin House, Riverside House and six other properties will be directly impacted by the proposed development. A construction compound is proposed in a greenfield site adjoining Riverside House. Replacement of the boundary wall to the southwest of Kilgobbin house will be within the private garden of the property. An overflow pipe will extend from Kilgobbin Road Bridge along the private access road to a discharge point south of the impacted properties. Installation of the pipe will have a direct impact on access along this lane during construction. Typical disruptions due to the proximity of the construction compound and construction activities are unavoidable and will be temporary. The effect of this will be temporary and not significant.

Once operational, flooding at Kilgobbin House and several properties downstream of the Kilgobbin Road Bridge will be prevented. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

[4] The 1% Annual Exceedance Probability (AEP) refers to the likelihood of a flood event occurring in any given year with a 1% chance, as defined by the Irish Office of Public Works (OPW) flood risk management guidelines.

Glenamuck Road – Measures 3.A

Eight properties in Ballyogan Grove/Castle View will be temporarily impacted by the installation of new flood walls and upgrades to boundary fencing upstream of the Glenamuck culvert bridge. To the east Priorsland House will also be impacted due to the proximity of new flood wall installation to the south.

A further four properties in Ballyogan Grove, west of the proposed works, will be temporary impacted indirectly during construction.

Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Cherrywood Road – Measure 4.A

Three properties will be temporary impacted by the installation of new flood defence walls along the left bank of the Brides Glen River. Due to space constraints, works will be undertaken from within the gardens of residential properties and the use of private driveways will be required for access.

During operation, these three properties in addition to nine other properties downstream of the measures will be protected from the 1% AEP flood event. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Lower Brides Glen – Measure 4.B

The proposed flood defence wall will be installed in close proximity to Waterfall Cottage which will require access to and the use of the private garden and driveway.

Once operational, the property will no longer be within the 1% AEP flood extent. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

N11 Culvert – Measure 4.C

A headwall will be installed at both the upstream and downstream ends of the pipeline. The upstream structure is located within the private lands of Waterfall Cottage. Although the upstream headwall will involve lands being acquired from a private landowner, these lands are currently unused with heavy overgrowth.

Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Commons Road – Measure 5.A

One property on the northern bank of the Shanganagh River will be directly impacted by the proposed works which include the installation of a new flood wall, existing flood wall upgrades and boundary wall replacement. Properties along the Commons Road will be indirectly temporarily impacted by construction works which will cause some nuisance typical of construction activities. A construction compound is proposed in a greenfield site on the northwestern corner of Shanganagh Bridge.

Once operational, 55 no. properties across the Brookdene estate and along the Commons Road will be protected from the 1% AEP flood event. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Bayview – Measure 5.C

The proposed works will be near residential properties off Bayview Lawns. The boundary wall of No. 20 Bayview Lawns will be replaced with a flood wall which will require direct access to the private garden of the property. Some trees will be removed if unsafe to be retained.

Once operational, 1% AEP flood extents will be confined to the river channel and riparian zones, reducing flood risk for 26 homes in Bayview. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

Bray Road – Measure 5.D

The proposed flood defence wall on the northern bank will be installed in close proximity to the residential and commercial properties off Bray Road. To mitigate risks to the properties and overcome space constraints, the river channel will be widened to allow for easier installation of conventional foundations.

A construction compound is proposed in a greenfield site at the back of several commercial or mixed-use properties along the Bray Road and north of the 9 properties of Cherrywood Park. A flood wall will be constructed along the rear of the commercial/mixed use properties.

Once operational, flood extents will be confined to the green field site protecting the commercial/mixed use properties from up to the 1% AEP flood event. Operational activities in the area will be passive flood protection, with periodic inspection and maintenance as required.

7.4.2 Educational Facilities

There are 10 educational facilities within 500m of proposed works.

Table 7.7: Educational Facilities in the Scheme Area

Type	Name
Secondary School	Rosemont School
Primary School	St. Columbanus National School
	St. Marys National School
	Gaelscoil Thaobh na Coille
	Stepaside Educate Together NS
	Ballyowen Meadows Special School
Pre-school/Montessori	Kids Biz Montessori and Pre School
	Gallops Montessori School
	Lambcross Preschool
Other	Loughlinstown Training Centre

7.4.3 Childcare Facilities

There are 2 childcare facilities within 500m of proposed works:

- Giraffe Childcare Cherrywood, Cherrywood Business Park, 18 Bray Rd, Cherrywood, Loughlinstown, Co. Dublin, D18 K7W4
- Park Academy Childcare Cherrywood, Tullyvale, Dublin, D18 YX28

7.4.4 Health, Social, Community, and Recreational Facilities

Table 7.8: Health, Social, Community, and Recreational Facilities within 500m of the Proposed Development

Name	Address
Medical Facilities	
St. Colmcille's Hospital	Bray Rd, Shanganagh, Loughlinstown, Co. Dublin, D18 V9K1
Lifetime Family Practice	33 Bayview Dr, Hackettsland, Killiney, Co. Dublin, A96 VN52
Mater Private Day Hospital	Cherrywood Business Park, Building 11, Loughlinstown, Co. Dublin,

	D18 DH50
Dr. James Hayden D18 Medical	Belarmine Plaza, Belarmine, Dublin 18
Glencairn Medical Centre	Ballyogan Rd, Kilgobbin, Dublin 18
Dr. Michael O'Brien Family Practice	Leopardstown Shopping Centre, Ballyogan Rd, Sandyford, Dublin 18
Social Facilities	
Sandyford Community Centre	Enniskerry Rd, Sandyford, Dublin, D18 E0A8
Belarmine Community Centre	Belarmine Plaza, Belarmine, Dublin
Shanganagh Community Garden	Shanganagh Cliffs, Shanganagh, Dublin
Shanganagh Park House (Community Centre)	Rathsallagh Ave, Shankill, Dublin 18, D18 DY83
Loughlinstown Community Rooms	Rear of Loughlinstown Shopping Centre, Loughlinstown, Co. Dublin
Recreational Facilities	
DLR Leisure	Loughlinstown Dr, Loughlinstown, Dublin
Stepaside FC	Ballyogan Rd, Ballyogan, Carrickmines, Co. Dublin
Carrickmines Croquet & Lawn Tennis Club	Glenamuck Road,Carrickmines, Dublin 18
Fernhill Park and Gardens	Enniskerry Rd, Newtown Little, Dublin
The Burrow 3-Par Golf Course	Enniskerry Rd, Kilgobbin, Stepaside, Co. Dublin
Shanganagh Playground	Shanganagh, Dublin
Shanganagh Cliffs FCShankill GAA Shanganagh Cliffs Pitch	Shanganagh, Dublin
Loughlinstown Pitch and Putt	Commons Rd, Loughlinstown Commons, Dublin, D18 TK38
The Blue Playground	Kilgobbin, Dublin

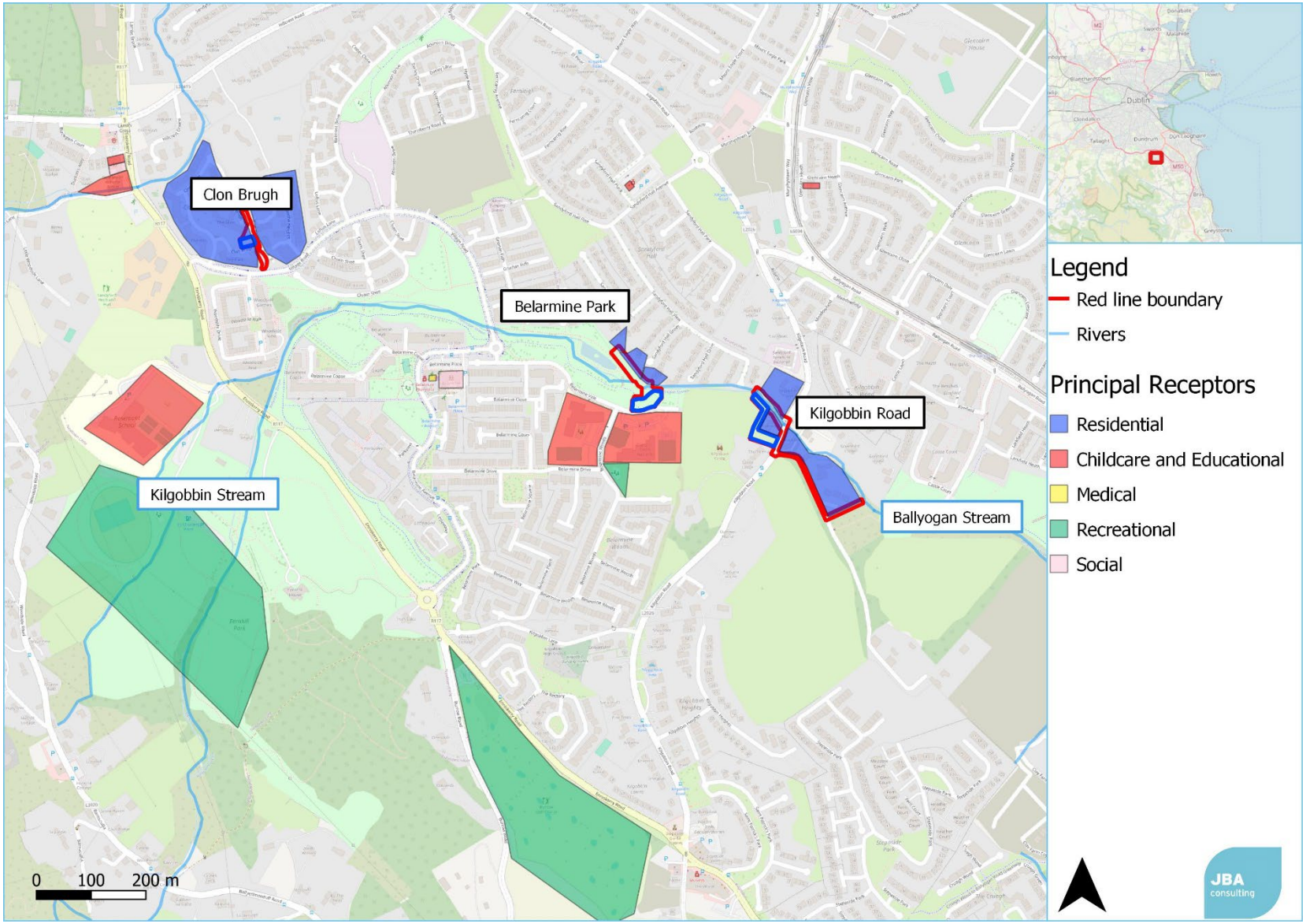


Figure 7.2: Population and Human Health Receptors, Clon Brugh to Kilgobbin Road

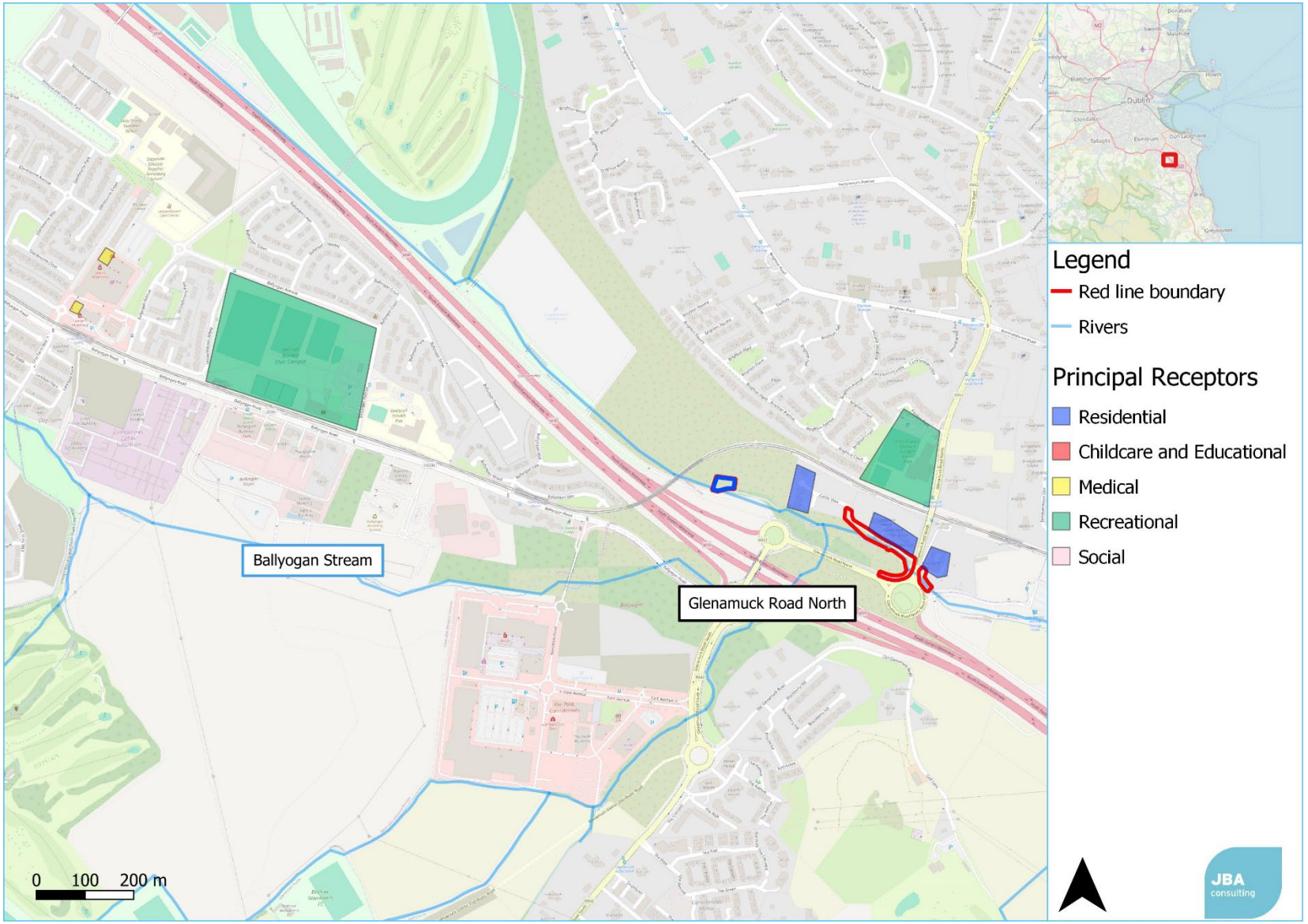


Figure 7.3: Population and Human Health Receptors, Glenamuck Road North

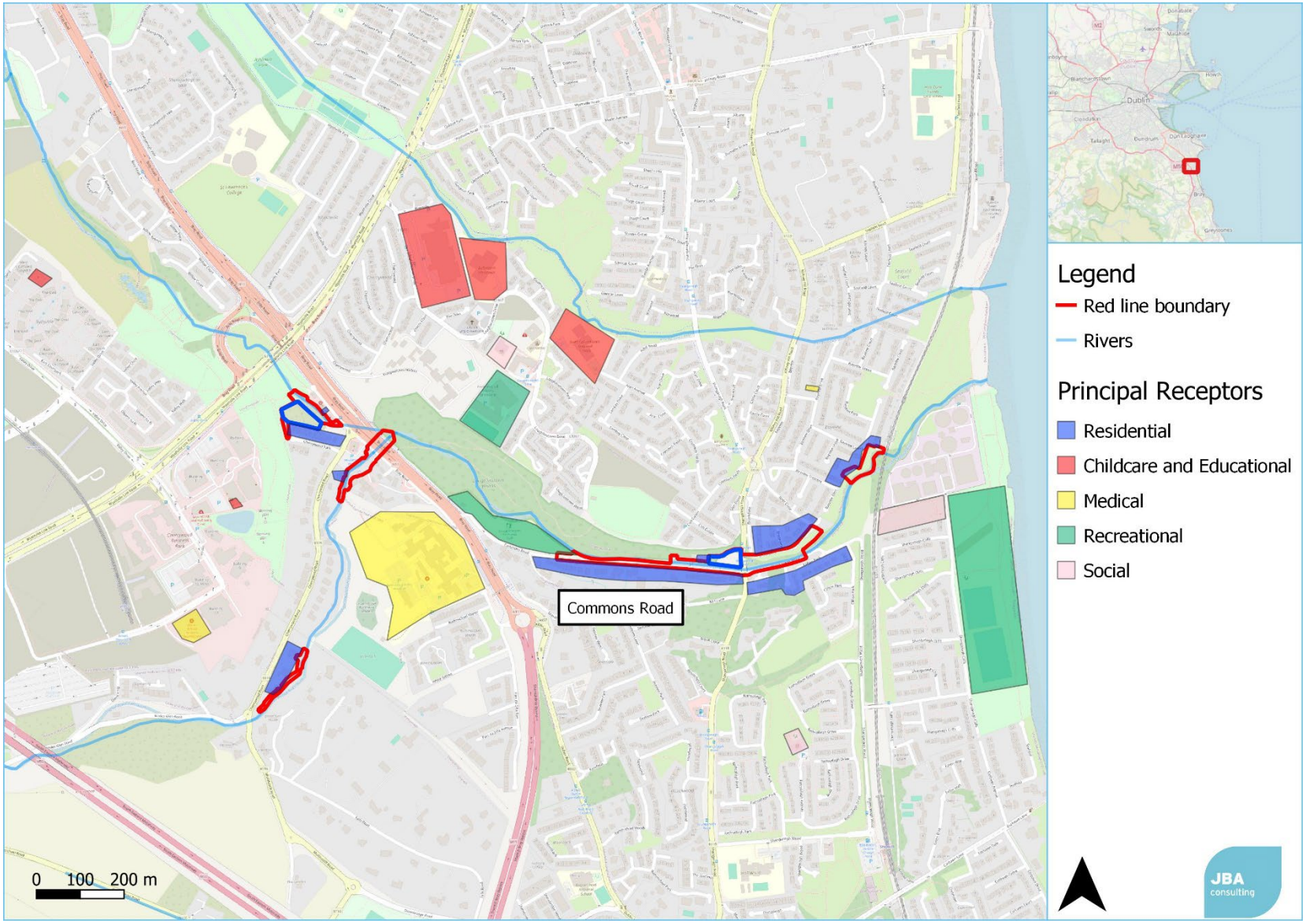


Figure 7.4: Population and Human Health Receptors, Cherrywood to Bayview

7.5 Predicted Impacts

7.5.1 Do-Nothing Scenario

Under the Do-Nothing Scenario, it is likely that flooding will continue to occur across the catchment area, which has the potential to impact over 400 properties and transport infrastructure. Continued flooding has the potential to compromise the population and human health through the direct destruction of property and potential exposure to unsanitary flood waters. Consequently, social and economic losses are also likely to occur as a result of continued flooding.

The effect of this on population and human health under the 'Do-Nothing' Scenario would be **long-term, significant, negative**.

7.5.2 Construction Phase

Impacts on Local Economy

During the construction phase, the influx of an additional workforce across the site will stimulate the local economy across the scheme area through potential use of local retail, leisure, and accommodation services.

In addition to direct employment within the construction sector, it is anticipated that the proposed development will lead to indirect employment via related technical and professional services.

The effect of the proposed development on the local economy will be **temporary, neutral to positive** and **not significant**.

Impacts on Human Health and Safety

There will be potential risks to the health and safety of construction personnel on-site, as with any construction site, due to the use of large, mobile machinery and heavy equipment and materials. There will be no significant offsite health and safety risks.

Works at Belarmine Park are within 100m of Stepaside Educate Together NS and Gaelscoil Thaobh na Coille. This will bring additional risks to pedestrians, particularly children.

The effect of the proposed development on human health and safety with no mitigation measures in place would be **temporary, slight, negative** and **not significant**.

Impacts on Residential, Recreational, Commercial, and Community Amenity

The majority of the works are proposed in or near residential areas and some temporary impacts are likely to be unavoidable. These are easily mitigated against and will be outlined in the operating plans devised by the appointed contractor.

Temporary loss of green spaces is expected at Belarmine Park, Clon Brugh, Loughlinstown Woods and Bayview. Temporary impacts to existing road infrastructure including footpath, road, and cycle lanes are anticipated at Clon Brugh, Belarmine Park, Kilgobbin Road, Glenamuck Road, the Bray Road (N11), and Commons Road. In addition, small increases in traffic volume around all works areas are expected during import and export of materials. No significant impacts to commercial or community facilities are expected.

The effect on residential, recreational, commercial and community amenity with no mitigation measures in place would be **temporary, slight, negative** and **not significant**.

7.5.3 Operational Phase

Once operational, the proposed development will not result in significant adverse impacts for population and human health. Permanent positive impacts are likely from the operation of the scheme as it will increase the level of flood protection for people's homes and businesses. The effect of this will be **positive**.

Operational inspection and maintenance will not result in significant impacts for population and human health. Periodically, inspection and maintenance will be required. This is expected to be short in duration and routine maintenance will not result in disruption for people.

7.6 Mitigation Measures

7.6.1 Construction Phase

While under construction, there will be potential risks to the health and safety of construction workers. A comprehensive Health and Safety Programme will be put in place on the site prior to commencement of construction to minimise any risks to site personnel and visitors. The requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) will be complied with at all times. A Construction Stage Traffic Management Plan will be developed and agreed with Dún Laoghaire-Rathdown County Council and the relevant property owners prior to commencement of the works.

The following mitigation measures are proposed during the construction phase:

- During pre-construction and construction phases safety will be managed in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013). A Project Supervisor Construction Stage (PSCS) will be appointed as part of the proposed project.
- Safety will be a primary concern during the construction phase of the proposed FRS. A contractor safety management program will be implemented identifying potential hazards associated with the proposed work including a permit to work system.
- The design of the final proposal will be subject to safety design reviews to ensure that all requirements of the project are safe. A Project Supervisor for the Design Process (PSDS) will be appointed as part of this process.
- Temporary contractor facilities and areas under construction will be enclosed and 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 will be kept secure when construction is not taking place.
- Measures to ensure public safety with respect to air quality and dust, and noise and vibration, are detailed in Chapter 6.
- A Community Liaison Officer will be responsible for communicating with residents, schools, and businesses regarding construction phasing and site-specific safety measures that will be put in place.
- Measures to ensure public safety with respect to construction traffic, are detailed in Chapter 11; and
- Construction working hours will be restricted to normal daytime hours in most cases, with the exception of the N11 overflow culvert (dealt with below).

Specific mitigation measures to the proposed development in respect of population and human health include:

- Works along the private access laneway off Kilgobbin Road will be undertaken in short sections, to allow intermittent access by plating over open trenches. The Contractor will liaise with the residents to agree on a works sequencing to mitigate any access issues.
- Construction working hours will be agreed by the contractor, DLR, and the NTA/TII, during the construction of the culvert traversing the N11.

7.6.2 Operational Phase

When the scheme is operational, a maintenance and monitoring schedule will be put in place to verify that the proposed flood defences are operating to the appropriate design standard. Repairs will be made as necessary. This will ensure that there is no risk to human health as the scheme ages. The proposed FRS has been designed so that guarding heights are at an appropriate level (1.2m) along flood defence walls.

Regular inspection and condition surveys will be carried out at a minimum of once a year to identify any damage or deterioration that may occur during the interim period which would compromise the structural integrity of the structure.

7.7 Residual Effects

7.7.1 Do Nothing Scenario

Under the Do-Nothing Scenario, it is likely that flooding will continue to occur across the catchment area which has the potential to impact over 98 properties and transport infrastructure. Continued flooding has the potential to compromise the population and human health through the direct destruction of property and potential exposure to unsanitary flood waters. Consequently, social and economic losses are also likely to occur as a result of continued flooding.

The effect on population and human health under the 'Do-Nothing' Scenario would be **long-term, significant, negative**.

7.7.2 Construction Phase

During construction, there will be a positive impact to employment, which will potentially boost local business because of the increased number of workers in the area. Potential risks to the health and safety of construction personnel will be mitigated against through adequate Health and Safety standards to ensure that no injury or accidents occur during the construction phase.

The population will experience disruptions to daily life and to their recreational facilities due to associated impacts on Traffic, Air, Noise, and the Visual amenity during the construction phase. Additional mitigation measures are described in the associated chapters of the EIAR. The impacts on the population during construction are expected to be temporary, affecting different locations only for a limited time durations within the 36-month construction period. This means that areas will not experience disruption throughout the entire duration of the construction.

The residual effect arising from construction to population and human health will be **temporary, slight, negative** and **not significant**.

7.7.3 Operational Phase

The purpose of the development is to provide protection from flood waters up to the 1% AEP event. The proposed FRS reduces flooding in locations where there are existing properties and primarily uses containment and conveyance mechanisms throughout the scheme areas. Existing green spaces such as Belarmine Park and Loughlinstown Woods remain as overspill areas which may result in intermittent loss of these amenities during flood events. This would be a slight, temporary and intermittent adverse impact.

Significant changes to strategic land zoning are not anticipated, however, improved flood protection of roads and bridge reinforcement measures at Common's Road Bridge and Shanganagh Bridge are likely to prevent future degradation of these structures. This will serve to promote Carrickmines and the surrounding areas as attractive places to live and support the Cherrywood Strategic Housing Development Project.

The long-term impact of the proposed development will be a reduction in flooding of key receptors in the area.

The residual effect on population and human health during operation will be **long-term, positive**.

7.8 Interactions

The environmental effects on population and human health are interlinked with the environmental effects of:

Construction impacts

Significant quantities of dust or impacts to air quality could lead to adverse effects for population and human health in the vicinity of the proposed development. There are no significant adverse interactions expected, as the effect from air quality and dust as outlined in the Construction Impacts chapter will be negligible. Excessive noise or vibration during construction could interact negatively with population and human health in the

surrounding area. Mitigation measures outlined in the Construction Impacts chapter will ensure that the impact of noise and vibration on population and human health will not be significant.

Water

Impacts to water quality could negatively interact with population and human health, due to either impacts to drinking water, or the amenity value of the Carrickmines-Shanganagh River Network and Killiney Bay. Adverse interactions with population and human health are not expected to occur, due to the mitigation measures to be put in place for the protection of water, and residual impacts to water being slight adverse to imperceptible.

Material Assets

Impacts to material assets, in particular to utilities or roads, traffic, and transport, could lead to interactions with population and human health if significant or allowed to go on for a long time. They have the potential to affect the local population and their daily activities during the construction phase, or commuters passing through the area.

During construction, there will be short disruptions to utilities which will inconvenience a small number of people close to construction sites. These will be communicated to residents in advance and will be kept to the shortest time possible. The overall impact of these disruptions, with mitigation measures in place as outlined in Chapter 12, will be temporary and imperceptible.

During construction, temporary disruptions to traffic and access due to partial road closures will occur. This will lead to temporary adverse impacts for residents and people passing through the area, particularly at the N11 overflow culvert, as outlined in Chapter 11. With mitigation measures in place as outlined in Chapter 11, the overall adverse impact on population and human health due to interactions with roads, traffic, and transport will be temporary, slight, negative.

Once operational, no impacts on Material Assets are expected and therefore there will be no operational phase interactions with Population and Human Health.

7.9 Cumulative Effects

Several developments are proposed or under construction in the areas of the Proposed Development, as outlined in Chapter 16 Cumulative Impacts. If the construction periods of these developments are to overlap, there is a potential to impact on population and human health through additional disruptions. These effects would be temporary while the construction phase progresses and will not be significant.

Planning Application D24A/0341, on appeal with An Bord Pleanála ABP-320493-24, has proposed the construction of 89 no. residential units on Kilgobbin Road, just south of the proposed development. If this project goes to construction at the same time as the proposed development, impacts on Kilgobbin Road with regard to construction traffic and disruption to residents using the road could be significant. The proposed flood defence works at Kilgobbin Road will need to be carefully sequenced with the above project. The relevant contractors will be required to liaise on sequencing and traffic management measures should construction occur at the same time.

No other projects nearby are expected to lead to cumulative impacts with the proposed development.

Once operational, the proposed FRS, when considered cumulatively with the above developments, will have a positive impact on population and human health.

8 Biodiversity

8.1 Introduction

This chapter assesses the impacts of the proposed Carrickmines Flood Relief Scheme (hereafter referred to as 'the proposed Scheme') on biodiversity during the construction and operation phases.

This chapter provides an overview of the assessment and field methodologies; receiving ecological environment; a description of the nature and scale of any potential significant direct or indirect impacts; and any necessary mitigation and biodiversity enhancement measures recommended as part of this Environmental Impact Assessment Report (EIAR).

The Carrickmines-Shanganagh river catchment comprises a number of streams and tributaries, including the Carrickmines River, Shanganagh River, Ticknock Stream, Glenamuck River, Brides Glen River, Cabinteely River, Ballyogan Stream, Racecourse Stream, and Kilgobbin Stream.

In the upper reaches of the catchment, the Kilgobbin Stream flows east into the Ballyogan Stream. The Glenamuck Stream joins further downstream, before a confluence with the Racecourse Stream. This then meets the Cabinteely Stream and becomes the Carrickmines River. At Cherrywood, the Carrickmines River meets the Shanganagh River, which continues to flow east, passing Shanganagh Wastewater Treatment Plant to the north before draining into the Irish Sea.

The scheme is divided into an assortment of measures spread throughout the catchment and shown in Figure 8.1.

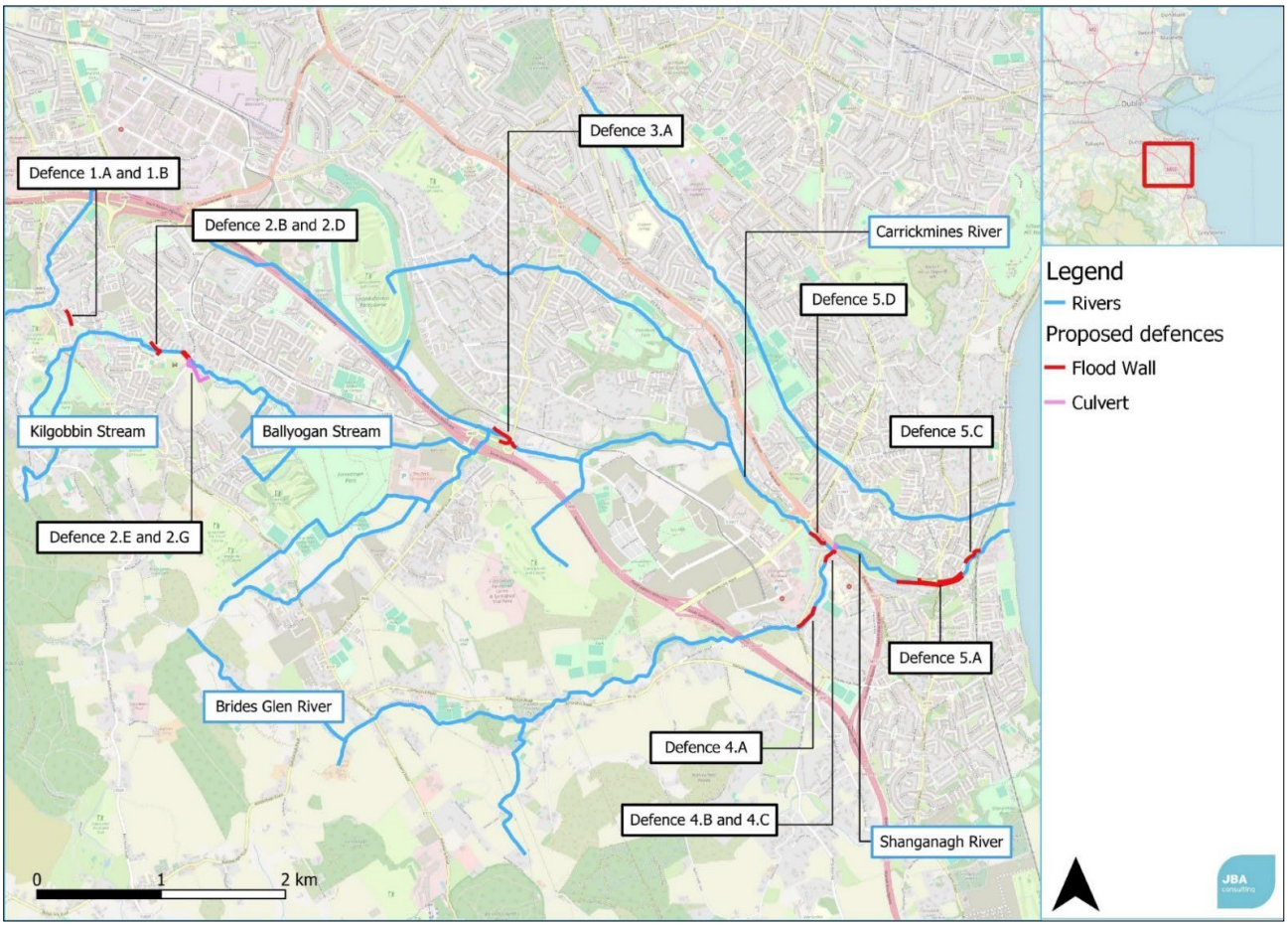


Figure 8.1: The extent of Carrickmines-Shanganagh River FRS

8.2 Methodology

8.2.1 Study Area

The study area of the proposed Scheme was defined by the findings of the desk study (i.e. presence/absence of protected habitats, flora, or fauna within the Zone of Influence (ZoI) and best practice methodology for assessing effects on those ecological features). In general, surveys were conducted for each of the ecological receptors within specific geographical areas; and focused on assessing potential impacts within the ZoI of the proposed Scheme.

Zone of Influence (ZoI)

The Zone of Influence (ZoI) for the proposed Scheme is based on a judgement of the likely extent of the ecological impacts on key ecological receptors. This will vary for different ecological features, depending on their sensitivities to environmental change.

The ZoI of for all European sites (Natura 2000) sites is within 15km of the proposed Scheme, as per guidance in Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (Department of Environment, Heritage, and Local Government, 2010 rev.). In respect to the ZoI for air pollution (emissions and dust), Natura 2000 sites within 50m of the boundary of the proposed works and up to 250m from the entrance to the site of works were considered as per the Institute of Air Quality Management (IAQM, 2024). Guidance on the Assessment of Dust from Demolition and Construction, including *ex situ* foraging habitats utilised by Qualifying Interest (QI) species associated with local Natura 2000 sites. For Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs), the ZoI is 5km.

In relation to terrestrial habitats, impacts will be limited to the lands within the site boundary of the proposed Scheme, as well as the immediate surrounding environs (e.g., overshading and soil; root compaction and changes to local hydrological regimes).

Surface water hydrological connections (e.g., drainage ditches, canals, wetlands and rivers) are often the most far-reaching impacts due to their lotic or semi-lotic nature. It becomes increasingly difficult to precisely predict the likely significance of adverse water-borne pollutants as they travel downstream from the pollution point source, given potential dilution and retention factors along the course of the impacted watercourse. Under the precautionary principle any designated sites, protected habitats or species (flora and fauna) located downstream of the watercourse which pass through the footprint of the proposed Scheme will be considered to be within the hydrological ZoI of this scheme.

In regard to groundwater and groundwater-to-surface water connections, the ZoI is largely determined by the site's underlying bedrock, the soil /sub-soil permeability, and the characteristics of the underlying aquifer(s). Due to the spread of the measures for the FRS, there is a variety in the underlying bedrock throughout the site. This is fully assessed in Section 8.4.5

In relation to physical (vibration and clearance works); audible and visual disturbance, faunal species will be considered on a species-by-species basis. Generally, smaller mammal species (e.g., Pygmy Shrew) will be given 100m disturbance zones, which is reflective of their relatively small territories. For larger mammals, such as Otter and Badger, a 150m disturbance ZoI can be established given the sensitivity of their resting / breeding location, i.e., holts and setts. A 150m disturbance ZoI has been detailed within best practice guidance documents Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (2006a) and Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (2006b).

The ZoI for local bats species is centred around the degradation or removal of foraging and commuting habitats; lighting impacts within and adjacent to footprint of the scheme; as well as the schemes proximity of known bat roosts within the locality. Of the above impacts, the degradation of habitats will be the furthest reaching and will therefore set the ZoI for local bat species impacts. As habitat degradation can potential occur within the surface water, groundwater and air (dust) ZoIs, the ZoI for local bat species will be set to 300m, with the addition of

downstream hydrological connections. This ZoI will include areas which are present within local bat species' core sustenance zones (a 3km radius around each of bat roosts) (Collins, 2023).

The ZoI for breeding bird species is linked with direct habitat loss and degradation within the footprint of the proposed Scheme. Additional adverse impacts for breeding birds will likely arise from the disturbance from construction works, which can extend 300m.[5].

The ZoI for amphibians (Common Frog and Smooth Newt) is linked to the wetland and freshwater aquatic habitats, which could potentially be degraded as a result of the proposed Scheme. Therefore, the ZoI for these floral / faunal species will mirror that of the groundwater-to-surface water ZoI, i.e., 300m, with the addition of downstream surface water hydrological connections.

The ZoI for freshwater macrophytes, fish and aquatic invertebrates is linked to the wetland and aquatic habitats, which could potentially be degraded as a result of the proposed Scheme. Therefore, the ZoI for these floral / faunal species will mirror that of the groundwater-to-surface water ZoI, i.e., 300m, with the addition of downstream surface water hydrological connections.

The ZoI for terrestrial invertebrates is generally linked with direct habitat loss and degradation, as well as construction and operational disturbances. As the furthest impact pathway that can affect terrestrial habitats is 300m, this will also be the ZoI distance for terrestrial invertebrate species.

8.2.2 Relevant Guidelines, Policy and Legislation

The biodiversity assessment included a comprehensive review of the following documents:

- The Planning & Development Act 2000 & the Planning and Development (Amendment) Act, 2010 (as amended) hereafter referred to as the Planning Acts;
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive);
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 on the assessment of the effects of certain public and private projects on the environment;
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) (as amended);
- EU Water Framework Directive (2000/60/EC) and European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);
- OPR Practice Note PN02 Environmental Impact Assessment Screening (OPR, June 2021);
- Guidelines for planning authorities and An Board Pleanála on carrying out environmental impact assessment (Department of Housing, Planning and Local Governments, August 2018);
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Draft) Environmental Protection Agency (EPA, 2022);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- Wildlife Acts (and amendments) 1976 to 2021;
- Flora (Protection) Order, 2022 (S.I. No. 235 of 2022);
- Inland Fisheries Acts 1959 to 2017;
- Guidelines on the Protection of Fisheries during construction works in and adjacent to water. (Inland Fisheries Ireland, 2016).

[5] Cutts, N.; Hemingway, K. & Spencer, J (2013). Waterbird Disturbance Mitigation Toolkit. Online: Available at: https://gat04-live-1517c8a4486c41609369c68f30c8-aa81074.divio-media.org/filer_public/8f/bd/8fbdd7e9-ea6f-4474-869f-ec1e68a9c809/11367.pdf. [Accessed: 04.09.2024]

- National Biodiversity Plan 2017-2021, Department of Culture, Heritage and the Gaeltacht (DCHG) 2017 (to be superseded by National Biodiversity Plan 2023-2027 should this document by published within the project's timeframe);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU 2013);
- Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, (CIEEM, 2018);
- Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (National Roads Authority, 2005)
- Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes (NRA, 2008b).
- Riparian breeding bird surveys methods (Cummins *et. al*, 2010).
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition) (Collins (ed.), Bat Conservation Trust 2016;
- Bat Mitigation Guidelines for Ireland (Marnell *et al*., 2022);
- Guidance Note 08/18. Bats and Artificial Lighting in the UK - Bats and the Built Environment series (ILP, 2018);
- The Bat Workers' Manual, 3rd Edition (Mitchell-Jones and McLeish), Joint Nature Conservation Committee 2004;
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (2008), NRA 2008;
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads, NRA 2010;
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters, IFI 2016; and
- Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning, IFI 2020.

8.2.3 Consultation

The consultation undertaken and subsequent outcomes for this work to date is reported in the EIAR – Volume 2 Main Report. This has included an online meeting with National Parks and Wildlife Service (NPWS) on 12 March 2024. All items raised by NPWS have been incorporated into this Biodiversity Chapter and/or incorporated into the design of the defences. Additional Consultation with Inland Fisheries Ireland (IFI) consultation was undertaken on 30 July 2024, with no major concerns raised at the time, although the importance of raising mitigation measures with the contractor on project handover was reiterated.

8.2.4 Competent Persons

The assessment has been carried out by Ecologist Michael Coyle BA (Hons), MSc, Senior Ecologist William Mulville BSc (Hons), MSc and Chartered Senior Ecologist Catherine Rodd BSc (Hons), MRes Cecol MCIEEM. They are all ecologists with JBA Consulting and have undertaken numerous Appropriate Assessment Screenings, NIS assessments and Ecological Impact Assessments.

This assessment was reviewed by Laura Thomas BA MRes PGCert CEcol MCIEEM. Laura is a Chartered Ecologist and Technical Director at JBA, with a specialism in botany and with extensive experience of EcIA, NIS assessment including their production and quality assurance.

8.2.5 Data Collection and Collation

This ecological assessment is based on a combination of desk-based research and a number of ecological field surveys targeting select groups of protected fauna likely to be impacted by the construction and operation of the proposed Scheme.

8.2.6 Desk Based Assessment

Reviewed data sources included relevant published biodiversity data; collation of existing information on the ecological environment; and consultation with relevant statutory bodies. Accessed data sources include:

- The Status of EU Protected Habitats and Species in Ireland Volume 1: Summary Overview, NPWS 2019;
- The Status of EU Protected Habitats and Species in Ireland Volume 2: Habitats Assessment, NPWS 2019;
- The Status of EU Protected Habitats and Species in Ireland Volume 3: Species Assessment, NPWS 2019;
- EPA Online databases on water quality and WFD maps (Available online at https://gis.epa.ie/EPAMaps/);
- Aerial photography available from www.osi.ie and Google Maps http://maps.google.com/;
- National Biodiversity Data Centre (NBDC) - Species Distribution Maps (Available online at www.biodiversityireland.ie);
- NBDC All Ireland Red Data lists for vascular flora, mammals, butterflies, non-marine molluscs, dragonflies & damselflies, amphibians, and fish (Available online at https://www.biodiversityireland.ie/resources/irish-red-lists/);
- International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (Available online at http://www.iucnredlist.org);
- Online data available on Natura 2000 network of sites and on Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) as held by the National Parks and Wildlife Service (NPWS);
- Records of rare and protected species for the study area, held by the NPWS;
- Habitat and species GIS datasets provided by the NPWS;
- Bat records from Bat Conservation Ireland's (BCI) database;
- Environmental Impact Statements or Environmental Impact Assessment Reports for any developments located along the alignment of the proposed Scheme;
- Environmental information/data for the area available from the EPA website;
- Records from the Botanical Society of Britain & Ireland (BSBI);
- Information provided by Inland Fisheries Ireland (IFI), and additional information accessed through the IFI online database.
- Dún Laoghaire-Rathdown otter survey 2020. Report prepared by Triturus Environmental Ltd for Dún Laoghaire-Rathdown County Council. November 2020.

The desk-based research includes a data search for protected and notable species using the National Biodiversity Data Centre (NBDC) Mapping System[6]. A customised polygon was produced to extract all the species data from the set ZoI for this scheme. Data from biological records centre or online databases is historical information, and datasets might be incomplete, inaccurate or missing. It is important to note that even where data is held, a lack of records for a defined geographical area does not necessarily mean that the species is absent; the area may simply be under-recorded.

8.2.7 Designated Nature Conservation Sites

Sites of international importance including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) and Ramsars are collectively known as Natura 2000 sites. All European (Natura 2000) sites within 15km of the proposed Scheme were considered, as per guidance in Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (Department of Environment, Heritage, and Local Government, 2010 rev.). Within this 15km buffer zone a source-pathway-receptor model was used to identify the sites which are present within the ZoI, as per OPR Practice Note PN01 Appropriate Assessment Screening for Development Management (OPR, 2021)[7].

Natural Heritage Areas (NHAs) and proposed NHAS (pNHAs), which are national designations, were identified within 5km of the site, with the source pathway receptor model used to identify sites which could be impacted within this ZoI.

6 NBDC (2023) NBDC Biodiversity Maps [online], available: https://maps.biodiversityireland.ie/Map/Terrestrial/Dataset/189

7 OPR (2021) 'OPR Practice Note PN01 - Appropriate Assessment Screening for Development Management'.

8.2.8 Site surveys

Surveying was completed by a number of experience ecologists including JBA Ecologists William Mulville BSc (Hons), MSc, Malin Lundberg BSc MSc, Patricia Byrne BSc, PhD, Dip, Mark Desmond BSc (Hons) MSc, and Michael Coyle BA (Hons) MSc, Matt Hosking BSc (Hons), and Jai Dolan BSc (Hons) MSc. Table 8-1 contains further details on survey dates and types of surveys undertaken.

The ecological walkover survey recorded habitats and protected species, following the methods outlined in the documents below:

- Heritage Council (2011). Best Practice Guidance for Habitat Survey and Mapping (Smith *et a*l. 2011)[8].
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009).

Aerial photographs and site maps assisted the survey. Habitats have been classified and described following Fossitt (2000)[9]. Nomenclature for higher plants follows that given in The New Flora of the British Isles 4th Edition[10]. Identification of Irish plants generally follows Webb's An Irish Flora[11].

Table 8.1: Ecological surveys undertaken in the study area

Surveyors	Date of Visit	Survey Type
Malin Lundberg and Patricia Byrne	20 November 2020	Fossitt Habitat Surveys and Preliminary Ecological Appraisal
Malin Lundberg and Patricia Byrne	10 December 2020	Fossitt Habitat Surveys and Preliminary Ecological Appraisal
Malin Lundberg and Patricia Byrne	06 January 2021	Fossitt Habitat Surveys and Preliminary Ecological Appraisal
Malin Lundberg and Patricia Byrne	20 January 2021	Fossitt Habitat Surveys and Preliminary Ecological Appraisal
Malin Lundberg and Patricia Byrne	25 February 2021	Fossitt Habitat Surveys and Preliminary Ecological Appraisal
Patricia Byrne	11 June 2021	Invasive Non-Native Species Survey
Malin Lundberg and Patricia Byrne	30 June 2021	Invasive Non-Native Species Survey, Fossitt Habitat Surveys and Preliminary Ecological Appraisal
Patricia Byrne	14 July 2021	Invasive Non-Native Species Survey
Mark Desmond	24 October 2022	Invasive Non-Native Species Survey
Mark Desmond	05 September 2023	Fossitt Habitat Surveys and Bat Roost Potential Survey.
William Mulville, Michael Coyle, Mat Hosking and Jai Dolan	02 February 2024	Otter and Fossitt Habitat Surveys
William Mulville, Michael Coyle and Jai Dolan	10 May 2024	Fossitt Habitat Surveys
William Mulville, Michael Coyle Matt Hosking and Jai Dolan	16 May 2024	Fossitt Habitat Surveys
Patricia Byrne, William Mulville, Michael Coyle Matt Hosking and Jai Dolan	05 June 2024	Bat Emergence and Bat Transect Surveys
William Mulville, Michael Coyle and Matt Hosking	11 July 2024	Otter and Fossitt Habitat Surveys

[8] Smith, G.F., O'Donoghue, P., O'Hora, K., Delaney, E., 2011. 'Best practice guidance for habitat survey and mapping', The Heritage Council: Ireland

[9] Fossitt, J.A., 2000. A Guide to Habitats in Ireland, Heritage Council of Ireland series, Heritage Council/Chomhairle Oidhreachta: Kilkenny

[10] Stace. C (2019) The New Flora of the British Isles 4th Edition

[11] Parnell, J. & Curtis, T., 2012. Webb's An Irish Flora [online], 8th ed, Trinity College Dublin. Available: http://www.corkuniversitypress.com/product-p/9781859184783.htm.

8.2.9 Terrestrial Habitat Surveys

Initial surveys of the terrestrial habitats were conducted on: 20 November and 10 December 2020; 6 January, 20 January, 25 February and 30 June 2021. Following this initial surveying, additional sections were added to the scheme, and these were surveyed on the 05 September 2023, and the 2 February, 10 May, 16 May and 11 July 2024.

All habitats located within the survey area of the proposed Scheme were mapped to level three of the Heritage Council's Fossitt (2000) habitat codes, and in accordance with Best Practice Guidance for Habitat Survey and Mapping[12]). Floral species present that were either representative of a habitat, or considered to be of conservation interest, were recorded. The habitat's extent was mapped onto an aerial photograph within the QField GIS Android application, with GPS points taken where any ecological features of note were observed. Any non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations were also recorded during the habitat surveys. Identification for higher plants principally follows that given in Webb's An Irish Flora; while contemporary nomenclature is in line with The New Flora of the British Isles 4th Edition.

8.2.10 Tree Survey

An initial tree survey was conducted by Michael Garry of Arbor-Care Ltd on the 04th of April 2024. An Arboricultural Impact Assessment was written in accordance with BS5837:2012 Trees in relation to design, demolition, and construction[13]. The full tree survey is available in Appendix 8.1.

8.2.11 Terrestrial Mammals

During all ecological surveys and visits to the Carrickmines scheme area, signs for Otter *Lutra lutra*; Badger *Meles meles*; Irish Hare *Lepus timidus hibernicus*; Pine Marten *Martes martes*; Hedgehog *Erinaceus europaeus*; and Pygmy Shrew *Sorex minutus* within the surrounding vicinity of the proposed Scheme were searched for following the guidelines in NRA (2008). Field signs include scat/ droppings, setts/ dens/ holts, and any mammal tracks.

A series of Otter surveys were completed in tandem with the habitat surveys on the 2 February and 11 July 2024. During these surveys, potential holts and couches were identified and investigated, one near to the Shanganagh Bridge in the south-east of the scheme.

8.2.12 Bat Surveys

The bat surveys comprised several elements, including daytime inspections of structures and bat habitats, dusk emergence surveys and passive static detector surveys which followed the guidelines present in Collins (2023).

Preliminary Bat Roost and Habitat Suitability Surveys

Given the presence of a number of mature trees within the proposed Scheme boundary, there was the potential for bat roosts to be present within or adjacent to the proposed Scheme. JBA ecologists carried out a preliminary bat roost potential assessment and habitat suitability surveys were conducted during daylight hours in order to identify the location of potential roosts features (PRFs) and access points (within structures).

These surveys were done in conjunction with habitat surveys, and surveyors took note of any existing features (such as cracked limbs or dense Ivy) that would be indicative to the suitability of roosting.

[12] Smith, G.F., O'Donoghue, P., O'Hora, K., and Delaney, E. (2011) 'Best practice guidance for habitat survey and mapping', The Heritage Council: Ireland

[13] Arbor-Care Ltd. (2024) Arboricultural Impact Assessment - Carrickmines Flood Relief Scheme (unpublished)

Bat Emergence Survey

Following the findings of the Preliminary Bat Roost surveys, the Shanganagh Bridge was considered to have low bat roosting potential. Following the guidelines of Collins (2023), one bat emergence survey was completed on the 5 June 2024 at the Shanganagh Bridge. This survey was conducted by three surveyors, beginning at 9pm and ongoing for two hours. One surveyor was stationed on the existing bridge, and was overlooking the east face of the bridge, while an additional two surveyors were located within the streambed downstream of the bridge. Surveyors were monitoring if bats were seen leaving the underside of the bridge, indicating the presence of a roost underneath. This survey was conducted with each surveyor using Anabat Walkabout listening devices, and the surveyors in the water were additionally using of an Axion Thermal Imaging Monocular. The time, species and frequency (khz) of individual bat calls were recorded.

Bat Detector Surveys

One static (*in situ*) bat detector [Anabat Chorus – Titley Scientific] was installed along the riparian corridor downstream of the Shanganagh Bridge. This static was deployed on the 5 June 2024, prior to the bat emergence survey and was left for a period of seven days. The data collected provided information on the frequency of use by individual bat species within this riparian corridor.

8.2.13 Amphibians

Ecological surveyors examined the proposed Scheme area in spring for the presence of amphibian species Common Frog *Rana temporaria* and Smooth Newt *Lissotriton vulgaris*, as well as suitable water bodies and wetlands to support breeding amphibian populations.

8.2.14 Fish

A fisheries assessment by means of an electrofishing survey was conducted by Triturus Ecology within the Ballyogan Stream (also known as the Barnaculia Stream), Carrickmines Stream, Shanganagh River in August 2023. Additionally, this fish survey also identified key aspects of the river's structure and its provision of habitats for many fish species. The full report provided by Triturus is provided in Appendix 8.2.

8.2.15 Incidental Recordings

Incidental recordings of breeding birds and terrestrial invertebrates were continuously recorded during the extensive habitat, mammal and bat surveys undertaken across the scheme footprint.

8.2.16 Limitations to the baseline data

The habitats and species present in a given area are subject to change over time. As such, the advice and assessments contained within this report is considered valid for a period of 18 months before a review or an updated survey/assessment must be made by an ecologist[14].

Data from biological records centres or online databases is historical information, and datasets might be incomplete, inaccurate, or missing. It is important to note that even where data is held, a lack of records for a defined geographical area does not necessarily mean that the species is absent; the area may simply be under-recorded. As such, records cannot be relied on and serve only as an indication of what might/ might not be found.

For the bat surveys, a static was deployed from the 5th of June to the 12th of June 2024, however, it only recorded data for four of these eight nights due to a mechanical fault. Even with the reduced number of days recorded

[14] CIEEM (2019). Advice Note on the Lifespan of Ecological Reports and Surveys. [Online] Available at: https://cieem.net/wp-content/uploads/2019/04/Advice-Note.pdf. [Accessed 01.09.2024].

due to a fault, given the high overall level of bat passes, the survey still gathered sufficient data to highlight the high activity of bats in the area.

8.3 Methodology for the Assessment of Impacts

8.3.1 General Approach

The ecological features identified during the walkover surveys and from desk-based assessments were reviewed.

An informal screening process is presented at the end of the baseline environment sub-section to ensure that the assessment focuses only on features where the impact could have important consequences for biodiversity (valued ecological features). Any features which are important beyond the site level were identified for further evaluation. Ecological features with little or no value beyond the site level were screened out and a short statement explaining this is given in the screening section.

A separate Appropriate Assessment (AA) Screening[15] report has been produced to assess the potential for effects on Designated Natura 2000 sites. The AA Screening Report concluded that there are no likely significant effects for the QIs of the Natura 2000 sites arising from the proposed Scheme, either alone or in-combination with other plans or projects.

The current Biodiversity Chapter impact assessment is written without prejudice to the NIS.

8.3.2 Valuation of Receptors

The value of designated sites, habitats and species populations is assessed with reference to:

- Their importance in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations);
- Any social benefits that habitats and species deliver (e.g., relating to enjoyment of flora and fauna by the public); and
- Any economic benefits that they provide.

The valuation of designated sites considers different levels of statutory and non-statutory protection. Assessment of habitat depends on several factors, including the size of the habitat, its conservation status and quality. The assessment also takes account of connected off-site habitat that has the potential to increase the value of the on-site habitat through association. Valuation of species depends on a number of factors including distribution, status, rarity, vulnerability, and the population size present.

Table 8.2: Examples of criteria used to define the value of ecological features (NRA, 2009)

Level of Value	Examples of Criteria
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (or a site considered worthy of such designation). A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive). Designated shellfish waters. Major fisheries area.
National	A nationally designated site e.g. Natural Heritage Area (NHA), a proposed Natural Heritage Area (pNHA), statutory Nature Reserve, or a site considered worthy of such designation. A viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring substantial population of a nationally important species, e.g. listed on

15 JBA Consulting (2023) Carrickmines-Shanganagh Flood Relief Scheme - AA Screening. Unpublished Report for Dun Laoghaire Rathdown County Council

	The Wildlife Act 1976 or The Wildlife (Amendment) Act 2000. A species included in the Irish Red Data Lists/Books. Significant populations of breeding birds.
Regional/County (Co. Dublin)	Species and habitats of special conservation significance within County Dublin, as identified in Dublin City Biodiversity Action Plan 2021-2025. An area subject to a project/initiative under the County's Biodiversity Action Plan. A regularly occurring substantial population of a nationally scarce species.
Local	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration. A good example of a common or widespread habitat in the local area. Species of national or local importance, but which are only present very infrequently or in very low numbers within site area.
Less than local (works site and its vicinity)	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest. Common and widespread species.

Ecological Valuation may also be considered of Local Importance (higher value) or Local Importance (lower value) (see Table 8.3).

Table 8.3: Examples of criteria used to define the value of ecological features of local importance16

Level of Value	Examples of Criteria
Local Importance (higher value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan (BAP), if this has been prepared. Resident or regularly occurring populations (assessed to be important at the Local level) of the following: *Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; *Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; *Species protected under the Wildlife Acts; and/or *Species listed on the relevant Red Data List. Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value
Local Importance (lower value)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites or features containing non-native species that are of some importance in maintaining habitat links

Guidance published by CIEEM[17] recommends breaking down the importance of ecological features in a geographic context similar to the NRA guidance shown in Table 8.2, with the following frame of reference to be adapted to local circumstances:

- International and European
- National
- Regional
- Metropolitan (Carrickmines), County (Dublin), vice-county (Dún Laoghaire-Rathdown) or other local authority-wide area

16 NRA (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes, available: https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf.

17 CIEEM (2018) Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater, Coastal and Marine.

- River Basin District
- Estuarine system/Coastal cell
- Local

The NRA (2009) guidance is congruent with this CIEEM (2018) guidance and includes a 'Less than local' level. The NRA (2008, rev. 2009) guidance on geographic criteria for ecological valuation, as described in Table 8.2 is followed in this chapter.

8.3.3 Descriptive Terminology

The EPA Guidelines[18] provide guidance on determining significance and type of ecological effects. Examples of relevant terms are listed in Figure 1.4.

8.3.4 Significance of Impacts

The overall significance of an impact can be derived from the total description of the effect compared against the sensitivity and significance (value) of the receptor as shown in Figure 1.2, which is taken from the EPA's EIAR Guidelines (2022)[19]. The context and character of the receptor must also be assessed, such as its position in relation to the effect and its connectivity to the effect, however, this should be determined before assessing the significance of the impact.

The total description of the effect includes the character, magnitude, probability and consequences of the effect as described in Figure 1.4, which are combined to give a general description of the effect on an ordinal scale from Negligible to High. The sensitivity and significance of the receptor is also described on an ordinal scale from Negligible to High.

The placement of the general description of the effect, and the sensitivity/significance of the receptor on this scale is determined by a Competent Person (a qualified ecologist in this case) as they interpret the qualities of the effect from the categories listed in Figure 1.4 and the receptors sensitivity and significance. Level of significance, also described as value of the receptor, is previously set out in sub-section 8.3.2 above. Sensitivity of the receptor is assessed by the Competent Person based on the receptor's characteristics and how susceptible to impact they are from the type of effect.

The overall significance of an effect is then categorised into one of the following seven classifications:

- Imperceptible
- Not Significant
- Slight
- Moderate
- Significant
- Very Significant
- Profound

This chart has been interpreted in Table 8.4 below as a significance of impacts matrix. The scale has been ordered into an upper and lower bound for each qualitative category, so that degrees of significance within subcategories can be interpreted by the Competent Person. As Table 8.4 frames the significance of effects a as a defined categorical scale rather than a sliding gradient as is shown in the EPA guidance, it is intended to be used as an initial reference resource, rather than definitive method of assigning impacts.

18 EPA (2022) Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports (Draft), Environmental Protection Agency.

19 EPA (2022) Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports (Draft), Environmental Protection Agency.

Table 8.4: Significance of impacts matrix

Magnitude of impact	Sensitivity/ Value of Receptor							
	High +	**High -**	**Medium +**	**Medium -**	**Low +**	**Low -**	**Negligible +**	**Negligible -**
High +	Profound	Very significant	Very significant	Significant	Moderate	Moderate	Not Significant	Imperceptible
High -	Very Significant	Very significant	Significant	Moderate	Moderate	Slight	Not Significant	Imperceptible
Medium +	Very Significant	Significant	Moderate	Moderate	Slight	Slight	Not Significant	Imperceptible
Medium -	Significant	Moderate	Moderate	Moderate	Slight	Slight	Not Significant	Imperceptible
Low +	Moderate	Slight	Slight	Slight	Slight	Slight	Not Significant	Imperceptible
Low -	Slight	Slight	Slight	Slight	Slight	Not Significant	Not Significant	Imperceptible
Negligible +	Not Significant	Not Significant	Not significant	Not Significant	Not Significant	Not Significant	Not Significant	Imperceptible
Negligible -	Not Significant	Not Significant	Not significant	Not Significant	Not Significant	Imperceptible	Imperceptible	Imperceptible

Furthermore, the NRA (2009) and CIEEM (2018) guidelines were followed (in conjunction with the EIA guidelines), which requires examination of the following two key elements:

- Impact on the integrity of the ecological feature; and
- Impact on its conservation status within a given geographical area.

8.3.5 Ecological Integrity

Ecological integrity should be regarded as the coherence of ecological structure and function, across the entirety of a site that enables it to sustain all of the biodiversity or ecological resources for which it has been valued[20].

Ecological integrity is most often used when determining impact significance in relation to designated nature conservation areas (e.g., SACs, SPAs or pNHA/NHAs) but can often be the most appropriate method to use for non-designated areas of biodiversity value where the component habitats and/or species exist, with a defined ecosystem at a given geographic scale.

Any adverse impact on the integrity of an ecological site or ecosystem is considered to be significant if it moves the condition of the ecosystem away from a favourable condition: removing and/or changing the processes that support the sites' habitats and/or species; affects the nature, scale, structure, complexity and functioning of component habitats; and/or, affects the population size and viability of the inhabiting floral and faunal species therewithin.

8.3.6 Conservation Status

The definitions for conservation status given in the EU Habitats Directive 92/43/EEC, in relation to habitats and species, are also used in the CIEEM (2018) and NRA (2009) guidance:

- For natural habitats, conservation status means the sum of the influences acting on the natural habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species, at the appropriate geographical scale.
- For species, conservation status means the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations, at the appropriate geographical scale.
- An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status.

After the definitions provided in the EU Habitats Directive 92/43/EEC, the conservation status of a habitat is favourable when:

- Its natural range and areas it covers within that range are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favourable as defined below under species.
- And the conservation status of a species is favourable when:
- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

20 NRA (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes, available: https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf.

If it is determined that the ecological integrity and/or conservation status of a key ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e., local, county / regional, national, international). In some cases, an impact may not be significant at the geographic scale at which the ecological feature has been valued (e.g., national) but may be significant at a lower geographical level (e.g., local).

8.3.7 Residual Effects

The project is assessed including some designed-in mitigation. This is done where mitigation is proven to be effective and will be implemented effectively with a high certainty. Where significant residual effects are still identified, further mitigation measures will be proposed as part of the EIA process to avoid, reduce or minimise them. Each impact assessment section assigns a final significance level to the impact described, which considers and includes the implementation of any stated mitigation measures; these are the residual effects.

8.3.8 Cumulative Impacts

Potential sources of cumulative impacts were identified based on the ecology of valued ecological features. Potential sources of cumulative impacts were sought within an area where there is the potential for a significant impact on a site or species. The plans and projects identified as potential sources of cumulative impacts are described in Section 16.

8.4 Ecological Baseline

This section summarises the baseline information about the ecological features within the footprint of the proposed Scheme.

8.4.1 Natura 2000 Sites

The Natura 2000 sites within the ZoI are listed in Table 8.5 below and their location are shown in Figure 8.2 (overleaf).

Table 8.5: Natura 2000 sites located within the ZoI

Natura 2000 site	Site Code	Approximate Distance from Site	Hydrological Distance from Site
Ballyman Glen SAC	000713	4km	n/a
Bray Head SAC	000714	5.5km	n/a
Carrigower Bog SAC	000716	14.6km	n/a
Dalkey Islands SPA	004172	3.4km	3.4km downstream (in bay)
Glen of the Downs SAC	000719	10.7km	n/a
Glenasmole Valley SAC	001209	9km	n/a
Howth Head SAC	000202	13.1km	n/a
Howth Head Coast SPA	004113	13.5km	n/a
Knocksink Wood SAC	000725	5km	n/a
North Bull Island SPA	004006	10.2km	n/a
North Dublin Bay SAC	000206	10.2km	n/a
North-West Irish Sea cSPA	004236	10.2km	n/a
Rockabill to Dalkey Island SAC	003000	1.8km	1.8km downstream (in bay)
South Dublin Bay and River Tolka Estuary SPA	004024	4.8km	n/a
South Dublin Bay SAC	000210	4.8km	n/a
Wicklow Mountains SAC	002122	4.7km	n/a
Wicklow Mountains SPA	004040	4.9km	n/a

The proposed scheme is located along the Carrickmines Stream and a small section of the Shanganagh River, which flow into Killiney Bay and are furthermore connected to Rockabill to Dalkey Island SAC and Dalkey Islands SPA. The proposed scheme is not connected to other Natura 2000 sites (Figure 8.2). A separate Appropriate Assessment (AA) Screening report[21] has been produced which examines the likely pathways and impacts of the proposed works on any of these Natura 2000 sites.

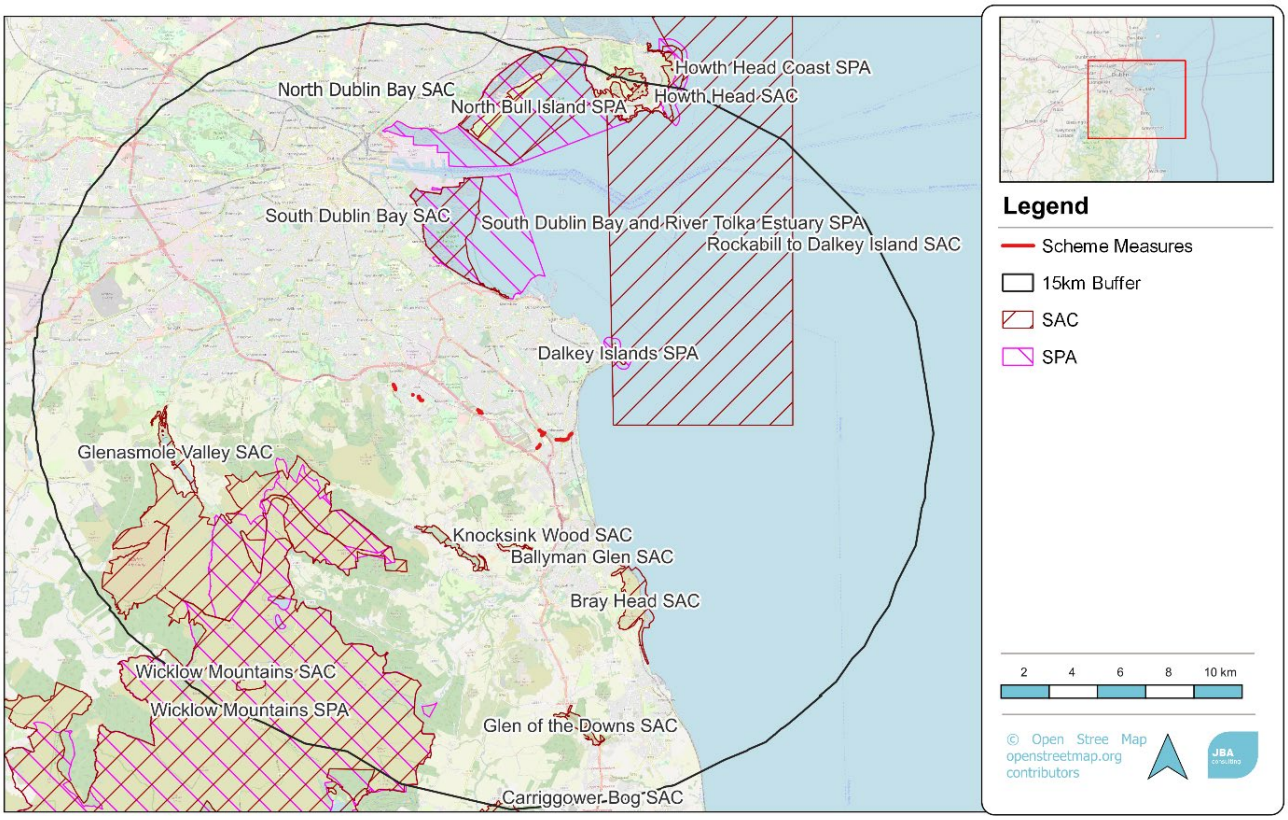


Figure 8.2: Natura 2000 sites within the ZoI of the development (OSM, 2023).

8.4.2 Natural Heritage Areas

There are six pNHAs and no NHAs located within the 5km ZoI of the site (Table 8.6, Figure 8.3 and Figure 8.4). Of these sites, four are within Natura 2000 designated sites. These are those associated with South Dublin Bay SAC/SPA, Dalkey Islands SPA, Knocksink Woods SAC, and Ballyman Glen SAC. The AA screening rules out any likely significant effects of the scheme for these Natura 2000 sites. As the pNHAs have the same receptors, these four pHNAs are covered by the assessment in the AA Screening report and are not considered to be impacted. These are screened out for further assessment in this EIAR. The other pNHA sites are assessed below.

[21] JBA Consulting (2024) Carrickmines-Shanganagh Flood Relief Scheme - Screening for Appropriate Assessment. Unpublished report Dun Laoghaire Rathdown County Council

Table 8.6: pNHAs within 5km of the site and requirement for further assessment.

pNHA Site code	pNHA Site name	Distance from site (km)	Screening for further assessment
001207	Dingle Glen	1.4km	No assessment required: No hydrological connection, outside of air pollutant buffer, no direct land interaction.
001753	Fitzsimon's Woods	0.4km	Considered further due to the pNHA's proximity to the site, and potential airborne pollutants.
001206	Dalkey Coastal Zone and Killiney Hill	0.3km	Considered further due to the pNHA's proximity to the site, potential waterborne and airborne pollutants.
001211	Loughlinstown Woods	Sections occur within site boundary	Considered further due to the pNHA's proximity to the site, potential and airborne pollutants, and potential direct land disturbance.
001202	Ballybetagh Bog	3.7km	No assessment required: No hydrological connection, outside of air pollutant buffer, no direct land interaction.
000725	Knocksink Woods	4.9km	No assessment required: No hydrological connection, outside of air pollutant buffer, no direct land interaction

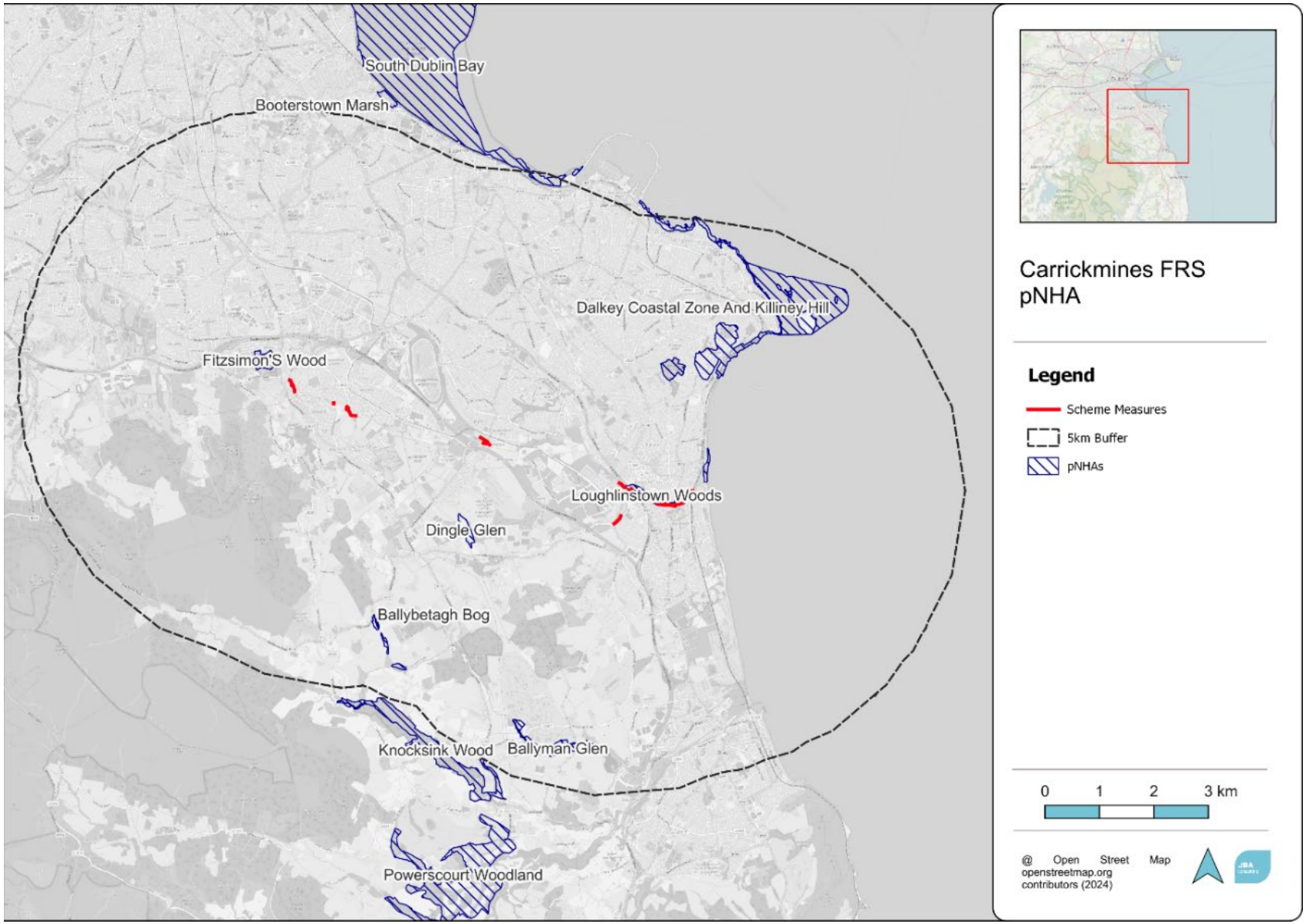


Figure 8.3: Proposed Natural Heritage Areas (pNHA) within the ZoI of the proposed scheme

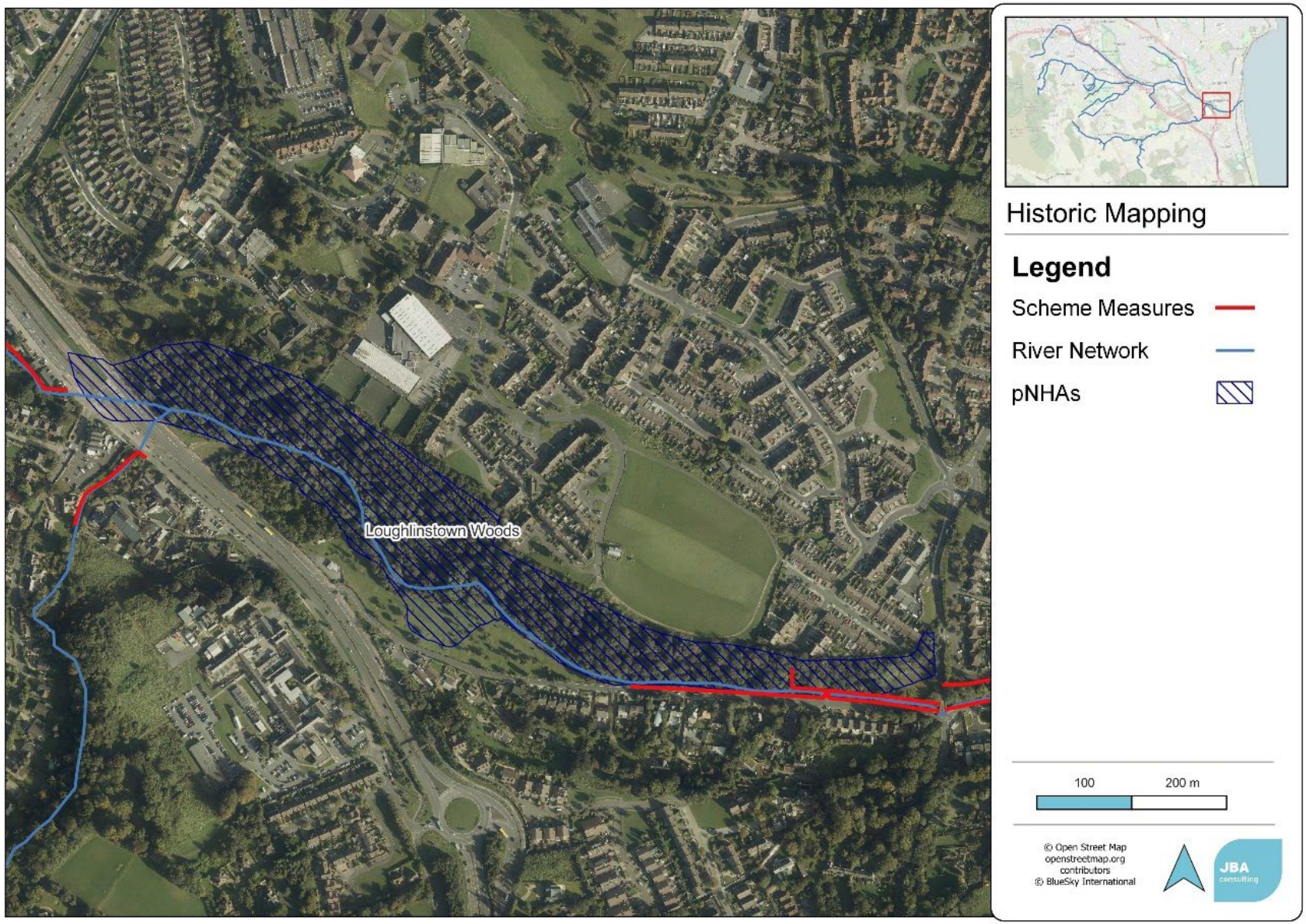


Figure 8.4: Loughlinstown Woods pNHA

8.4.3 Protected Species

Records of protected fauna including birds, amphibians, fish and mammals collated from the National Biodiversity Data Centre[22] database, present within 5km of the flood relief scheme since 2014 are listed in Appendix 8.3. This table includes their level of protection, if they are red or amber listed on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List and the date of the last record of this species at this location.

8.4.4 Invasive Non-native Species

The Records of Invasive Non-native Species (INNS) collated from the NBDC database present within 5km of the scheme since 2014 are listed in Appendix 8.4.

8.4.5 Aquatic Habitat – On and Off-Site Receptors

The entirety of the proposed Scheme lies within the Water Framework Directive (WFD) Dargle_SC_010 sub-catchment. The proposed flood relief scheme will primarily be contained within the Carrickmines Stream_010 water body, while there will be additional works along the Shanganagh_010 river water body. Both rivers flow east towards Killiney Bay main body.

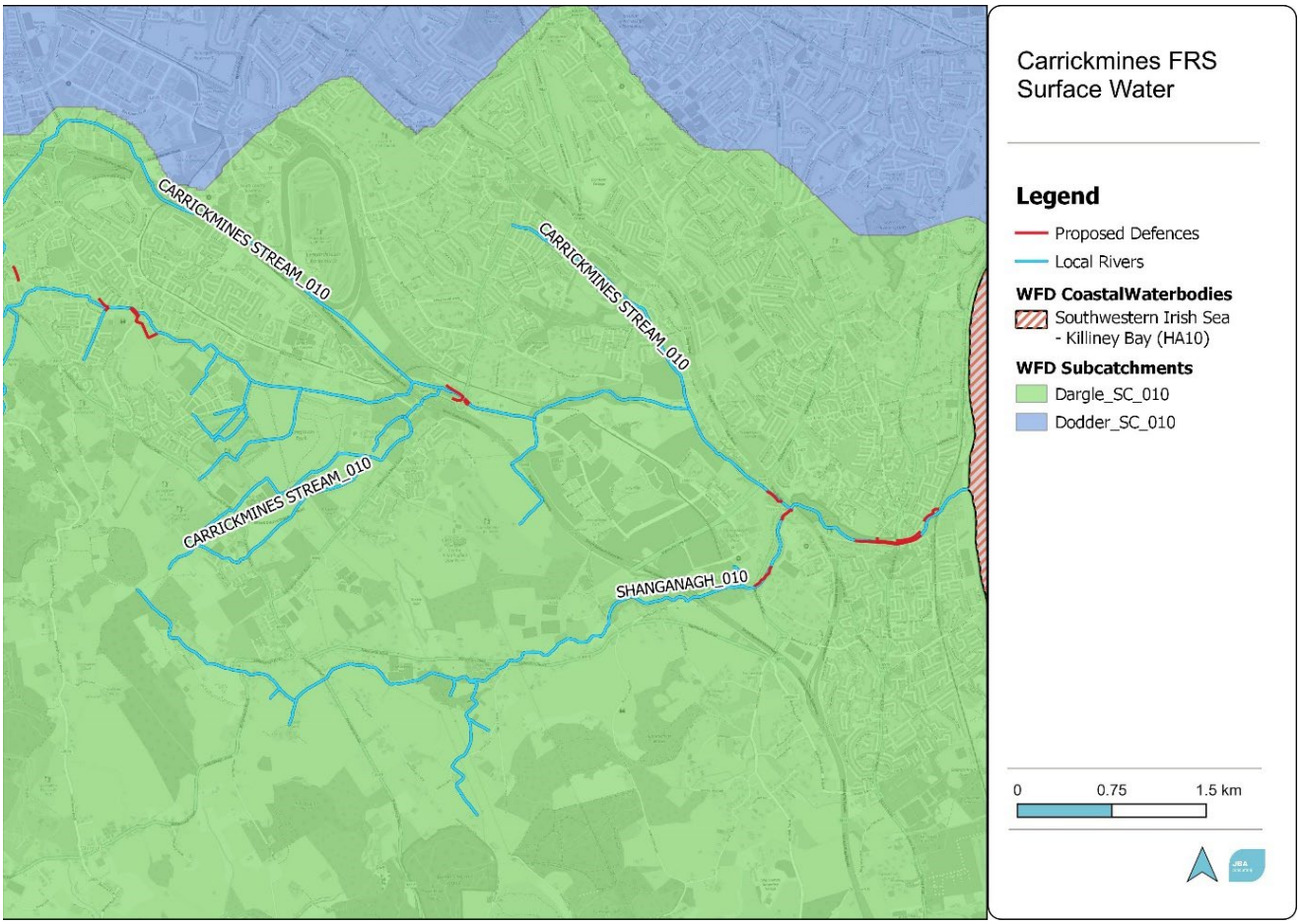


Figure 8.5: WFD surface water bodies within the vicinity of the proposed site

The entirety of the proposed project is located within the Water Framework Directive (WFD) Avoca-Vartry catchment, and within the Dargle_SC_010 sub-catchment (EPA, 2023). The scheme takes place along various

[22] National Biodiversity Centre (2024) Biodiversity Maps - Map Viewer [online], National Biodiversity Data Centre Biodiversity

points of the Carrickmines Stream_010, and along the Shanganagh_010. These two watercourses are both considered to be "Not at risk", while they are also considered to be of "Good" quality. The locations of the scheme along these water bodies are shown in Figure 8.5. Water from both streams flow east before reaching the Irish Sea. Note the waterbody names shown in Figure 8.5 are the WFD waterbody names; the watercourse names referred to throughout this EIAR as shown in Figure 3.1 are the ones used for the scheme.

All of these water bodies, along with their WFD status (2016-2021) and current risk are listed in Table 8.7.

Table 8.7: WFD status and risk of local watercourses

WFD Sub-Catchment	WFD Watercourse	WFD Status	WFD Risk	Approx. Distance from Site
Dargle_SC_010	Carrickmines Stream_010	Good	Not at Risk	Work along riverbanks
Dargle_SC_010	Shanganagh_010	Good	Not at Risk	Work along riverbanks

8.4.6 Groundwater

The entirety of the scheme is located within the Wicklow groundwater body (Figure 8.6). The Wicklow groundwater body currently holds "Good" WFD status (2016-2021); and is considered to be 'At Risk'.

Due to the spread of the measures for the FRS, there is a variety in the underlying bedrock throughout the site. Sections are dominated by Granite with Muscovite Phenocrysts of the Type 3p Muscovite Porphyritic formation, Granite with microcline phenocrysts of the Type 2 Microcline Porphyritic formation, and Dark blue-grey slate, phyllite and schist of the Maulin Formation. Meanwhile, the soil is derived of a variety of Made Ground, Alluvial deposit and Till derived chiefly form Granite. Given this spread of bedrock and derived soils, the permeability of the site's different areas is similarly varied, ranging from Low in the eastern areas, to Moderate in the western areas, while there are intermittent sections that have yet to have their permeability classified. This spread of permeability is mirrored in the recharge capacity throughout the site, ranging from 7.5-20% in areas of Low permeability, and a higher recharge rate of 85%. The variation of the groundwater's permeability and recharge is reflected in the changing vulnerability throughout the site, shown in Figure 3.15.

The site is split between two types of aquifers. Most of the site is "Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones", an aquifer with poor connections and a low permeability, low storage, short flow paths, and a very restricted discharge to streams. The site also contains a small area of "Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones" Vulnerability which also has poor connections, low permeability, discharge restricted to a few hundreds of meters and general restricted groundwater discharge to streams[23].

[23] GSI, 2023. Geological Survey Ireland Spatial Resources website. Available online at: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c 228

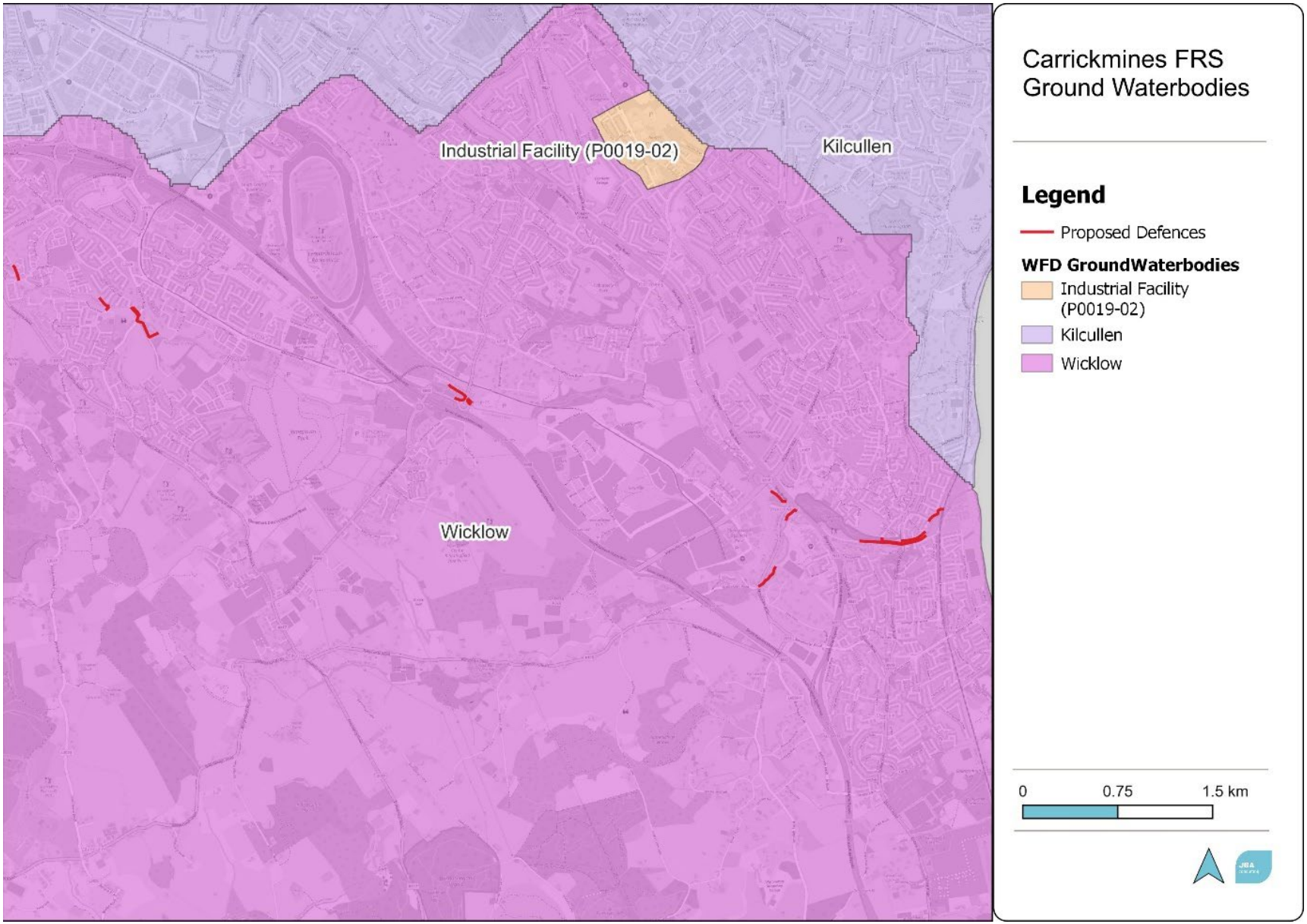


Figure 8.6: Groundwater bodies in the vicinity of site (OSM, 2023)

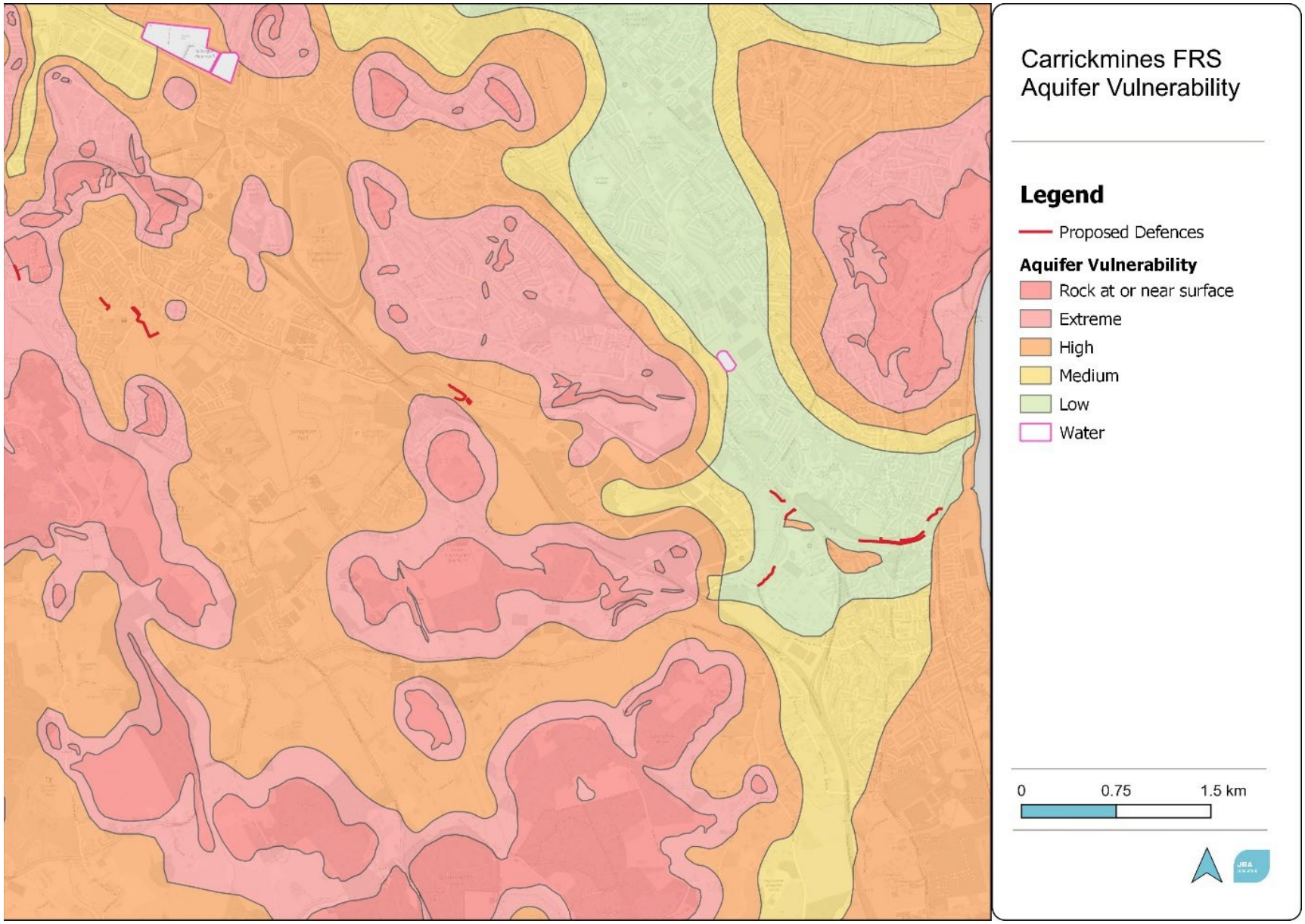


Figure 8.7: Aquifer vulnerability of the study area (OSM, 2023)

8.5 Habitats

A list of habitats recorded during the ecological habitats surveys is listed in Table 8.8 and descriptions are provided in the following section. Given the overall expanse of the scheme's measures, the scheme has been divided into different sub-sections.

Table 8.8: Habitats recorded during site visit.

Habitat	Fossitt Code	Linked Annex Habitats and Species
Stone walls and other stonework	BL1	-
Earth banks	BL2	-
Mosaic: Earth banks / Scrub	BL2 / WS1	-
Buildings and artificial surfaces	BL3	-
Recolonising Bare Ground	ED3	
Other artificial lakes and ponds	FL8	-
Eroding/upland rivers	FW1	Otter
Mosaic: Eroding/upland rivers / Depositing/lowland rivers	FW1 / FW2	Otter
Drainage ditches	FW4	-
Improved agricultural grassland	GA1	-
Amenity grassland (improved)	GA2	-
Dry meadows and grassy verges	GS2	-
Wet grassland	GS4	-
Marsh	GM1	-
Dense Bracken	HD1	-
Mosaic: Dense Bracken / Scrub	HD1 / WS1	-
(Mixed) broadleaved woodland	WD1	Bats
Mosaic: (Mixed) broadleaved woodland / Scrub	WD1 / WS1	Bats
Mixed broadleaved/conifer woodland	WD2	Bats
Mosaic: Mixed broadleaved/conifer / Scrub	WD2 / WS1	-
Scattered trees and parkland	WD5	Bats
Hedgerow	WL1	Bats
Treelines	WL2	Bats
Scrub	WS1	Bats
Mosaic: Scrub / Dry meadows and grassy verges	WS1 / GS2	-

Habitat map Area A: Measures 1.A and 1.B (Clon Brugh)

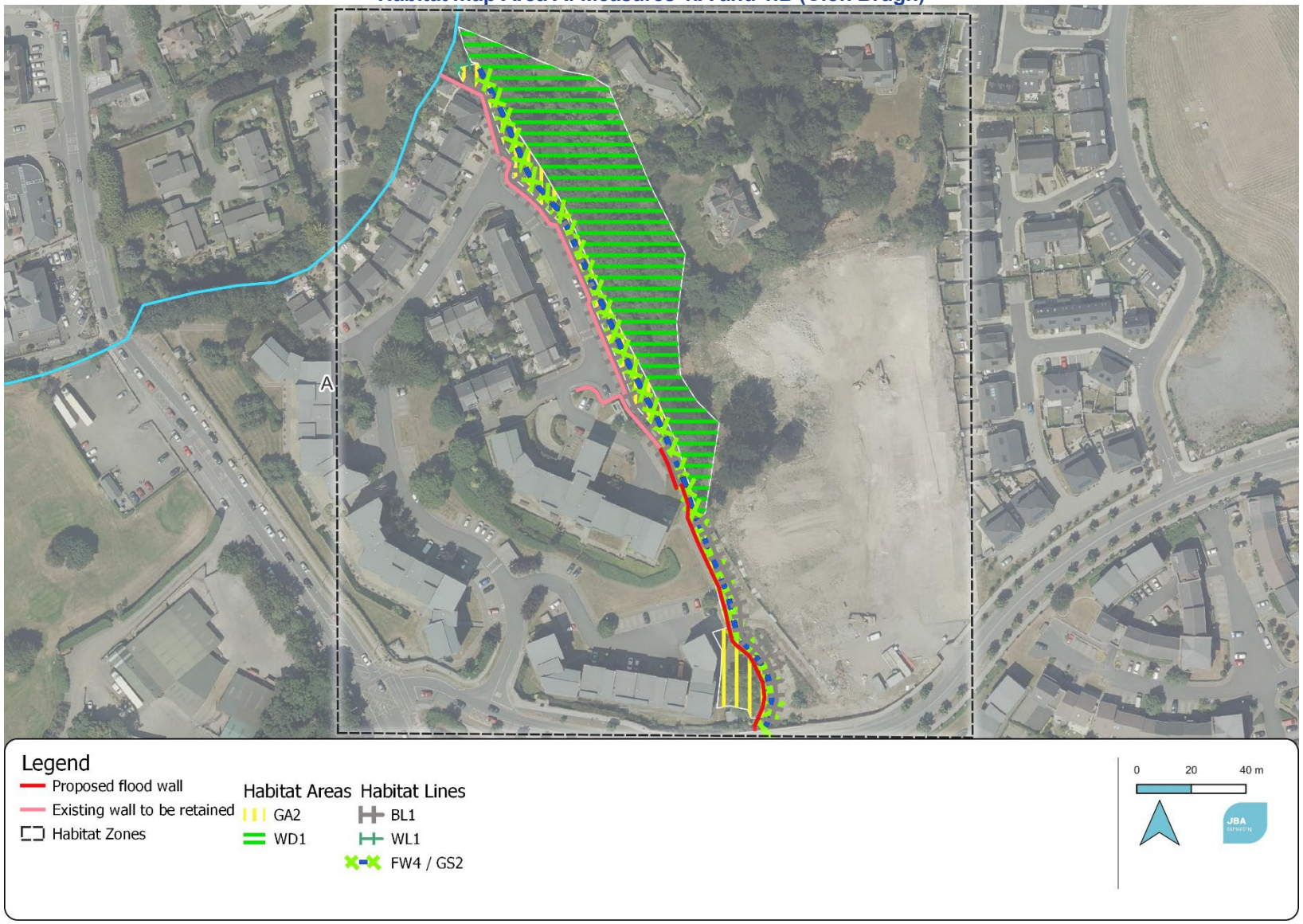


Figure 8.8: Clon Brugh habitats

A habitat map of the sections near Defence 1A & 1B area found above in Figure 8.8, and habitats for this area are expanded below. The habitats in this section include:

Stone walls and other stonework (BL1)

There are stone walls present within the housing estate at Clon Brugh. There were neither floral nor faunal species present on this stone wall.

In the context of the site and its surrounds, this habitat is considered to be of **less than local ecological importance** given the absence of supported species of ecological interest.

Buildings and artificial surfaces (BL3)

A large portion of the site is dedicated to roadways, houses, footpaths or adjacent housing. These areas that have few species present or associated with them.

In the context of the site and its surrounds, this habitat is considered to be of **less than local ecological importance** given the absence of supported species of ecological interest.

Drainage ditches / Dry meadows and grassy verges (FW4, GS2)

Located through Clon Brugh is a ditch that has a distinct grassy verge located along its course (Figure 8.9)C. At the time of the survey on the 16th of May 2024. This ditch was wet at the very northern tip of this section, and dry for the remainder. The flora located along the ditch's course include: willowherb *Epilobium* sp; Hogweed *Heracleum sphondylium*; Perennial Rye-grass *Lolium perenne*; Cuckooflower *Cardamine pratensis*; Dandelion *Taraxacum* spp.; Red Clover *Trifolium pratense*; Bramble *Rubus fruticosus* agg.; Hedge Crane's-bill *Geranium pyrenaicum*; Ragwort *Jacobeae vulgaris*; Lesser Stitchwort *Stellaria graminea* ; Creeping Cinquefoil *Potentilla reptans*; Ribwort Plantain *Plantago lanceolata*; Black Medick *Medicago lupulina*; Wild Carrot *Daucus carota*; Red Fescue *Festuca rubra*; Cock's-foot *Dactylis glomerata*; Oxeye Daisy *Leucanthemum vulgare*; Herb Robert *Geranium robertianum*; Smooth Sow-thistle *Sonchus oleraceus*; Common Vetch *Vicia sativa*; Meadow Buttercup *Ranunculus acris*; Creeping Buttercup *Ranunculus repens*; and Broad-leaved Dock *Rumex obtusifolius*. Some garden Marigolds were also located within this area.

Figure 8.9: The ditch running through the Clonbrugh stretch of the scheme, with the distinct floral diversity visible in contrast to the amenity grassland on either side.

Figure 8.10: The wet section (left) and dry section (right) in the vicinity of Measures 1.A and 1.B

At the more southern area of this ditch, was a Common Frog *Rana temporaria*.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present.

Amenity grassland (improved) (GA2)

On either side of the ditch in this area, is a section of amenity grass (Figure 8.9). While some of the plants from the ditch and its verges have spread into these amenity areas, it is managed moderately, and so it consists mainly of Ragwort, Perennial Rye-grass, Dandelion and Daisy *Bella perennis*.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given lack of floral diversity.

(Mixed) broadleaved woodland (WD1)

East of Defences 1A and 1B is a woodland which consists of a mixture of trees, native and non-native (Figure 8.10). This woodland is dominated by Sycamore *Acer pseudoplatanus*, while also containing other tree species such as: Ash *Fraxinus excelsior*; Silver Birch *Betula pendula*; Scots Pine *Pinus sylvestris*; Hawthorn *Crataegus monogyna*; Blackthorn *Prunus spinosa*; Elder *Sambucus nigra*; Holly *Ilex aquifolium*; Alder *Alnus glutinosa*; Pedunculate Oak *Quercus robur*; Horse Chestnut *Aesculus hippocastanum*; and Barberry *Barberis* sp., while also having a light layer of English Ivy *Hedera helix* on some of the trees.

The understory of this woodland section includes Cleavers *Gallium aparine*, Bramble, Lords-and-ladies *Arum maculatum*; Burdock *Arctium minus*; Hedge Mustard *Sisymbrium officinale*; Dandelion; Creeping Buttercup; Perennial Rye-grass; Cleavers; Ragwort; Sunspurge *Euphorbia peplus*; Scaly Male Fern *Dryopteris affinis*, Shepherd's-purse *Capsella bursa-pastoris*, Creeping Thistle *Cirsium vulgare*; Broad-leaved Dock; Garlic Mustard *Alliaria petiolata*, Green Alkanet *Pentaglottis sempervirens*; Common Vetch; Nettle *Urtica dioica*; Wood Sorrel *Oxalis acetosella*; White Clover *Trifolium repens* and Common Fumitory *Fumaria officinalis*.

Figure 8.11: The woodland in the area of Measures 1.A and 1.B

This woodland was also inspected for bat roosting features, and was deemed to have low potential for roosting, given the lack of dense Ivy growth of cracks within trees and limbs.

In the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance**, given its quality as a pocket woodland with diverse tree species within an urban setting, albeit containing some non-native species.

Hedgerows WL1

There is a small hedgerow located to the north of this location, made entirely of Cherry Laurel *Prunus laurocerasus*, before beginning to merge with the woodland section (Figure 8.12).

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given it is a planted hedgerow made-up entirely of the invasive species Cherry Laurel.

Figure 8.12: Cherry Laurel hedging at the north of this location

8.5.1 Habitat Map Area B: Measures 2.B and 2.D (Belarmine Park)

Figure 8.13: Belarmine habitats

Other artificial lakes and ponds (FL8)

West of the Belarmine culvert inlet, lies an acting water storage and flood relief pond with an island (Figure 8.14). In the area of this pond and along the bank are, both mature and immature Willow *Salix* spp., Willowherb, Broadleaved Dock, Creeping Buttercup; Bulrush *Typha latifolia*, Pendulous Sedge *Carex pendula*, Soft Rush *Juncus effusus*; Hard Rush *Juncus inflexus*; Common Vetch; Creeping Buttercup; Meadow Buttercup; Lesser Stitchwort; Dandelion; Broad-leaved Dock; Yorkshire Fog *Holcus lanatus*; Bent *Agrostis* sp., Yarrow *Achillea millefolium;* White Clover; Hogweed; Sweet Vernal-grass *Anthoxanthum odoratum*; Ragwort; Creeping Thistle; Red Clover and Common Daisy.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its uniqueness as a pond throughout the length of the scheme and the diverse flora associated with this water body.

Figure 8.14: The lake in Belarmine Park

Amenity grassland (improved) (GA2)

There are large areas of amenity grassland located within the vicinity of Defences 2 A-E. These areas are predominantly Perennial Rye-grass with some small sections of Ragwort, Dandelion and Daisy.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given its lack of floral diversity.

Marsh (GM1)

There is a small section of marshland within the Belarmine Park. This area exhibits little management, and this has allowed for stands of Yellow Iris, Bramble, Willowherb and some singular stands of Grey Willow *Salix cinerea* and Alder to develop (Figure 8.15).

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type.

Figure 8.15: The Marsh within Belarmine Park

Dry meadows and grassy verges (GS2)

There are patches of unmown grassy verges and small meadow patches in the south of Belarmine Park. These verges include Annual Meadow-grass *Poa annua*; Yorkshire Fog; Bent *Agrostis* sp.; Dandelion; Perennial Rye-grass; Cuckooflower; Dandelion; Red Clover; Ragwort; Lesser Stitchwort; Creeping Cinquefoil; Cock's-foot; Herb Robert; Meadow Buttercup and Creeping Buttercup.

In the south-east of this section, near to the bridge on Kilgobbin Road, is a small patch of grassy verge that contains the species: Red Valerian *Centranthus ruber*; Curled Dock *Rumex crispus*; Meadow Buttercup; Ivy; Creeping Buttercup; Nettle; Creeping Thistle; Tutsan *Hypericum androsaemum*; willowherb; Cow Parsley *Anthriscus sylvestris*; Dandelion; Mouse-ear *Cerastium fontanum* ; Yorkshire Fog; Hart's-tongue Fern *Asplenium scolopendrum*; Pendulous Sedge, and Cleavers.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type.

Wet grassland (GS4)

A section of wet grassland is present in the centre of the Belarmine Park, in a clearing of the Wet willow-alder-ash woodland and grading from the Marsh. Within this wet grassland are varied management sections. While there were sections of lower growth height that contained lots of Cuckooflower, along with Creeping Buttercup; Daisy; Dandelion; Chickweed *Stellaria media*; Soft Rush *Juncus effusus* and willowherb (Figure 8.16) there were additional sections in this area that had undergone some mowing, while still retaining the soft and waterlogged ground (Figure 8.16).

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type.

Figure 8.16: The unmanaged sections of wet grassland within Belarmine Park

Figure 8.17: The mown and heavily managed sections of wet grassland

(Mixed) broadleaved woodland (WD1)

There is a small stretch of Mixed Broadleaved woodland in the east of Belarmine Park, which consists of two interlocking treelines. These treelines contain Beech *Fagus sylvatica* and Ash *Fraxinus excelsior* with a minimal ground layer of Perennial Rye-grass and some Ground Ivy *Glechoma hederacea*.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its contribution to the pocket woodland cover of the area, allowing for a diversity of tree species within the vicinity, albeit containing a non-native species.

Scattered trees and parkland (WD5)

In the west of Belarmine Park is a small section of scattered trees in an amenity grass area. These trees consisted of Pedunculate Oak *Quercus robur*.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its structural complexity it provides within the site.

Treelines (WL2)

In and the west and east of this section, are rows of trees bordering the roadways or the grassland areas, which contain the species Ash, Hawthorn *Crataegus monogyna*, Beech, Sycamore, Elder *Sambucus nigra* and Holly with a low cover of Bramble.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its structural complexity it provides within the site, albeit containing some non-native species.

Wet willow-alder-ash woodland (WN6)

Throughout Belarmine Park is a woodland (Figure 8.18) that consists of high content of Ash and White Willow, while also containing other tree species Elder *Sambucus nigra*, Sycamore, Dogwood *Cornus sanguinea*, Silver Birch, Hazel *Corylus avellana* and Beech. The understory of this woodland consisted of a variation of Bramble; Cleavers; Cow Parsley; Creeping Buttercup; Ivy; Gorse *Ulex europaeus*; Ribwort Plantain *Plantago lanceolata*; Nettle; Hogweed; Bush Vetch *Vicia sepium*; Annual Meadow-grass; Lords-and-ladies; Male Fern *Dryopteris filix-mas*; Tutsan; Harts-tongue Fern; Pendulous Sedge; Hedge Bindweed *Calystegia sepium*; Field Horsetail *Equisetum arvense*; Greater Stitchwort *Stellaria holostea*; Brooklime *Veronica beccabunga*, Lesser Celandine *Ficaria verna*; Herb Robert; Nipplewort *Lapsana communis*, Gorse, and Ground Ivy.

The Carrickmines Stream ran directly through this woodland (Figure 8.19), whilst there were sections of the woodland that were off from the main water body, but still had pools of standing water present (Figure 8.20).

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its contribution to the pocket woodland cover of the area, allowing for a diversity of tree species within the vicinity.

Figure 8.18: The northern boundary of the Belarmine Park woodland

Figure 8.19: The centre of the Belarmine Park woodland, with the Carrickmines Stream running through it

Figure 8.20: Areas of Belarmine Park woodland that were not part of the main woodland body, but had standing pools of water

Scrub (WS1)

West of the Belarmine culvert, and north-east of the attenuation pond, is an area that widens into a dense scrub. This scrub section was largely a section of Bramble at the time of surveying. Additional species present include Beech; Ash; Broad-leaved Dock; Cow Parsley; Creeping Buttercup; Nettle; Sycamore; Ash; Crab Apple *Malus sylvestris* and Cleavers.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its diverse habitat within the site and its function enhancing connectivity of the site to the surrounding habitats.

Invasive Species

There is widespread Skunk Cabbage *Lysichiton americanus* and Three-cornered Garlic *Allium triquetrum* present along the stretch of the Carrickmines Stream.

8.5.2 Habitat Map Area C: Measures 2.E and 2.G (Kilgobbin Road)

Figure 8.21: Kilgobbin Road habitats

Stone walls and other stonework (BL1)

There is a stone wall that lines either side of Kilgobbin Road this wall was species poor, including Ivy-leaved Toadflax *Cymbalaria muralis*; Ivy; Herb Robert; Stonecrop *Sedum* sp and Dandelion.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given its low cover and limited spread of flora.

Buildings and artificial surfaces (BL3)

There are houses, roads and driveways located within the area of this section of the Scheme. These areas do not have any species associated with them.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given its absence of vegetative communities.

Improved agricultural grassland (GA1)

There is a field to the west of Kilgobbin Road, that at the time of surveying had a horse present in it. Due to the grazing of the horse (Figure 8.22), the field was not entered, however, from the roadside it was apparent that the grassland was species-poor, likely due to over-grazing.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given its limited diversity and cover of floral species.

Figure 8.22: The grazed field located west of Kilgobbin Road

Amenity grassland (improved) (GA2)

Areas of amenity grass within this section of the Scheme include the gardens of local residents that were not surveyed due to their maintenance and low ecological value.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given lack of floral diversity.

Dry meadows and grassy verges (GS2)

There are two large field areas that are located within this section of the Scheme, which had previously been utilised as agricultural land. At the time of the survey, these areas have been allowed to diversify and develop into meadow areas with species including Cow Parsley; Meadow Buttercup; Cock's-foot; Yorkshire Fog; Cuckooflower; Cleavers; Nettle and have begun to be encroached by Bramble, in particular along the edges of the field boundary.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type within this section of the scheme.

Scattered trees and parkland (WD5)

In the east of this section of the Scheme is a housing estate that has a planted woodland present (Figure 8.23). Trees in this area include Sycamore; Ash; Horse Chestnut and Scots Pine. The ground flora in this area is amenity grassland that is tightly mown and managed. In the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance**, given its quality as a pocket woodland within an urban setting, albeit containing some non-native species.

Figure 8.23:Section of the planted woodland in the housing area east of Kilgobbin Road

Hedgerows (WL1)

There is one hedgerow within this section of the scheme that is located within the centre of the grazed field. As with the rest of this field, the area was not surveyed due to the presence of the horse, however, from a distance it was apparent that the hedge was heavily fragmented. Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **low local ecological importance** given the heavy fragmentation and low quality of this habitat, but still adding habitat complexity to the section.

Treelines (WL2)

There are treelines located throughout this section of the Scheme, with one treeline consisting of Horse Chestnut; Bramble; Ivy, Sycamore and Hawthorn with Nettles and Creeping Buttercup present at its base. The treelines that are present within the rest of this section include Ash; Sycamore, and Beech.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its structural complexity it provides within the site, albeit containing some non-native species.

8.5.3 Habitat Map Area D: Measure 3.A (Glenamuck Road)

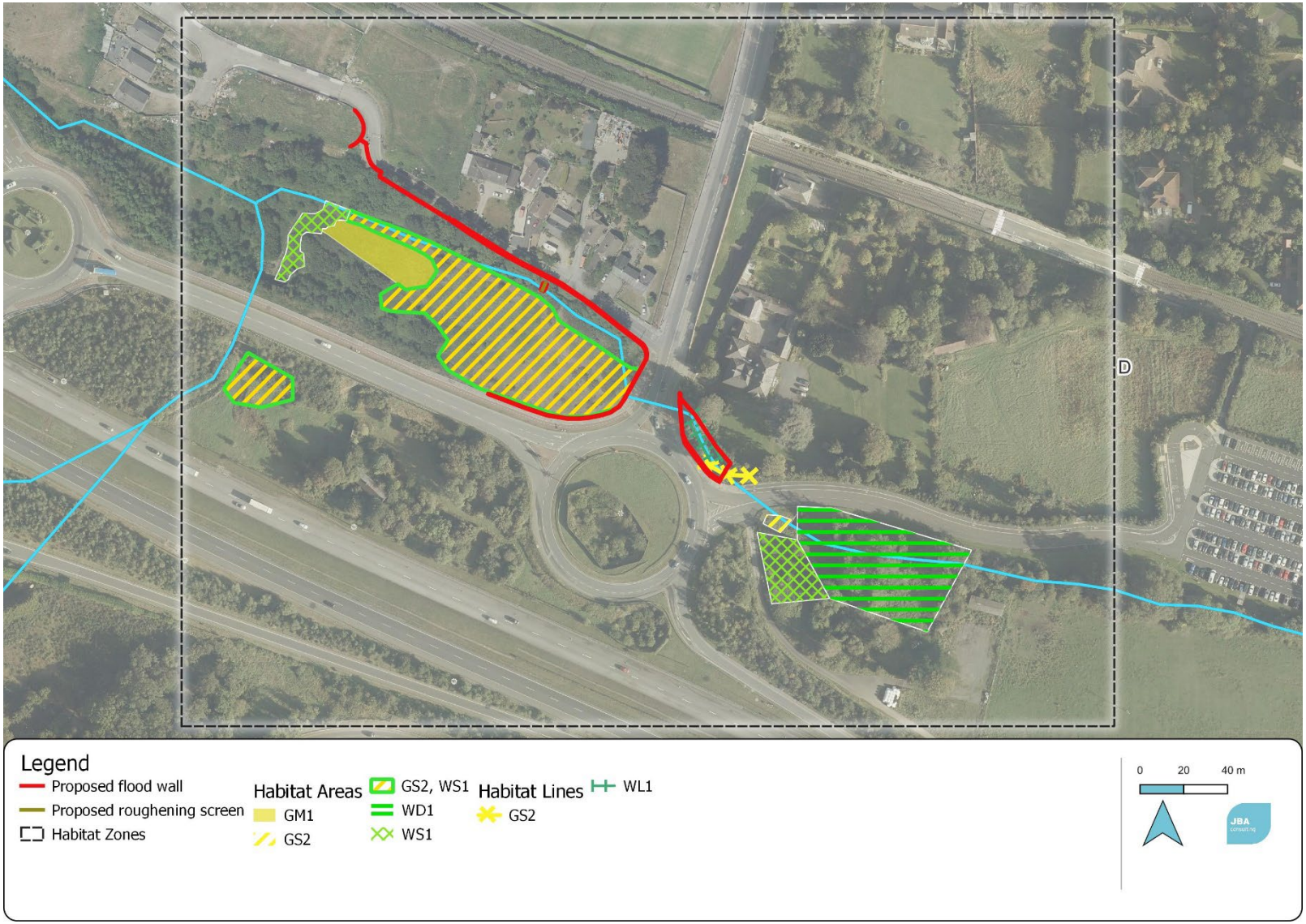


Figure 8-23: Glenamuck Road habitats

Recolonising Bare Ground (ED3)

There is a narrow, linear section of recolonising bare ground in the north-east of the roundabout section. This linear feature includes Field Mustard *Brassica rapa*; Ragwort; Field Speedwell *Veronica persica*; Wavy Bittercress *Cardamine impatiens*; American Willowherb *Epilobium Ciliatum*; Groundsel *Senecio vulgaris*; Alder; Ivy; Nettle and Bilbao Fleabane *Conyza floribunda*. This habitat was less than 0.5m in width so not mapped, due to its small scale.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **low local ecological importance** given its low cover of locally distinct flora.

Marsh (GM1)

There is a section of marsh located in the patch east of the roundabout. This marshland contains Green Alkanet, Nettle, Pendulous Sedge; Cleavers; Water Figwort *Scrophularia nodosa*; Cow Parsley, Great Willowherb *Epilobium hirsutum*; Hogweed, Curled Dock; Bramble and Marsh Marigold *Caltha palustris*.

A patch of marsh also exists north-west of the roundabout section. This marsh area also contains Cleavers; Hogweed; Bramble; Great Willowherb; Pendulous Sedge, Nettle; while it contained the additional species Yellow Iris, Field Scabious *Knautia arvensis*, False Oat-grass; Meadowsweet *Filipendula ulmaria*; Meadow Buttercup; Greater Stitchwort; Red Clover; White Clover; Yarrow and Cock's-foot with occasional sapling Alder and Goat Willow, and the invasive non-native species Butterfly Bush *Buddleja davidii*.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type.

Dry meadows and grassy verges (GS2)

A small section of meadow is located to the east of the roundabout which contains Cow parsley; Dandelion; Bramble; Common Vetch; Meadow Buttercup; Bush Vetch; Cleavers; Downy Oat-grass *Avenula pubescens*; Hedge Bindweed; Cock's Foot; Creeping Buttercup; Creeping Thistle; Yorkshire Fog; Ragwort; Curled Dock; Broad-leaved Dock; Meadow Foxtail *Alopecurus geniculatus*; Hogweed; English Cinquefoil *Potentilla anglica*; Horsetail; Dandelion; Ragwort; Rough Hawk's-beard *Crepis biennis;* Red Fescue; Butterfly Bush; Yorkshire Fog; Wood Avens *Geum urbanum*; Ribwort Plantain; Spear Thistle *Cirsium vulgare*; Fleabane spp.; Herb Robert; Yarrow; Cock's-foot; Smooth Sow-thistle and American Willowherb.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present.

(Mixed) broadleaved woodland (WD1)

A stretch of woodland is located east of his roundabout section. This woodland contains Sycamore; Ash; Hawthorn; Cypress *Cupressus* sp; Nettle; Alexanders *Smyrnium olusatrum*; Bramble; Ivy; Hogweed; Cleavers; Lords-and-ladies; Pendulous Sedge; Soft Shield-fern *Polystichum setiferum*; Harts-tongue Fern; Giant Knotweed *Reynoutria sachalinensis*; Wych Elm *Ulmus glabra*; Winter Heliotrope *Petasites pyrenaicus*; Palm Tree, Holly; Irish Yew, Cherry Laurel and Beech.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **low local ecological importance** given its function as a connective habitat but featuring a number of invasive non-native species.

Treelines (WL1)

There are two small treelines located north of the roundabout. These treelines contain a mixture of tree species Alder; Ash; Wych Elm; Sycamore and Beech, with an understory of Bramble; Alexanders, Nettle; Water Figwort and Pendulous Sedge.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type, albeit containing some non-native species.

Scrub (WS1)

A patch of scrub exists to the east of the roundabout, adjacent to the local woodland. This scrub consists mainly of Bramble, while also containing occasional Cow Parsley; Tutsan; Hawthorn; Sycamore; Alder; Elder, Butterfly Bush; Pendulous Sedge; Dogwood and Rowan *Sorbus aucuparia*.

An additional patch of scrub is located in the west of this section, containing the same species as in the east.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral diversity present and locally distinct habitat type and its importance as connective habitat.

Scrub / Dry meadows and grassy verges (WS1 / GS2)

There is one small section of meadow grassland, east of the roundabout, that is transitioning into a patch of scrub. The species in this area include False Oat-grass, a dense growth of Bramble, Hogweed, Meadow Buttercup, ferns, Great Wood-rush *Luzula sylvatica*, Ivy, Ribwort Plantain, Hedge Bindweed *Calystegia* spp., Fairy Flax *Linum catharticum*, Tufted Vetch *Vicia cracca*, Hawthorn, Creeping Thistle, Meadow Foxtail and Creeping Cinquefoil.

In the western part of this section, is a larger patch of meadow grassland / scrub. This western section also contains Bramble; Hogweed; Hawthorn; False Oat-grass; Meadow Buttercup; Creeping Cinquefoil; Creeping Thistle; Ribwort Plantain and Ivy.

In the east of this area of scrub/grassland, were the invasive non-native species Japanese Knotweed *Reynoutria japonica*, Winter Heliotrope and Giant Knotweed *Heracleum mantegazzianum*.

This western section also included additional species Yorkshire Fog; Meadowsweet; Cock's-foot; Common Vetch; Bush Vetch; Gorse; Ash; Nettle; Herb Robert; Silverweed; Great Willowherb; Sweet Vernal-grass; Pedunculate Oak; Ragwort; Alder; Smooth Sow-thistle; Smooth Meadow-grass *Poa pratensis* sens lat; Curled Dock; Dandelion; Cleavers; Perennial Rye-grass; Soft Rush; Hedge Woundwort; Common Couch *Elymus repens*; Perforate St John's Wort *Hypericum perforatum*; Pendulous Sedge; Colt's-foot *Tussilago farfara*; Smooth Hawkbit; Elm; Italian Alder *Alnus cordata*; Cow Parsley; Cluster Dock; Soft Rush; Sycamore; Horsetail; Meadow Vetchling *Lathyrus pratensis*; Black Medick; Common Bent *Agrostis capillaris*; Creeping Bent *Agrostis stolonifera* and Oxeye Daisy.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its high floral diversity present, although its overall importance is limited by the presence of invasive non-native species in part of the habitat.

8.5.4 Habitat Map Area E: Measures 4.A, 4.B, 4.C and 5.D (Bride's Glen River and Bray Road)

Habitats for the western section are mapped in Figure 8.24 overleaf. Given the widespread nature of measures 4 and 5, these areas are addressed east and west of the pitch and putt.

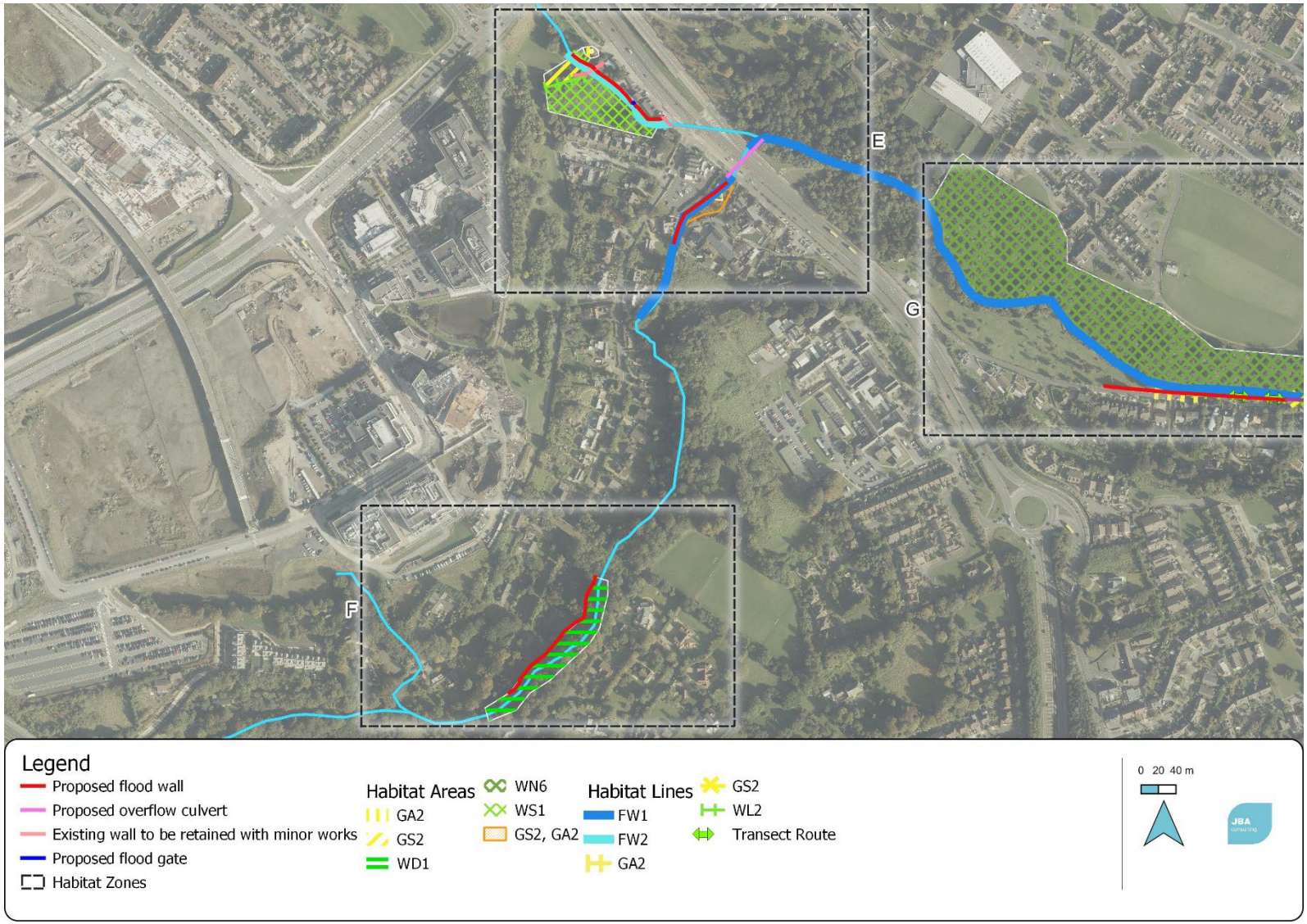


Figure 8.24: Brides Glen River and Bray Road habitats

Eroding/upland rivers (FW1)

Throughout this section of the scheme is a continuation of the river. Where it flows under the railway line, there is no access to north between houses and railway line. In this area, the watercourse is approximately 5.5 m wide, containing boulders cobbles, gravel. At the time of the survey, it was approximately 0.5m deep and fast flowing. The channel banks are vegetated with Bramble, Alexanders, Hart's Tongue Fern, Pendulous Sedge and Reed Canary-grass *Phalaris arundinacea.* The banks also support the non-native species Winter Heliotrope and Butterfly Bush.

Despite the presence of non-native species, this habitat is considered an important corridor for wildlife and is considered to be of **regional importance.**

Figure 8.25: The lower section of the Shanganagh River (FW1) is confined by the walls on each bank.

Mosaic: Eroding/upland rivers / Depositing/lowland rivers (FW1 / FW2)

There is a section where the river transitions between and eroding, and a depositing river. The river varies in depth from 10cm to 50cm deep, and is fast flowing, having a cobble base with sections of a sandy gravel substrate and stone walled edges. The banks of the river include Pendulous Sedge, Bramble, Ferns, Alder and Ash Saplings.

This habitat is an important corridor for wildlife and is considered to be of **regional importance.**

Dry meadows and grassy verges (GS2)

There are sections of meadow located throughout the northern parts of this section of the site which include unmown grassy areas within the local parkland and in the vicinity of some local businesses. These areas include Dandelion, White Clover, Red Clover, Hogweed, Creeping Buttercup, Ragwort, Common Bird's-foot-trefoil, Cuckooflower, Ribwort Plantain, Common Bent, Mouse-ear, Common Sorrel *Rumex acetosa* and Meadow Buttercup.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local importance** given its moderate floral diversity present

Dry meadows and grassy verges / Amenity grassland (improved (GS2 / GA2)

This habitat comprises Perennial Rye-grass, Dandelion, White Clover, Creeping Buttercup, Ribwort Plantain, Colts-foot, Cow Parsley, Hogweed, Broad-leaved Dock, Winter Heliotrope, Bush Vetch, Curled Dock, Rough Hawk's-beard, Common Vetch, Cleavers, False Oat-grass, Herb Robert, Common Bent, Nettle, Brome *Bromus sp*. and Three corner garlic. Common Carder Bee was also recorded in this area.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **low local ecological importance** given its coverage of invasive non-native species.

(Mixed) broadleaved woodland (WD1)

There are stretches of mixed broadleaved woodland along the banks of the river in the west of this section, one at the back of the local Pitch and Putt, which includes Alder, Sycamore and Ash, with an understory of Bramble and the invasive species Butterfly Bush and Fuchsia *Fuchsia magellanica*.

In the south of this section is another stretch of woodland opposite of the River, which contains the species Elm, Beech, Willow, Ash, Alder, Pine, Holly and an understory of Bramble and Fern (Soft Shield-fern *Polystichum setiferum* and Male-fern *Dryopteris filix-mas*, while continuing further south there are areas of Elder and Elm, with an understory of Nettle, Ivy, Lords-and-Ladies, Ramsons *Allium ursinum*, Sweet Violet *Viola odorata*, Speedwell *Veronica* spp., Lesser Celandine and Primrose *Primula vulgaris*.

There is a small section of broadleaved woodland in the west of the site adjacent to the river, which comprises Willow, Alder, Ash and a ground flora of Ivy, Pendulous Sedge, Cow Parsley and Lesser Celandine.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its role as an important riparian corridor.

Figure 8.26: Mixed Broadleaved woodland (WD1) and Treelines (WL2) found along the Eroding River (FW1) running behind the houses next to Cherrywood Road.

Scrub (WS1)

There is an area of scrub which comprises: Elder; Bramble; Rowan, Wych Elm; Dog rose; Willow; and Hawthorn. This area has a ground flora of Cow Parlsey, Cleavers, Colt's-foot, Spurge, Broad-leaved Dock, Common Vetch, Germander speedwell, Teasel *Dipsacus fullonum*, Water Figwort, Pendulous Sedge and Hedge Bindweed. There are a number of non-native species including *Leillandii, Buddleja*, an ornamental Holly and Giant Hogweed.

Giant Hogweed was recorded within the scrubland located behind the local businesses.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its large floral diversity present, despite the presence of INNS.

8.5.5 Habitat Map Area F: Measures 5.A and 5.C (Commons Road, Brookdene and Bayview)

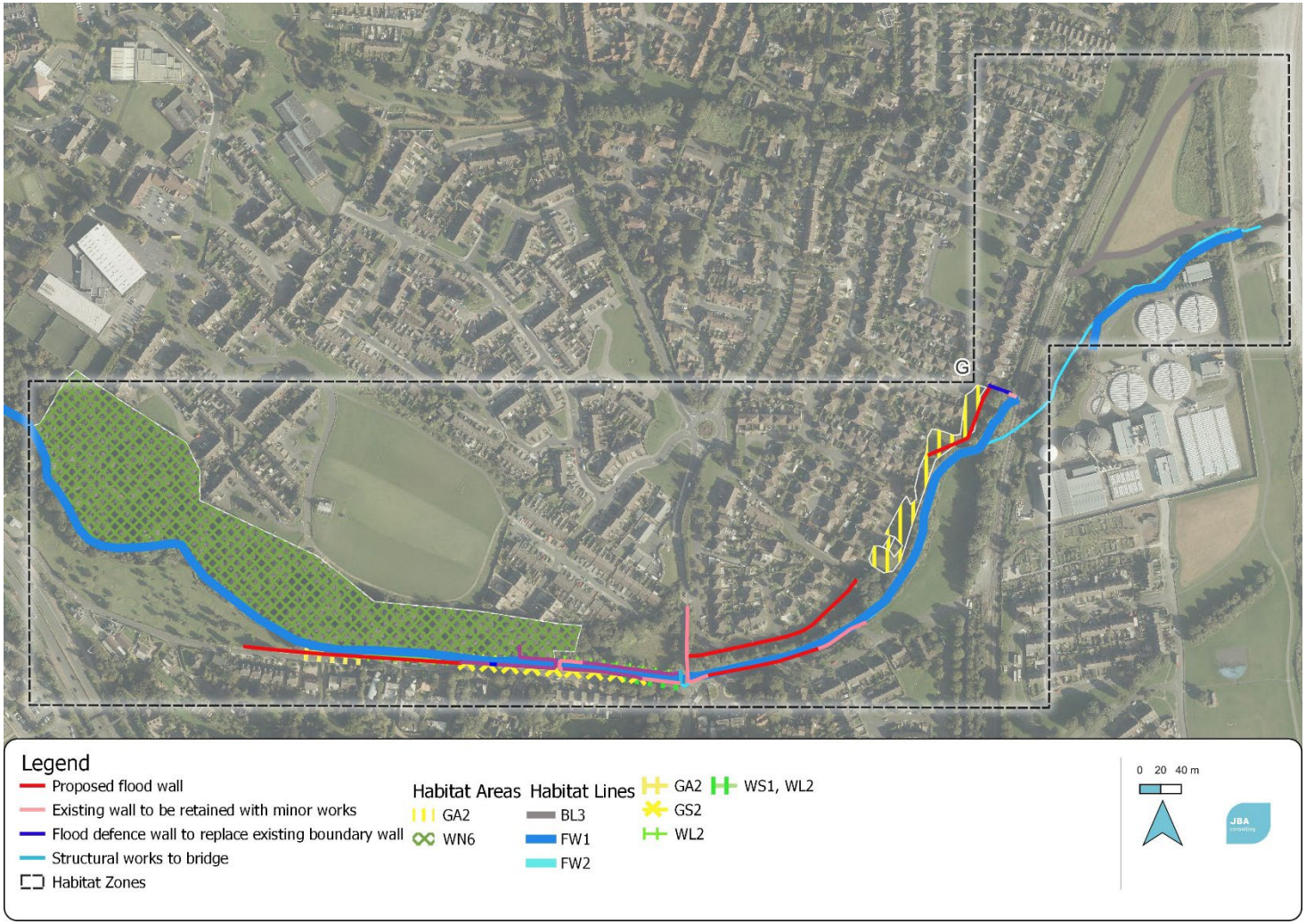


Figure 8.27: Commons Road, Brookdene and Bayview habitats

Stone walls and other stonework (BL1)

There are stone walls in the east and the west of this section, these walls have no notable ecological characteristics, and no species present. The stone wall along the back of the houses had Bramble, Ivy and Willowherb.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given its limited floral diversity present.

Amenity grassland (Improved) – GA2

A small stretch of mown amenity grassland occurs along the footpath of Commons Road. This grassland patch contains Ragwort, Daisy, Perennial Rye-grass, Dandelion, Meadow Buttercup, Yarrow, Red Clover, Meadow Vetchling and Ribwort Plantain. Giant Hogweed was also present.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **less than local ecological importance** given its limited floral diversity present.

Dry meadows and grassy verges – GS2

Linear sections of grassy verge occur near to the banks of the River Shanganagh along Commons Road. These verges include Curled Dock, Nettle, Cleavers, Dandelion, Smooth Sow-thistle, Creeping Buttercup, Cut-leaved Crane's-bill *Geranium dissectum*, Wood Avens *Geum urbanum*, White Clover, Hogweed, Common Bent, Daisy, Tufted Hair-grass *Deschampsia cespitosa*, Herb Robert, Ribwort Plantain, False Oat-grass, Roughs Hawk's-beard, Black Medick, Nightshade, Bramble, Cow Parsley, French Crane's-bill *Geranium endressii*, Field bindweed, Ash, Cock's-foot, Lesser Trefoil *Trifolium dubium*, Perennial Rye-grass, Hedgerow Crane's-bill *Geranium pyrenaicum*, Field forget-me-not *Myosotis arvensis*, Field Marigold *Calendula arvensis*, Common Vetch, Field Mustard and the non-native species Montbretia *Crocosmia x crocosmiiflora,* Winter Heliotrope, Giant Hogweed, *Cotoneaster sp.* and Sycamore.

There is a large meadow section in the east of this stretch of the project (Figure 8.28), near to the coastline. This meadow is divided by a footpath and contains Creeping Buttercup; Meadow Buttercup; Ribwort Plantain; Cuckooflower; Brome; Meadow-grass; Dandelion; Cock's-foot; Red Clover; Curled Dock; Hedge Mustard; Hogweed; Cow Parsley, Alexanders; Daisy; Red Fescue; Lesser Trefoil; Ragwort, Common Couch; Yorkshire Fog, Meadow Foxtail; Sweet Vernal-grass; Cleavers; Lesser Celandine; Rough Hawk's-beard, and False Oat-grass.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its wide floral diversity present.

Figure 8.28: Meadow patch in the east, near the coastline

Dry meadows and grassy verges / Scrub – GS2/WS1

The meadow near to the coastline begins to grade into an area of showing characteristics of scrub, gradually transitioning into a section more dominated by Common Reed *Phragmites australis* while also containing Horsetail; False Oat-grass; Creeping Thistle; Bramble; Bush Vetch; willowherb; Hogweed; Brome.; Ribwort Plantain; Alexanders and a single standing Hawthorn (Figure 8.29).

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its floral characteristics and uniqueness of a habitat present within the site.

Figure 8.29: The transitional period between the meadow and the coastline in the far east of the scheme

(Mixed) broadleaved woodland - WD1

There are stretches of broadleaved woodland located throughout the Hacket Island housing estate. These include a main woodland stretch along the river bank (Figure 8.30), and a series of isolated woodland pockets among the housing estate's amenity grass areas (Figure 8.31).

The woodland stretches include a ground layer of Fumitory; Alexanders; Broad-leaved Dock; Cow Parsley; Dandelion; Creeping Buttercup; Nettle; Ivy; Hedge Bindweed; Bramble; Cleavers; dock; Creeping Thistle; Daisy; Shepherd's Purse; Germander Speedwell *Veronica chamaedrys*; Green Alkanet; Wood Speedwell *Veronica montana*, Spear Thistle; Herb Robert; Hogweed; Pendulous Sedge; Ribwort Plantain; Field Forget-me-not; Yarrow; Garlic Mustard; Wood Sorrell; Nettle; Wood Dock *Rumex sanguineus*; Wood Avens; Meadow Buttercup; Creeping Buttercup; Lords-and-ladies; willowherb; Cuckooflower; Ribwort Plantain; Cowslip *Primula veris*; and Cock's-foot.

The tree cover of this woodland stretch includes Sycamore; Alder; Pedunculate Oak; Ash; Crack Willow *Salix fragilis*; Turkey Oak *Quercus cerris*; Field Maple *Acer campestre*; Elm; Cherry; Crab Apple; Leaf Little Box Wood, Leylandi; Chestnut Saplings; Hawthorn, Cypress, White Willow, Japan Chestnut; Silver Birch; Linden; Privet; Sessile Oak, Cherry Laurel; Eucalyptus. This woodland stretch also contains some Three-cornered Garlic, Winter Heliotrope, Giant Hogweed; and Snowberry *Symphoricarpos albus*.

The pockets of woodland within these areas include Italian Alder; Yarrow; Beech; Wood Avens; Herb Robert; Nettle; Dandelion; Meadow Buttercup; Fringecups *Tellima grandiflora*; Common Vetch; Field Maple;

Cottonwood; Ivy; Nipplewort, Firethorn *Pyracantha coccinea*, Hedge Periwinkle *Vinca* sp., Common Vetch, Ragwort, Creeping Thistle, Bent, Nettle, Burdock *Arctium minus*, Cleavers, Dock, Creeping Buttercup, Hogweed; Spear Thistle; Bramble; Field Maple; and Elm.

Therefore, in the context of the site and the lands immediately adjacent, this habitat is considered to be of **high local ecological importance** given its dense characteristics as a dense riparian corridor, and the woodland pockets which contribute to the ecological complexity within the scheme, although the presence of a number of non-natives and invasive non-natives reduces its value.

Figure 8.30: The woodland running along the River Shanganagh in the east of the scheme

Figure 8.31: The woodland pockets within amenity grasses in the east of the scheme

(Mixed) broadleaved woodland / Scrub – WD1 / WS1

There is a patch in the far east of the site, near to the grassy meadows and the coastline, that contains a mixture of mature trees and a scrub layer. This area contains Holly, Sycamore, Elm, Hart's-tongue Fern; Bramble; Cow Parsley; Soft Shield-fern *Polystichum setiferum*; Buckler Fern *Dryopteris* sp.; Hedge Bindweed; Nettle; Cleavers; Alder; Butterly Bush; Bluebell *Hyacinthoides non-scripta*; Green Alkanet; and Bush Vetch. There was also widespread Three-cornered Garlic and Giant Hogweed in this area.

This habitat is considered to be of **low local ecological importance**, contributing to the wider network of woodland patches, but limited in value by the dominance of invasive non-native species.

Figure 8.32: Scrubby growth and woodland patch in the far-east of the site

Treeline – WL2

There is a small treeline at the entrance to the estate at Hacket Island. This treeline contained Elder; Beech; Bramble; Cleavers; Cherry Laurel; Creeping Buttercup; Dandelion; Nettle; Wild Cherry Sycamore; Hedge Bindweed; Broadleaf Dock, Alexanders, Daisy, and Herb Robert.

Additional treelines include those along the Shanganagh Stream parallel to Commons Road. These treelines contain Wavy Bitter-cress *Cardamine flexuosa*; Lesser Celandine; Bush Vetch; Red Clover; Wood Spurge *Euphorbia amygdaloides*; Daffodil *Narcissus pseudonarcissus*; Dog Rose *Rosa canina*; Willow; Alder; Pendulous Sedge; Butterfly Bush; Ivy; Tutsan, Water Figwort; Elder; Sycamore; Herb Robert; Birch; Horsetail; buttercup; Vetch *Vicia* sp.; White Willow and Gorse. These treelines also contained the garden escapee *Cyclamen* sp. and the invasive non-native Giant Hogweed. These treelines connect to the grassy verge located within this area.

These treeline habitats are considered to be of **low local ecological importance**, contributing to the wider network of woodland and connective habitat, but limited in value by the dominance of invasive non-native species.

Wet willow-alder-ash woodland – WN6

There is a section of the Loughlinstown Wood pNHA that is classified as a Wet willow-alder-ash woodland and runs along the Shanganagh River that is in close proximity to some of the works. This downstream section of the pNHA includes Ash; Willow; Alder; Sycamore; Tutsan; Nettle; Herb Robert; Ivy; Bramble; Creeping Buttercup; Pendulous Sedge; Common Vetch; Cow Parsley; Soft Shield-fern; Hart's-tongue Fern; Elder; and Hawthorn. This woodland also had widespread Giant Hogweed along the woodland both through the main body of the woods, and along the riverbank.

Despite the presence of widespread Giant Hogweed, this habitat is considered to be of **at least regional importance**, due to the value of wet woodland and its designation as a pNHA (the habitat would be considered of National Importance in the absence of Giant Hogweed).

8.5.6 Offshore Reefs

Reefs [1170] are a protected habitat and Qualifying Interest of the nearby Rockabill to Dalkey Island SAC (Table 4-2 below). A comprehensive survey of the reefs within the vicinity of Killiney Bay was completed by MERC consultants in 2022 (MERC, 2022) on behalf of DLRCC. These reefs included Littoral (intertidal) reef habitats and Sublittoral (Subtidal) reef habitats. These reefs are downstream of, but not within, the works footprint.

Littoral reef habitats include all areas of geogenic rock (bedrock, boulders and cobbles) which occur in the intertidal zone (the area of the shore between high and low tides) as well as the marine communities, and their associated species, that colonise this area are adapted to withstand a range of physical processes, not least the diurnal flooding and ebbing tides.

The sublittoral reef habitat is generally divided into two categories, infralittoral and circalittoral. The infralittoral reef habitat is the area in the shallow subtidal zone and typically supports seaweed communities. As depth increases, and light levels drop further the circalittoral zone commences. This zone is characterised by animal dominated communities, as opposed to the algae dominated communities of the infralittoral zone.

Littoral and sublittoral reefs within Killiney Bay are mapped below in relation to the proposed site location. A sublittoral reef is present approximately 300m off the coast of the proposed sports facility. Littoral (intertidal) reef communities are also present approximately 900m north-east of the site (Figure 3-10). The sublittoral reef is mainly made up of two biotopes, 1) Sediment-affected or disturbed kelp and seaweed communities and 2) Echinoderms and crustose communities (MERC Consultants, 2022).

These reef habitats are considered to be of **national importance** due to their inclusion in the Natura 2000 network and their relative scarcity.

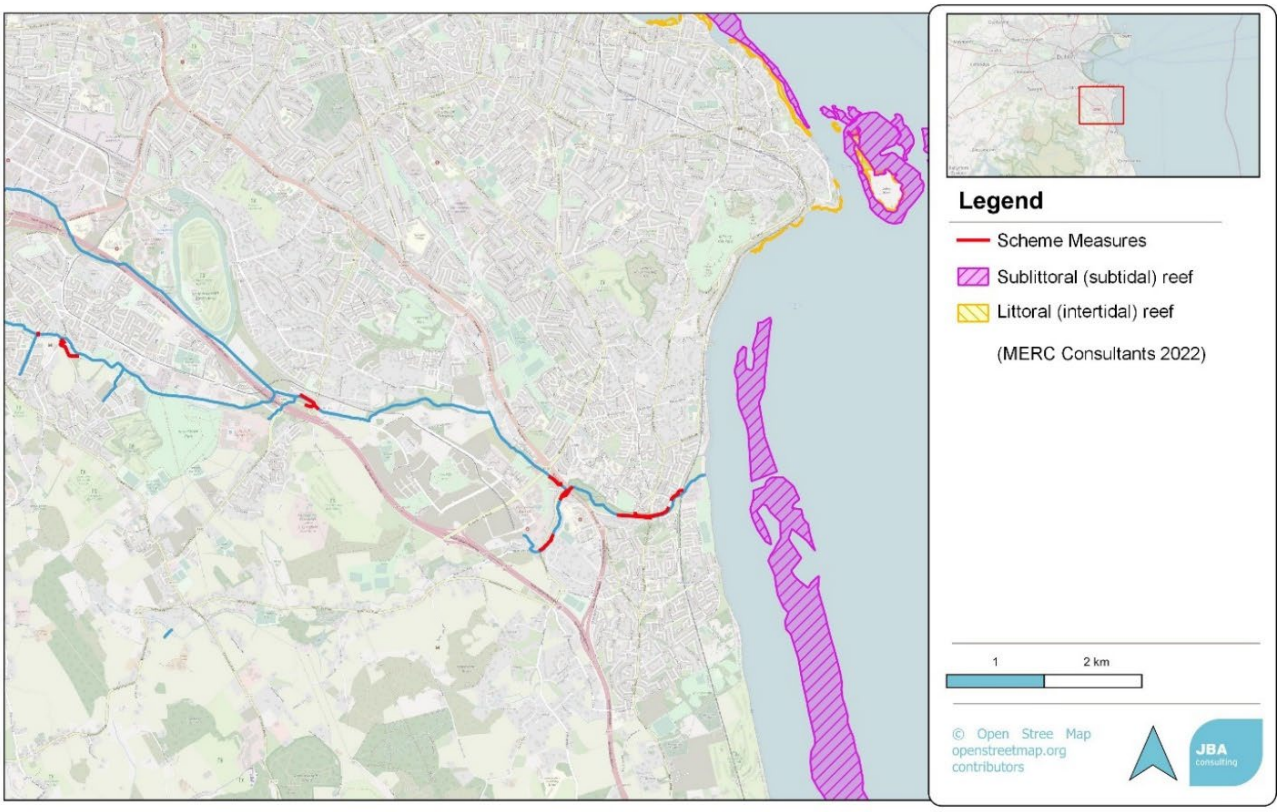


Figure 8.33: Offshore reefs

8.6 Species

8.6.1 Protected Flora

There was no protected flora recorded within the areas of the proposed scheme.

8.6.2 Protected Fauna

Mammals – Terrestrial

A desktop search of the NBDC data indicates that the following protected mammal species have been recorded within 5km of the site within the last 10 years; Eurasian Badger *Meles meles*, Eurasian Pygmy Shrew *Sorex minutus*, Eurasian Red Squirrel *Sciurus vulgaris*, European Otter *Lutra lutra*, Pine Marten *Martes martes*, and West European Hedgehog *Erinaceus europaeus*. All these species are protected under the Wildlife Act (1976, as amended), while European Otter is additionally protected under Annex II and IV of the EU Habitats Directive, and Pine marten is also protected under Annex V of the EU Habitats Directive.

Otters field signs including spraints, latrines, pawprints and slides have been frequently recorded at the downstream extent of the proposed works. These are mapped in Figure 8-33 below. Historically, a potential hold has also been recorded in this area (Dún Laoghaire-Rathdown Otter survey, 2020). However, during the site visits, this potential holt entrance became increasingly covered by dense vegetation with no signs of activity around it. It is therefore considered to be inactive/ not an Otter resting site.

Badger have also been historically noted in the catchment, but there are no Badger setts within the vicinity of any of the works sites and no field signs for Badger have been recorded in any of the surveys in the last year.

Given the utilisation of both the land and the rivers through the expanse of the scheme, the spread of the scheme and its surrounding environment, it is considered to be of **High Local ecological importance** for Badger, Hedgehog, Pine Marten, Pygmy Shrew and Red Squirrel and of **Regional importance** for Otter.

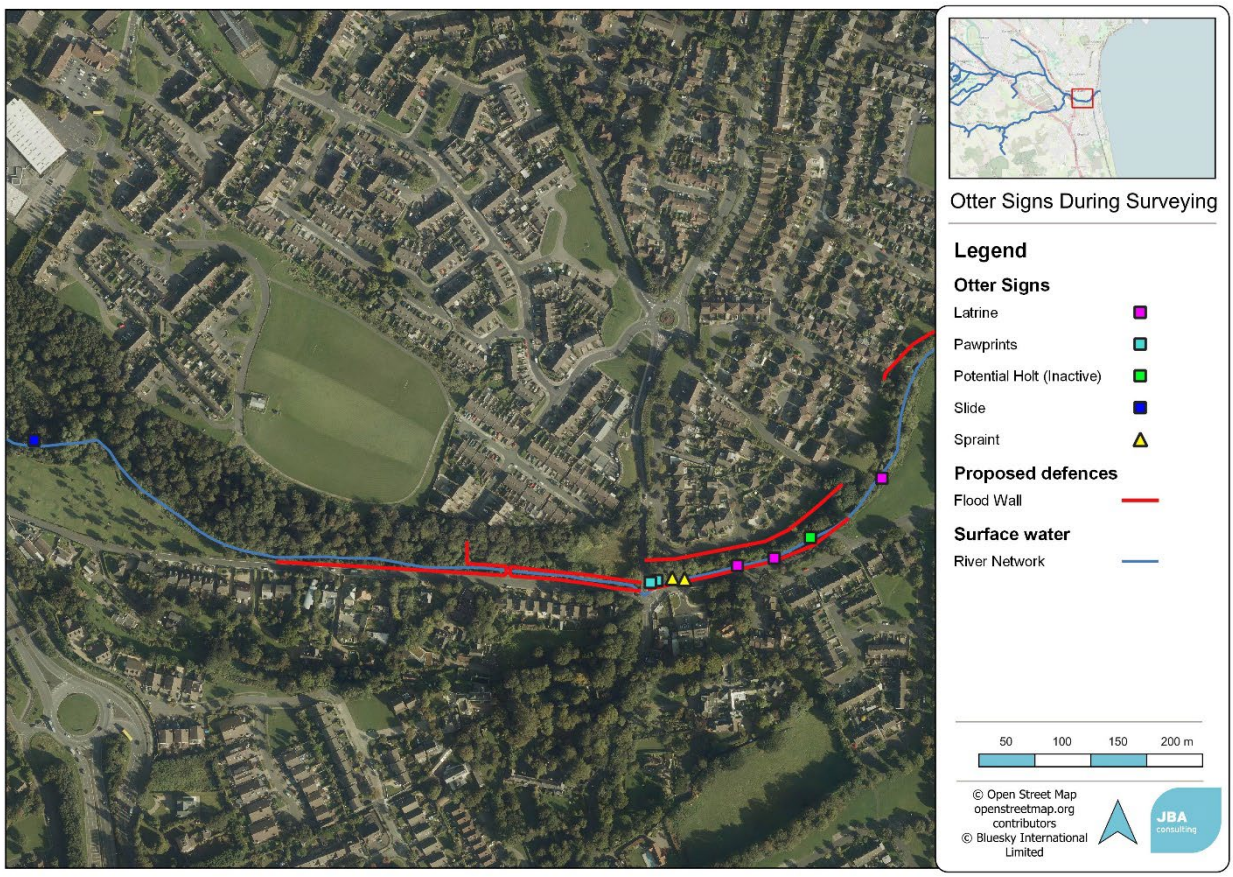


Figure 8.34: Otter signs recorded during survey work

Mammals – Marine

A number of marine mammals were present in the NBDC records within the 5km buffer. Bottle-nosed Dolphin *Tursiops truncates*, Common Porpoise *Phocoena Phocoena*, Common Seal *Phoca vitulina*, and Grey Seal *Halichoerus grypus* were present. These species are protected under the Wildlife Acts and under Annex IV and V of the EU habitats Directive.

While these species are recorded within the NBDC radius, there are no marine habitats on site, and the area of the scheme is considered to be of **Less than Local ecological importance** for Marine Mammals

Bats

The NBDC records indicate the presence of Daubenton's Bat *Myotis daubentonii*, Lesser Noctule *Nyctalus leisleri*, Natterer's Bat *Myotis nattereri*, Common Pipistrelle *Pipistrellus pipistrellus sensu lato*, and Soprano Pipistrelle *Pipistrellus pygmaeus* within the 5km radius

All Irish bats species are protected under the Wildlife Acts 1976-2021 and Wildlife (Amendment) Act 2023. Also, the EU Habitats Directive, seeks to protect rare species including bats and their habitats and requires that appropriate monitoring of populations be undertaken. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats.

The key locations of importance that bats may use for commuting and foraging along the study area include watercourses, treelines, hedgerows, areas of woodland, scrub and scattered trees.

Older, mature trees in the area also offer potential roosting opportunities for bats. Old stone bridges can offer roosting opportunities for bat species, however, following the emergence surveys of the site, it was deemed that the bats do not use the bridges for roosting.

Daytime Surveys – Bat Roost Potential

Bridges and older, mature trees can offer roosting opportunities for bat species. Inspection of the bridges along the Carrickmines Stream and River Shanganagh took place during the ecology surveys. No field signs of bats (staining etc.,) were recorded, and only one bridge, the bridge along the R189 by Commons Road, was recorded as having low bat roost potential. This was due to a small crack located on the bridge's underside.

The River Shanganagh provides an important linear waterway for commuting and foraging bats in the local area of Carrickmines. This is especially important in an urban setting, as often such linear waterways are the remaining dark conduit in an urban area where there is a large degree of street lighting. None of the trees within the woodland habitats were recorded as having bat roost potential during the walkover surveys.

Passive Static Detection

The deployment of a static detector occurred at one location within the riparian corridor within the east of the scheme (Figure 8.35). This static was deployed from the 5th of June to the 12th of June 2024, however, it only recorded data for four of these eight nights due to a mechanical fault. Regardless of this fault, there was still an overwhelmingly large count of bat passes within this location with a total of six confirmed species of bat were recorded with a potential seventh given the possibility of both Brandt and Whiskered bat. Three/four of the species of bat recorded are light sensitive bat species (Daubenton's bat, Brown Long-eared Bat and Brandt/Whiskered bat *Myotis brandti/mystacinus*).

The static surveillance results indicate that Common Pipistrelle is the most user of the habitats, followed by Brandt/Whiskered Bat, which also had a noticeably high passage frequency. The frequency of bat passages is recorded in Table 8.9.

The proposed works footprint is considered to be of **high local importance** to foraging and commuting bats due to the value of the riparian corridor in an otherwise highly lit urban landscape.

Figure 8.35: Bat transect route, emergence location and location of bat static deployment near to Shanganagh Bridge

Table 8.9: Bat Static Passes along the riparian corridor in the east of the scheme

Species	*05-June-2024*	*06-June-2024*	*07-June-2024*	*08-June-2024*	Total
Leisler's Bat	13	27	53	14	107
Common Pipistrelle	792	365	2244	1033	4434
Soprano Pipistrelle	169	23	276	177	645
Whiskered/Brandt's Bat	81	265	828	324	1498
Daubenton's Bat	2	11	103	38	154
Brown Long-eared Bat	0	1	0	0	1
Total	**1057**	**692**	**3504**	**1586**	**6839**

Breeding and Wintering Birds

A full list of bird species, covered under national and/or international legislation, recorded in the NBDC record query is available in Appendix 8.3.

Eight Annex I species include: Arctic Tern *Sterna paradisaea* (Amber List, Breeding), Common Kingfisher *Alcedo atthis* (Amber List, Breeding), Common Tern *Sterna Hirundo* (Amber List, Breeding), Mediterranean Gull *Larus melanocephalus* (Amber List, Breeding), Peregrine Falcon *Falco peregrinus* (Amber List, Breeding), Red-throated Diver *Gavia stellata* (Amber List, Breeding and Wintering), Sandwich Tern *Sterna sandvicensis* (Amber List, Breeding), and Snowy Owl *Bubo scandiaca* (Amber List, Wintering).

Fourteen Annex II and III species include: Common Coot *Fulica atra* (Amber List, Breeding and Wintering), Common Pheasant *Phasianus colchicus*, Common Pochard *Aythya farina* (Red List, Wintering) Common Scoter *Melanitta nigra* (Red List, Wintering), Common Snipe *Gallinago gallinago* (Amber List, Breeding and Wintering), Common Wood Pigeon *Columba palumbus*, Eurasian Curlew *Numenius Arquata* (only under Annex II) (Amber List, Breeding and Wintering), Eurasian Teal *Anas crecca* (Amber List, Breeding and Wintering), Gadwall *Anas Strepera* (only under Annex II) (Amber List, Breeding and Wintering), Mallard *Anas platyrhynchos* (Amber List, Breeding and Wintering), Northern Lapwing *Vanellus vanellus* (only under Annex II) *(Amber List, Breeding and Wintering)*, Red Grouse *Lagopus lagopus* (Red List, Breeding) Rock Pigeon *Columba livia* (only under Annex II), and Tufted Duck *Aythya fuligula* (Amber List, Breeding and Wintering).

Additional listed species which are not covered granted additional protections under the Annexes of the Bird's Directive include Barn Owl *Tyto alba* (Amber List, Breeding), Black-headed Gull *Larus ridibundus* (Amber List, Breeding and Wintering), Common Redshank *Tringa tetanus* (Amber List, Wintering), Herring Gull *Larus argentatus* (Amber List, Breeding and Wintering), and Yellowhammer *Emberiza citronella* (Amber List, Breeding) were also identified in addition to these EU protected species.

Given there are both land and river habitats in the scheme area available for breeding birds (in particular, riparian birds), and the spread of the scheme and its surrounding environment, it is considered to be of **High Local ecological importance** for breeding birds. The lack of habitats within the scheme utilisable by wintering birds means the scheme area is considered to be of **Less than local ecological importance** for them.

Amphibians and Reptiles

Common Frog *Rana temporaria* was recorded within the drainage ditch/grassy verge located in the far west of the scheme (Figure 8.36), and this is mapped along with all other fauna points at the end of this section. Present within 5km of the site in the NBDC records are both Common Frog and Smooth Newt *Lissotriton vulgaris*. Both species are protected under the Wildlife Acts, and the Common Frog is additionally protected under Annex V of the EU Habitats Directive. The NBDC records also indicate the presence of Common Lizard *Zootoca Vivipara* within the 5km buffer.

The site contains a series of water bodies, and a pond feature which, and while not recorded within the surveys would provide suitable resources for local amphibians. Any habitats offering a mosaic of open, grassland and scrub within the scheme footprint may support Common Lizard. Therefore, in the context of the scheme and its surrounding environment, the area of the scheme is considered to be of **High local ecological importance** for both **Amphibians and Reptiles**.

Figure 8.36: Common Frog in the drainage ditch in the far west of the site

Terrestrial Invertebrates

There were no terrestrial invertebrates of note recorded within NBDC records withing a 5km radius. The area of the scheme contained no areas of high-resource availability for local terrestrial invertebrates. Therefore, the scheme and its surrounding environment are considered to be of **Less than local ecological importance** for terrestrial invertebrates.

Fish

A dedicated fish survey was conducted by Triturus Ecology within the Ballyogan Stream (also known as the Barnaculia Stream), Carrickmines Stream, Shanganagh River. Additionally, this fish survey highlights many key aspects of the river's structure and its provision of habitats for many fish species.

The Barnaculia Stream is a small, shallow only 0.1m – 0.3m deep. It is an upland stream and therefore high energy with a fast flow. It retains a semi-natural sinuous profile, with riffle, glide and pool sequences. The substrata of the stream comprised of occasional small boulders, cobble, bedded mixed gravels, sand and silt. The Barnaculia Stream had no recording of any protected species such as the European Eel or Lamprey species. The stream is considered to be too high energy for lamprey species. Although there is some habitat of moderate suitability for European Eel, significant downstream barriers prevent access to this stream residing in the upper reaches of the Carrickmines catchment. Three Spined Stickleback was recorded in the Barnaculia, the stream is too shallow and small to be suitable for Salmonid species such as Brown Trout or Sea Trout.

The Carrickmines stream was split into three different areas, containing sand and gravel beds, gravel bar deposits, boulder, cobble, riffle pool sequences, sand bars and some meanders. Lower down the stream there is a site adjacent to a bridge which has a heavily modified riverbed, consisting of cast concrete and strewn with building rubble and metal bars. The Carrickmines stream recorded both European eel and Lamprey in some of the site's samples. Only one European eel was recorded throughout the stream despite multiple areas of moderate to good habitat, this is likely due to the same downstream barriers as the Barnaculia stream. The stream had some moderate quality spawning habitat for Lamprey, with ammocoetes recorded in one of the sites; however, these habitats were impacted due to siltation and compaction creating anoxic silt, which limited the number of ammocoetes. Throughout the stream there are areas of moderate to good spawning, nursery and holding areas for Salmonids; however, due to high siltation these have all been impacted negatively resulting in low suitability for Salmonids. This is reflected in the low numbers and age structure in the Brown Trout found in stream.

The Shanganagh River was split into three different areas, all areas are of high energy and flow rates. One of the areas was predominantly composed of riffles and glides, with not many pools found throughout. The substrate of the river consisted of abundant small boulders in this section, with cobble and heavily bedded gravel also present. The other sections had regular riffle, glide and pool sequences, the substrate consisting of predominantly cobble with gravels, sand and boulders regularly throughout. Siltation was present throughout the stream but was only light compared to the other two surveyed. European Eel and Lamprey were recorded in this stream, high quality eel habitat is present but the number of Eel was limited to one, likely due to downstream barriers. Good lamprey nursery habitat is found within the stream indicated by recording of ammocoetes within the stream. This stream is also good spawning and nursery grounds for Salmonids, shown by the higher numbers and age variety of Brown Trout throughout the stream, one migratory Sea Trout was recorded in addition to the Brown Trout.

Of the above fish species, the European Eel is on the IUCN Red List as 'Critically Endangered' (Freyhof, J & Kottelat, M. 2010)[24] and the Lampreys are listed in Annex II (River Lamprey also listed in Annex V) (Nelson, B *et al*., 2019).

Although the suitability of the habitats on site to support different life stages of Lamprey, Salmonids and Eels are varied, the Shanganagh River in particular offers high quality habitats and the watercourses play an important role in the supporting the movement of migratory fish so the works footprint is considered to be of **Regional importance** for Lamprey and salmonids (Sea Trout and Brown Trout) and Eel. Although there are good quality habitats on site, the catchment is considered to be limited in its Eel populations due to the presence of instream barriers to movement. The site is therefore considered to of **high Local importance** to Eel.

8.6.3 Invasive Non-native Species

A full list of invasive non-native species occurring within the site is found within Table 8.10 overleaf. This table includes the species recorded, their level of impact, and whether they are listed on the third schedule of the EC (Birds and Natural Habitats) Regulations 2011 S.I. No. 477/2011.

A series of invasive non-native species were recorded throughout the scheme area, these are listed below in and shown in the figures below.

[24] Freyhof, J. & Kottelat, M. 2010. Anguilla anguilla (Europe assessment). The IUCN Red List of Threatened Species 2010, available https://www.iucnredlist.org/species/60344/12353683 [accessed 06th December 2023.

Table 8.10: INNS recorded within or immediately adjacent to study area

Invasive Non-Native Species	Impact	Regulation S.I. 477/2011
American Skunk Cabbage *Lysichiton americanys*	Medium Impact	Yes
Butterfly-bush *Buddleja davidii*	Medium Impact	No
Cherry Laurel *Prunus laurocerasus*	High Impact	No
Floating Pennywort *Hydrocotyl ranunculoides*	High Impact	Yes
Giant Hogweed *Heracleum mantegazzianum*	High Impact	Yes
Giant Knotweed *Fallopia sachalinensis*	High Impact	Yes
Himalayan Honeysuckle *Leycesteria formosa*	Medium Impact	No
Least Duckweed *Lemna minuta*	Medium Impact	No
Nuttal's Waterweed *Elodea nuttallii*	High Impact	No
Rhododendron *Rhododendron ponticum*	High Impact	Yes
Three-cornered Garlic *Allium triquetrum*	Medium Impact	Yes
Winter Heliotrope *Petasites pyrenaicus*	Low Impact	No
Japanese Knotweed *Fallopia japonica*	High Impact	Yes

Figure 8.37: INNS recorded in in the vicinity of Measures 1.A and 1.B

Figure 8.38: INNS recorded in in the vicinity of Measures 2.B, 2.D, 2.E and 2.G

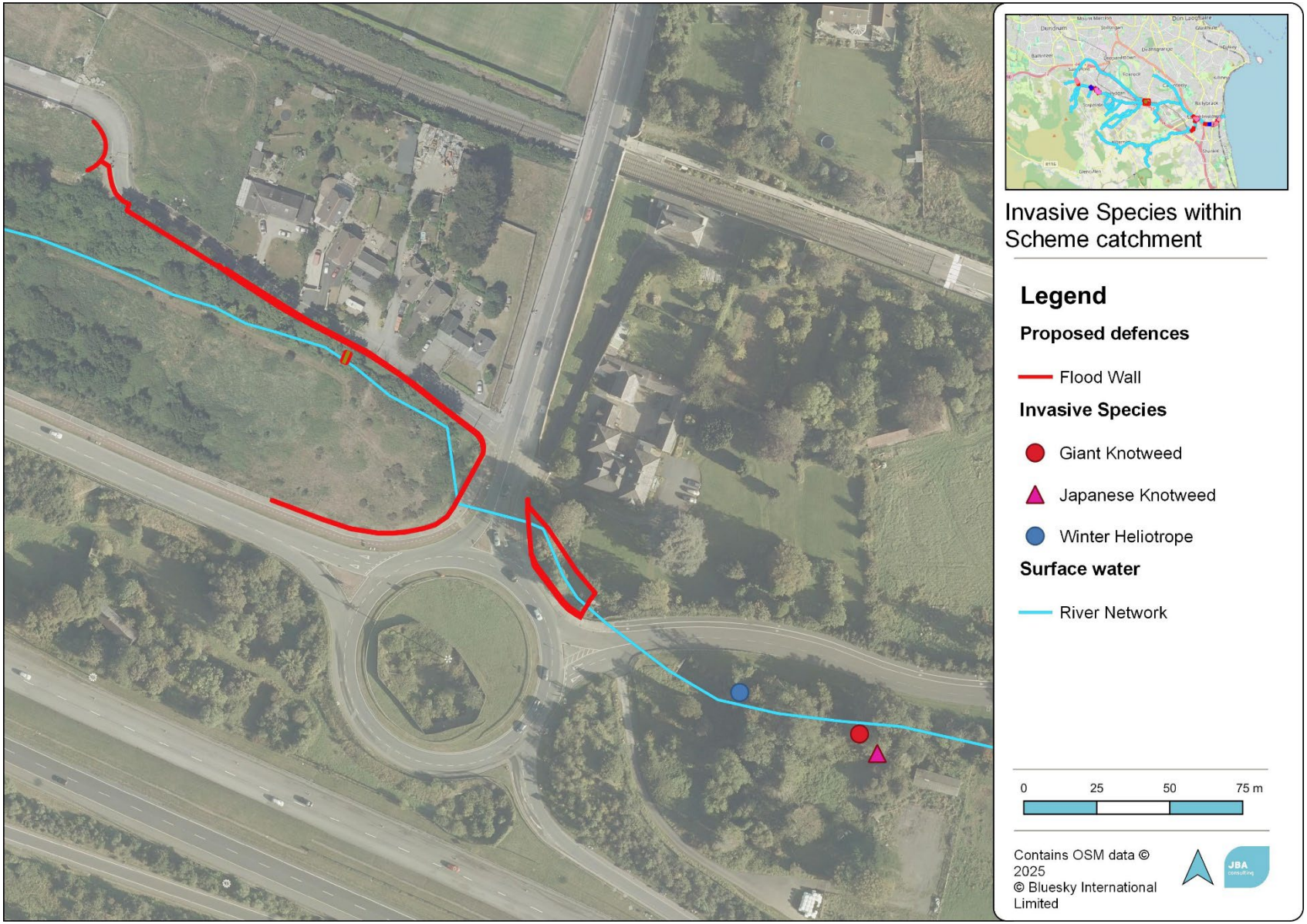


Figure 8.39: INNS recorded in in the vicinity of Measure 3.A

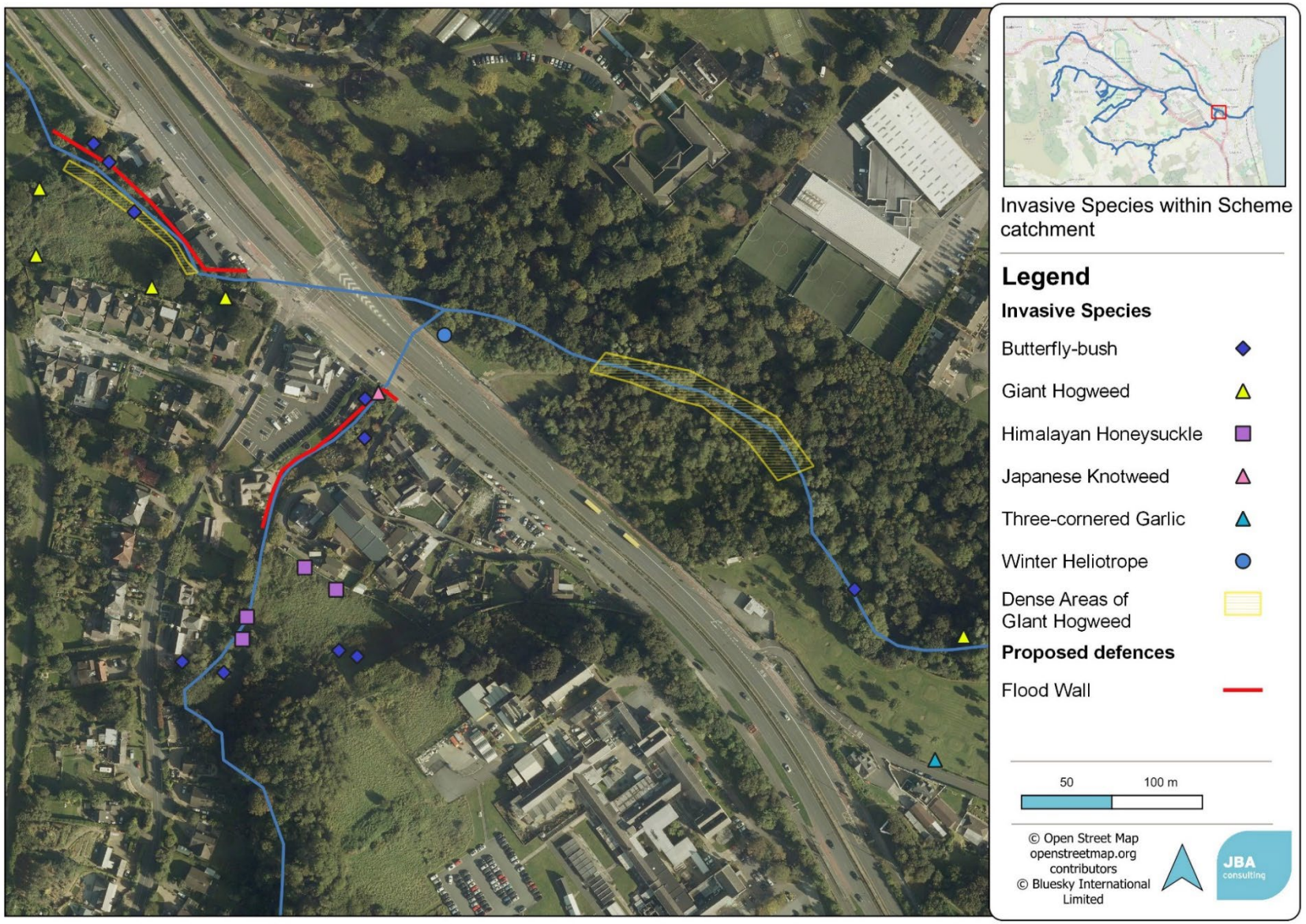


Figure 8.40: INNS recorded in in the vicinity of Measure 4.B, 4.C and 4.D

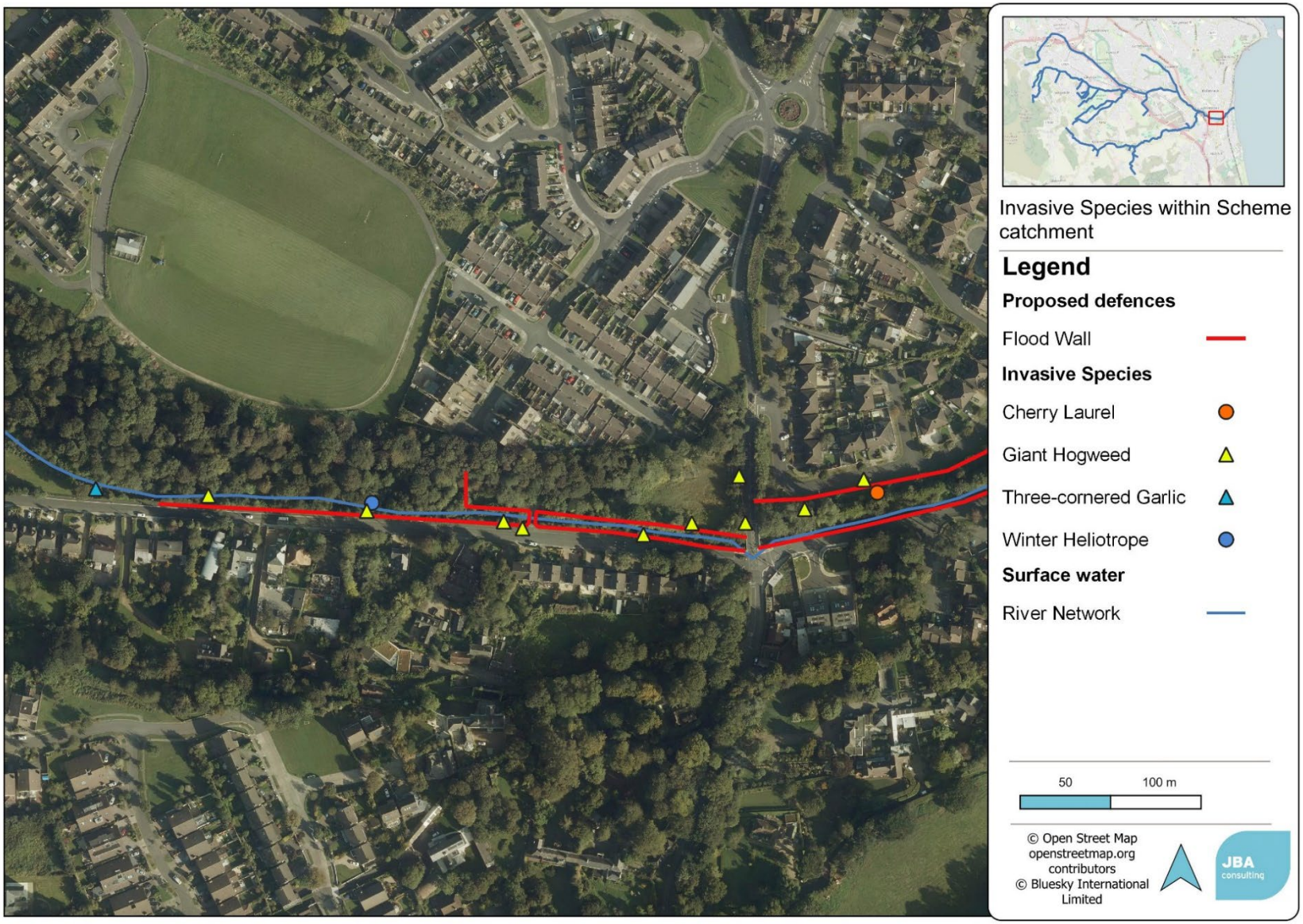


Figure 8.41: INNS recorded in in the vicinity of Measure 4.A

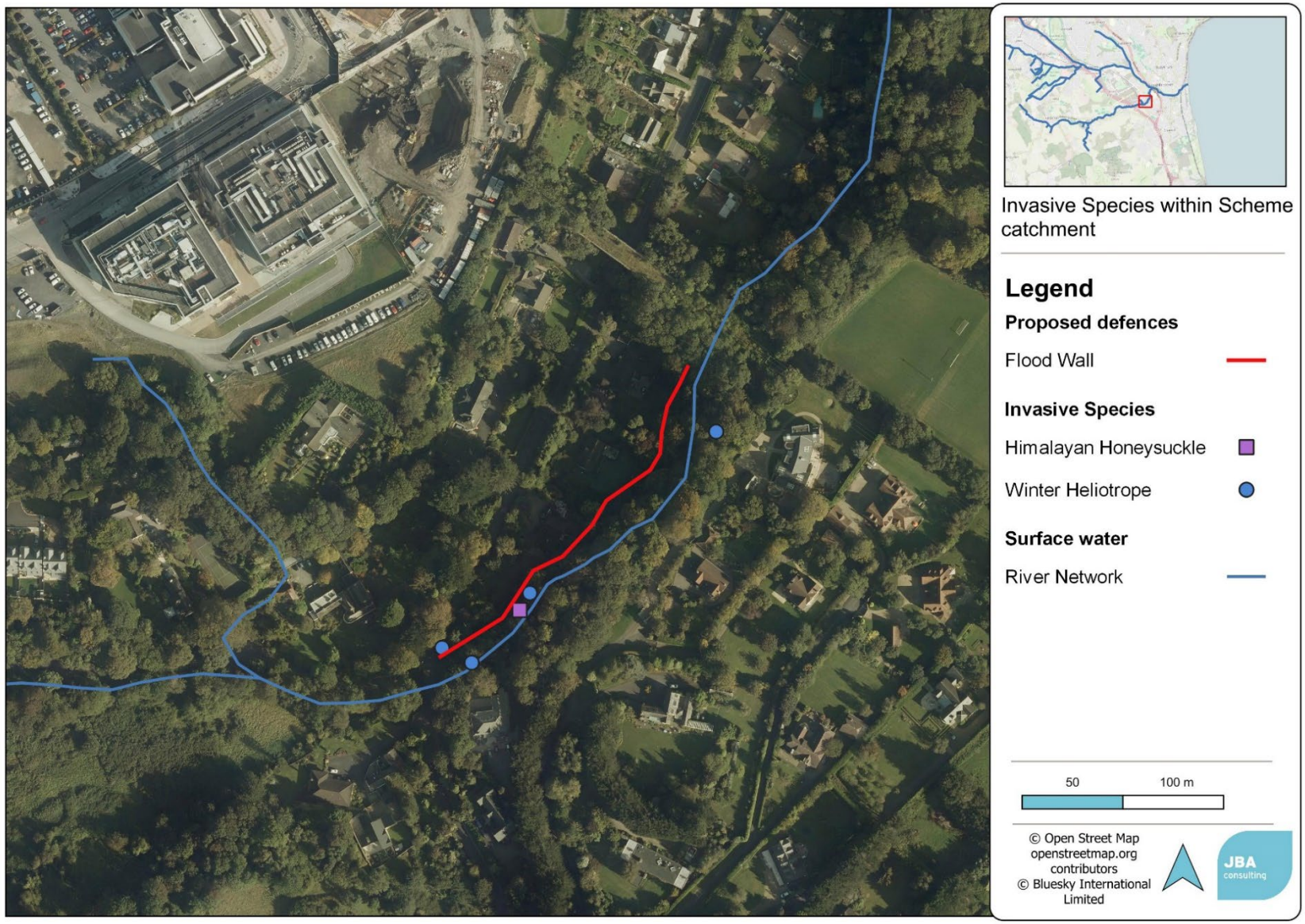


Figure 8.42: INNS recorded in in the vicinity of Measure 5.C

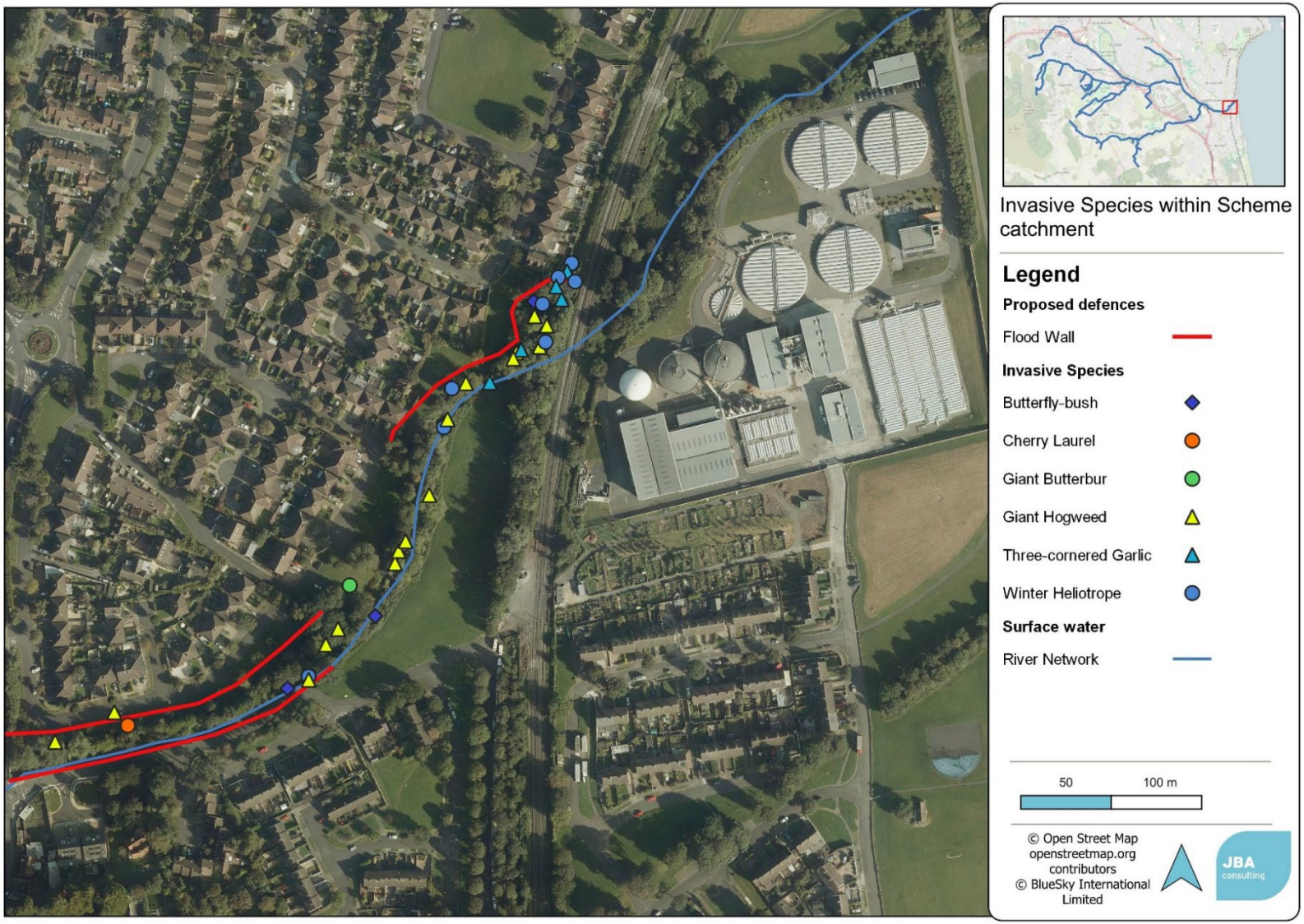


Figure 8.43: INNS recorded in in the vicinity of Measure 5. A.

8.6.4 Screening of Ecological Features

The screening of ecological features is given in Table 8.11. Those features screened out are not considered further in this assessment. Ecological features carried forward are assessed for potential impacts during construction and operation in the following sections.

Table 8.11: Summary of ecological features and the screening assessment

Ecological feature	Value	Screening	Reasoning
Ballyman Glen SAC	International	Out	Lack of Connectivity
Bray Head SAC	International	Out	Lack of Connectivity
Carrigower Bog SAC	International	Out	Lack of Connectivity
Dalkey Islands SPA	International	Out	No adverse impacts anticipated
Glen of the Downs SAC	International	Out	Lack of Connectivity
Glenasmole Valley SAC	International	Out	Lack of Connectivity
Howth Head SAC	International	Out	Lack of Connectivity
Howth Head Coast SPA	International	Out	Lack of Connectivity
Knocksink Wood SAC	International	Out	Lack of Connectivity
North Bull Island SPA	International	Out	Lack of Connectivity
North Dublin Bay SAC	International	Out	Lack of Connectivity
North-West Irish Sea cSPA	International	Out	Lack of Connectivity
Rockabill to Dalkey Island SAC	International	Out	No adverse impacts anticipated
South Dublin Bay and River Tolka Estuary SPA	International	Out	Lack of Connectivity
South Dublin Bay SAC	International	Out	Lack of Connectivity
Wicklow Mountains SAC	International	Out	Lack of Connectivity
Wicklow Mountains SPA	International	Out	Lack of Connectivity
Dingle Glen pNHA	National	Out	Lack of Connectivity
South Dublin Bay pNHA	National	Out	Lack of Connectivity
Ballyman Glen pNHA	National	Out	Lack of Connectivity
Knocksink Wood pNHA	National	Out	Lack of Connectivity
Fitzsimon's Woods pNHA	National	Out	Lack of Connectivity
Dalkey Coastal Zone and Killiney Hill pNHA	National	Out	Lack of Connectivity
Loughlinstown Woods pNHA	National	In	Scheme works take place within the site boundary
Ballybetagh Bog pNHA	National	Out	Lack of Connectivity
Knocksink Woods pNHA	National	Out	Lack of Connectivity
Stone walls and other stonework	Less than local	Screened out	Limited ecological value
Earth banks	Less than local	Screened out	No notable ecological features
Mosaic: Earth banks / Scrub	Less than local	Screened out	Limited ecological value
Buildings and artificial surfaces	Less than local	Screened out	Limited ecological value
Other artificial lakes and ponds	High Local	Screened In	Spawning opportunities for local Amphibians
Eroding/upland rivers	Regional	Screened In	Occurring fish and Otter populations
Mosaic: Eroding/upland rivers / Depositing/lowland rivers	Regional	Screened In	Occurring fish and Otter populations
Drainage ditches	High Local	Screened In	Area of diverse habitat and provision for

			local Amphibians
Improved agricultural grassland	Less than local	Screened out	Limited ecological value
Amenity grassland (improved)	Less than local	Screened out	Limited ecological value
Dry meadows and grassy verges	High Local	Screened in	Commuting and foraging opportunities for mammals and bats
Wet grassland	High local	Screened in	Habitat diversity
Dense Bracken	Less than local	Screened out	Limited ecological value
Mosaic: Dense Bracken / Scrub	Less than local	Screened out	Limited ecological value
(Mixed) broadleaved woodland	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Mosaic: (Mixed) broadleaved woodland / Scrub	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Mixed broadleaved/conifer woodland	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Mosaic: Mixed broadleaved/conifer / Scrub	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Scattered trees and parkland	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Hedgerows	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Treelines	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Scrub	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Mosaic: Scrub / Dry meadows and grassy verges	High local	Screened In	Commuting and foraging opportunities for mammals and bats, nesting opportunities for birds
Terrestrial Mammals (Badger, Hedgehog, Pine Marten, Pygmy Shrew and Red Squirrel)	High Local	Screened In	Impacts on foraging and commuting potential
Terrestrial Mammals (Otter)	Regional	Screened In	Works along the river and on the walls which may encounter occasional Otter.
Marine Mammals	Less than Local	Screened Out	Marine mammals are not anticipated to be impacted by scope of works
Bats	High Local	Screened In	Disruption of foraging, commuting ant roosting potential
Breeding Birds	High Local	Screened In	Disruption of foraging, commuting ant nesting potential
Wintering Birds	Less than local	Screened Out	Area within the FRS is not intensely utilised by Wintering Birds
Amphibians	High Local	Screened In	Pollution and disruption of the pond in Belarmine Park or of the Drainage Ditch near Clon Brugh
Reptiles	High Local	Screened In	Disruption of commuting and foraging
Terrestrial Invertebrates	Less than local	Screened Out	No threatened or protected species present
Fish (Salmonids, Eel & Lamprey)	Regional	Screened In	Spawning, commuting, distribution throughout the scheme's watercourses

Invasive Non-native Species	N/A	Screened In	Heavily present throughout the scheme

8.7 Potential Impact of the Proposed Development – Construction Phase

8.7.1 Introduction

The potential direct and indirect impacts on the valued ecological features are assessed here. The initial assessment considers the potential impact pathways and whether these apply to the ecological features. The impact assessment considers the project and the anticipated effects in the absence of any mitigation. Where potentially significant adverse impacts are identified, avoidance and mitigation measures are proposed to offset these impacts.

The key construction and operational impacts assessed are:

- Habitat loss/disturbance
- Disturbance/ killing and injury to faunal species
- Reduction in water quality
- Release of dust (impacting habitats and water quality)
- Spread of invasive non-native species
- Pollution of the water

8.7.2 Do Nothing Scenario

If the proposed works were not to go ahead, it is likely that the current use of the land throughout the proposed scheme would undergo a gradual increase of flooding due to increased rainfall projections following climate change, and as such, many terrestrial habitats and species would undergo long-term impacts. Adverse impacts could occur through the increased spread of invasive non-native species, and increased water quality issues associated with flooding of urban land.

8.7.3 Common impacts across the scheme

Some impacts will not be location specific and will affect certain ecological features throughout the construction phase. This is mainly related to disturbance of habitats, generation of noise, release of pollutants, invasive non-native species, and the release of dust emissions during construction.

Dust and emissions

A separate Air Quality assessment has been carried out for the EIAR (Construction Impacts Chapter 6). The volume of deposition due to demolition, earthworks, construction and the spread of dusty materials from the tires of machinery has the potential to affect sensitive habitats and plant communities. Dust could smother local woodland and grassland habitats adjacent to the works. There is also a potential impact that any dust settling in the river, or watercourses could introduce pollutants which could impact fish species.

Construction impacts for dust have been calculated as medium to high risk due to the sensitive ecological receptors that are located next to the works. Therefore, mitigation measures are required. In the absence of mitigation, dust emissions from construction across the proposed works are anticipated to have **short term adverse effects of slight significance.**

Release of pollutants

The proposed development's construction activities may lead to the introduction of pollutants, such as hydrocarbons, to the local surface water and groundwater networks. Potential direct impacts include the degradation of the vegetation of local habitats via hydrocarbon pollution. Additionally, hydrocarbon pollutants can degrade the scales and furs of fish and mammal species, respectively. Additionally,

temporary, or permanent reductions in area and/or overall health may be experienced by local habitats as a result of deleterious substances entering the habitat via surface water and groundwater-to-surface water pathways. Additionally, the consumption of food containing polluting elements may impact the health of mammal and fish populations.

In the absence of mitigation, dust emissions from construction across the proposed works are anticipated to have **short term adverse effects of moderate significance**, depending on the receptors impacted.

Dry meadows and grassy verges, Dry meadows and grassy shrub/scrub

There are several areas of grassy verges, meadows, or meadows transitioning into scrubland scattered throughout the proposed Scheme area, including Belarmine Park, Kilgobbin Road, Glenamuck Road, and near the coastline in Bayview. Many of these grassy areas are in the vicinity of the proposed flood walls and may be damaged through the movement of vehicles to the areas, and habitat will be lost via the access to the areas of flood wall.

In addition to direct habitat loss, grassy verges will also be vulnerable to surface water (run-off) polluting events (e.g. leaking, or spilled hydrocarbons), and spillages of excavated materials which may occur within the area, which will have a knock-on impact of disrupting or possibly damaging the quality of local vegetation.

The large meadow grassland is not anticipated to deteriorate during the construction phase.

Therefore, in the absence of mitigation, **short term adverse effects of slight significance** are anticipated for this habitat, due to direct habitat damage, spillages of excavated material or an accidental pollutant spill causing a deterioration in habitat quality.

Hedgerows, Scrub & Treelines

Throughout the scheme, trees, hedges and bushes have been identified as potentially needing to be removed to accommodate the wall works, site compound and access routes. As a result of this, the habitats will experience direct mechanical reduction of their area and vigour. In addition to mechanical removal, vegetative material of these habitats that are not scheduled for removal may still be impacted by nearby works, including the creation of dust during the demolition of the existing wall, the spillage of concrete during *in-situ* pouring, the release of silt during vegetation clearance along the banks and excavated materials during construction, along with spill occurring during accidental pollutant events.

Therefore, in the absence of mitigation, **short term adverse effects of slight significance** are anticipated for these habitats, due to localised habitat removal and potential impact to the habitats through excavated material or accidental pollutant spill causing both a reduction in habitat spread due to direct removal, and a reduction in quality in areas suffering from pollutant spill.

Mammals – Pygmy Shrew, Red Squirrel, Pine Marten & Badger

Throughout the scheme, the habitat types that are frequented by the above mammals including: hedgerows, treelines, scrub, meadow grasses and woodlands are overall anticipated to experience minor impacts base on the occurring works.

In addition to the loss of resourceful habitats which could disrupt foraging and commuting activities, ground-dwelling mammals could suffer impacts in the form potential loss of life to individuals in the case of the accidents within the construction site (e.g. accidental trappings). There are no Badger setts within the ZoI, however, and it is expected that most mammals would be deterred from the works areas due to noise emissions, lighting and vibration.

Therefore, in the absence of mitigation, during the construction phase, a **short-term adverse effect of slight significance** is anticipated for these mammal species due the disruption and reduction of foraging efficiency or from potential killing/injuring.

Mammals – Otter

Throughout the scheme, the local Rivers, ditches and streams that are or may potentially be frequented by Otter are set to be disturbed through the carrying out of works, although in channel and bankside works are likely to be limited to daytime activities due to reasons of health and safety so the risk of encountering and disturbing an Otter is considered to be low. However, there is a risk of accidentally trapping or causing injury to Otter through inappropriate work practices, such as leaving excavations open or leaving un-secured materials on site which could collapse on an Otter if explored at night.

There are no active holts on site to be impacted upon the proposed works; no Otter resting sites will be impacted by the construction works.

Therefore, in the absence of mitigation to prevent the accidental killing/injuring of individuals through poor work site management during the construction phase, a **temporary but significant impact** is anticipated for the local Otter population.

Bats

Construction works throughout the proposed Scheme area will generate noise and disturbance as a result of machinery operation and workforce movement during the duration of the project. Bats have been recorded commuting and foraging throughout the project area.

Works will not be conducted at night-time, when bats are active, and therefore it is not expected that construction of the Scheme will cause any impact to bats commuting between their roosts and foraging areas at watercourses, treelines and meadow habitats.

No roosts were confirmed in the treelines/woodland or within the bridges, and the removal of individual or small groups of trees will not result in the loss of any long linear features which may act as navigational aids for bats.

In the absence of mitigation, pollution incidents in the channel or surrounding habitats could indirectly impact upon bats through the loss of insect populations/ foraging resources.

Therefore, in the absence of mitigation to prevent pollution incidents, **short term adverse effects of slight significance** are anticipated for bat species through the loss of foraging resources.

Breeding Birds

Local breeding bird species will potentially be subject to visual and noise disturbance during the construction works. Any vegetation removed within the breeding season could also damage or destroy nests. There will be a temporary loss of nesting habitat and foraging resources due to the vegetation clearance required for the works to be undertaken, prior to any replanting to be undertaken.

Therefore, in the absence of mitigation during the construction phase, a **temporary adverse impact of slight significance** is anticipated for these bird species due to the disruption of bird activities during the works from the reduction of suitable vegetation habitat for nesting and foraging.

Amphibians and reptiles

Within the scheme, works taking place within the area identified for amphibian resource availability include the pond within the Belarmine Pond and the ditch at Clon Brugh. There is a minor risk of killing or injuring amphibians, particularly at these locations.

Elsewhere on site, there is a possibility that amphibians or reptiles will be encountered within the works footprint. However, any small numbers of amphibians and reptiles are anticipated to move away from areas of disturbance, lowering possibility of killing and injuring.

In the absence of mitigation during the construction phase, a **temporary adverse impact of slight significance** is anticipated for amphibian species, particularly around Belarmine Pond and the ditch at Clon Brugh. Potential impacts to Common Lizard are imperceptible.

Fish

Throughout the scheme, the local watercourses that are or may potentially be frequented by fish are set to be disturbed through the carrying out of in-channel works. In the absence of suitable mitigation, in channel works including machinery entering channels, over-pumping works or dewatering works could lead to the direct killing/injuring of fish, including salmonids (Brown Trout and Sea Trout), Lamprey and Eel, although the Eel population is thought to be limited due to the current impediments to migration in the channel. Additionally, any pollution events could cause fish kills in the absence of suitable emergency procedures to control an incident.

No new impounding features will be built during the construction phase to have any long-term impacts on fish passage.

Therefore, in the absence of mitigation during the construction phase, **temporary adverse impacts of moderate significance** are anticipated for fish.

Spread of INNS

Giant Hogweed, American Skunk Cabbage and Three-cornered Garlic are Third Schedule species under Regulations 49 & 50 in the European Communities (Birds and Natural Habitats) Regulations 2011 (Note: Regulation 50 not yet enacted). Regulations 2011 restricts the dispersal, spread and transportation of these invasive non-native species and due diligence must be given to the facilitation of the spread of invasive non-native species.

There are numerous INNS recorded through the proposed works footprint including Giant Hogweed, American Skunk Cabbage and Three-cornered Garlic. All works coming into contact with these species could lead to the spread of INNS both within and beyond the site. Additionally, without appropriate biosecurity measures in place, any machinery or personnel entering the watercourses could inadvertently spread new INNS to the catchment. The spread of INNS could introduce new diseases or increased competition to native flora and fauna present within the scheme footprint resulting in the widespread loss of a species, or simplification of a habitat.

8.7.4 Impacts to Loughlinstown Woods pNHA

In order to facilitate the construction of the new bypass culvert under Bray Road, a small cluster of Ash and Willow *Salix* spp. trees which fall within the pNHA require felling. These trees located on the small island between Bray Road and the confluence of the two watercourses on the north-western edge of the woodland (see Figure 8.44). The new culvert outfall structure will prevent the regrowth of vegetation on part of this small island, but it is expected that the remainder of the bank will naturally regenerate over time, even in the absence of additional tree planting.

In the absence of mitigation, there will be a **permanent adverse effect of slight significance** upon the pNHA.

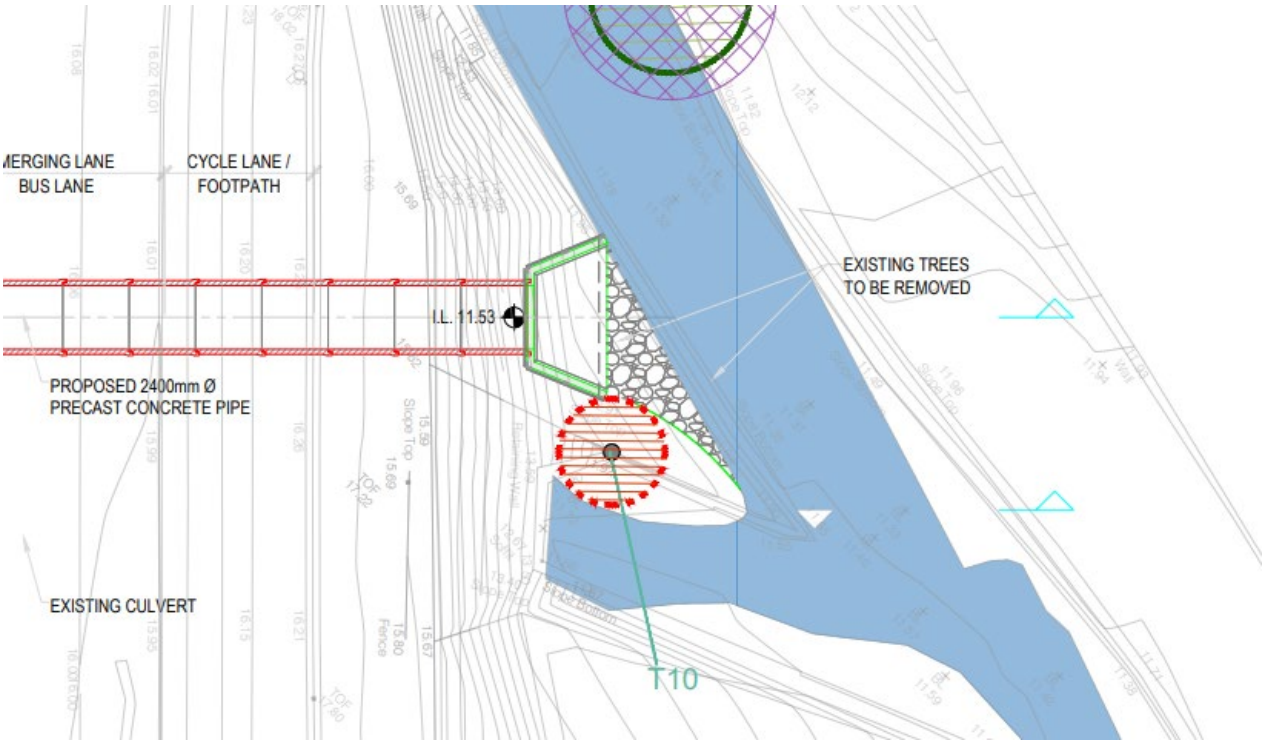


Figure 8.44: Extract from the AIA showing tree removal downstream of the new culvert (Arbor-Care Ltd, 2024)

8.7.5 Impacts to Eroding/Upland Rivers, Depositing/lowland rivers

In-stream works

In-channel works are scheduled to occur within the area of Belarmine Park, Kilgobbin Road, Bray Road, along the N11 Culvert, the reinforcement of the Shanganagh Bridge, and with the installation of the flood risk wall out in the Bayview area.

Aquatic habitats could be impacted through direct disturbance/damage and through the release of pollutants and silt mobilisation during construction works, in the absence of mitigation.

These construction phase impacts are considered to be **temporary adverse effects of slight significance** for the watercourses.

Riparian habitats

Works along the banks and near to the watercourses include the construction of walls adjacent to watercourses located at Belarmine Park, Kilgobbin Road, Cherrywood Road, Lower Bridges Glen, Commons Road, Brookdene and Bayview, along with the installation of a flood gate at the steps to the river at Rose Cottage. These measures, while not directly taking place within the watercourse, are adjacent to the channel, where the spillage of pollutants and the release of sediment during excavations could directly lead to the deterioration of the watercourse' quality.

While not at risk of direct habitat loss, these aquatic habitats will also be vulnerable to surface water (run-off) polluting events (e.g. leaking, or spilled hydrocarbons), and spillages of excavated materials which may occur within the area, which will have a knock-on impact of disrupting or possibly damaging the quality of local vegetation. There will be some loss of riparian trees on the bank tops for enabling works, although it is expected that the riparian trees will naturally regenerate even in the absence of additional tree planting. Many of these trees are non-natives such as Sycamore so their removal and regeneration (or replanting) with native species will be of long-term benefit.

Therefore, in the absence of mitigation, **short term adverse effects of slight significance** are anticipated for this habitat, due to potential infiltration of the water by excavated material or an accidental pollutant spill causing a deterioration in water quality and the loss of some bank top trees.

8.7.6 Impacts to Other artificial lakes and ponds

While the pond located within Belarmine Park is not directly involved with the works, it is in close proximity to works being undertaken on the local culvert, flood defence wall and railing.

Given this aquatic habitats' proximity to the works they will be vulnerable to surface water (run-off) polluting events (e.g., leaking or spilled hydrocarbons) where the vegetative and amphibian species are inhabiting the pond.

Therefore, in the absence of mitigation, during the construction phase, a **temporary adverse impact of slight significance** is anticipated for this habitat.

8.7.7 Impacts to Drainage ditches

The area along the dry ditch that runs through Clon Brugh is directly involved within the scope of works within the FRS (Measures 1A and 1B). Along lands adjacent to this ditch, is to be the demolition and removal of an existing masonry wall to accommodate the realignment of the existing footpath, along with the construction of a new proposed flood defence wall. The construction of the wall will include the steel fixing and in-situ concrete casting along with a masonry stone finish to match the existing stone wall.

While this is not occurring within the ditch itself, the close proximity of the works to the ditch's trench will result in this habitat being vulnerable to the release of silt during vegetation clearance, creation of dust during the demolition of the existing wall, the spillage of concrete during in-situ pouring, the release of silt during vegetation clearance along the banks and excavated materials during construction, along with spill occurring during accidental pollutant events.

Therefore, in the absence of mitigation, during the construction phase, a **temporary adverse impact of moderate significance** is anticipated for this habitat, given the proximity of works to the ditch and the likelihood of contamination through the excavation and construction efforts.

8.7.8 Impacts to Dry meadows and grassy verges

There are meadow grasslands present along the areas of the Bray Road that are involved within the scope of works within the FRS (Measures 4C, 5A and 5D). While the addition of a culvert, raising of flood defence walls, or additional defences along Loughlinstown Village will not take place directly within this habitat type, the grasslands are in close proximity to the works being done, and as such, will be vulnerable to surface water (run-off) polluting events. (e.g., leaking or spilled hydrocarbons).

Therefore, in the absence of mitigation, during the construction phase, a **temporary adverse impact of slight significance** is anticipated for this habitat.

8.7.9 Impacts to (mixed) Broadleaved woodland, Mixed broadleaved / conifer woodland & woodland mosaics

There are woodlands spread throughout the site, with a small section of woodland in the vicinity of Clon Brugh, another small section located along Glenamuck Road, a larger section located along Cherrywood Road, and the body of Loughlinstown Woods itself, which has been addressed within its own section.

The woodland section within Clon Brugh, nearby Cherrywood Road and along Glenamuck will be susceptible to the creation of dust during the demolition of the existing wall, the minor removal of vegetation along the banks and the release of material excavated materials during construction, along with spill occurring during accidental pollutant events, while the section along Clon Brugh will also be at risk to the spillage of concrete during in-situ pouring. A number of individual or small groups of trees require removal for site enabling works, including some mature Ash and Willows. However, the majority of trees to be

removed are non-native species including Sycamore, Cabbage Palm *Cordyline australis*, Sycamore, Beech and Poplar.

Therefore, in the absence of mitigation, during the construction phase, a **temporary adverse impact of slight significance** is anticipated for these three sections of woodland habitats and **permanent adverse impacts of slight significance** in terms of the loss of individual trees across the scheme.

In addition to these identified woodlands, another woodland section within the spread of the scheme exists within the boundary the dominating habitat within the Loughlinstown Woods pNHA and impacts to this woodland section have already been assessed.

8.7.10 Predicted Impacts - Operational Phase

The realignment of the scheme is not anticipated to lead to any adverse impacts during the operational phase. The watercourses and riparian will continue to function as valuable corridors and habitats for wildlife and there will be no new impediments to fish passage in the channel. A new overflow culvert will create an additional connection under the N11 and will be of benefit to Otter and other mammals looking to navigate safely under the road. This culvert will provide this benefit in all instances throughout the year, bar during flood events greater where the overflow culvert is activated.

8.8 Mitigation Measures - Construction Phase

This section describes the avoidance and mitigation measures required to prevent or reduce impacts generated during the construction and operation of the proposed development on the ecological features of high local or national ecological importance outlined in Table 8.11. All prescribed mitigation measures will be strictly adhered throughout the length of the construction phase.

A site-specific Construction and Environment Management Plan (CEMP) and Construction Method Statement (CMS) will be submitted to the competent authority for agreement prior to site works commencing. The CEMP will incorporate the mitigation measures listed here. The proposed development's principal contractor, as well as all other construction contractors, will be required to comply with all the mitigation details outlined within the CEMP.

All works and mitigation measures will be monitored by a suitably qualified ecological clerk of works (ECoW) during the construction period, with findings reported to the competent authority.

8.8.1 Standard Environmental Best Practice

The activities required for the proposed development's construction phase shall remain within the previously identified locations of the proposed site, bar select compound areas, which will be located in adjacent lands for mitigation control reasons. The CEMP will also strictly adhere to best practice environmental guidance including but not limited to the following:

- CIRIA Guidance C532: Control of water pollution from construction sites. Guidance for consultants and contractors. (CIRIA, 2019 - www.ciria.org);
- CIRIA Guidance C741: Environmental good practice on site guide (Charles & Edwards, 2015; CIRIA, 2019 - www.ciria.org);
- CIRIA Guidance C750D: Groundwater control: design and practice (Preene et al., 2016; CIRIA, 2019 - www.ciria.org);
- CIRIA (C512): Environmental Handbook for Building and Civil Engineering Projects (CIRIA, 2000);
- CIRIA (C649) Control of water pollution from linear construction projects: Site guide (CIRIA 2006a);
- CIRIA (C848): Control of water pollution from linear construction projects: Technical guidance (CIRIA, 2006b);
- Inland Fisheries Ireland: Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters (IFI, 2016);

- Inland Fisheries Ireland: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (IFI, 2020)

8.8.2 Environmental Management of Site Compounds

The principal contractor will be required to ensure good environmental management within the site compounds set up along the length of the proposed development. The below list of measures will be incorporated into site compound environmental management:

- Site compounds will not be set up within flood zones in accordance with the Office of Public Works (OPW) 'Planning System and Flood Risk Management Guidelines' (2009).
- Site compounds will not be located within core foraging areas utilised by locally or nationally important species and have been identified within the accompanying buildability report.
- Only plant and materials necessary for the construction of the works will be permitted to be stored at the compound location.
- Site establishment by the Contractor will include the following:
  - Site offices
  - Site facilities (canteen, toilets, drying rooms, etc.)
  - Office for construction management team
  - Secure compound for the storage of all on-site machinery and materials
  - Temporary car parking facilities
  - Temporary fencing;
  - Site Security to restrict unauthorized entry.
- All sub-contractors will be given induction toolbox talk so that they are aware of material storage arrangements.
- Construction materials within the compound will be stored in a designated area in an organised manner so as to protect them from accidental damage and deterioration as a result of exposure.
- Bunded storage of fuels and refuelling area. Bunds shall be 110% capacity of the largest vessel contained within the bunded area.
- A separate container will be located in the Contractors compound to store absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by a licenced waste contractor at a licenced site. Records will be maintained of material taken off site for disposal.
- A maintenance programme for the bunded areas will be managed by the site environmental manager. The removal of rainwater from the bunded areas will be their responsibility. Records will be maintained of materials taken off site for disposal.
- The site environmental manger will be responsible for maintaining all training records and weekly environmental inspections.
- Drainage collection system for washing area to prevent run-off into surface water system.
- Stockpiling of spoil and spoil-like materials will be appropriately located within the compounds to minimise exposure to prevailing winds.
- All refuelling of vehicles will be carried out at the fuel stores within the main site compound and only ADR trained personnel will be permitted to operate fuel bowsers.

8.8.3 Protection of Surface Water, Groundwater and Air Quality

In order to protect surface water, groundwater and air quality throughout the proposed development site, the principal contractor will be required to develop and implement a Surface Water Management Plan, Pollution Control Plan and Dust Management Plan. The minimally required list of mitigations measures outlined below will be incorporated into these plans.

Surface Water Management Plan

In order to safeguard the local surface water network, and in turn the local groundwater network, from surface water-based pollution events, the following must be strictly adhered to:

- The principal contractor will ensure compliance with environmental quality standards specified in the relevant legislation, namely European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments), and the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988).
- Oil booms and oil soakage pads should be maintained on-site to enable a rapid and effective response to any accidental spillage or discharge. These shall be disposed of correctly and records will be maintained by the environmental manager of the used booms and pads taken off site for disposal.
- Management of silt-laden water on-site, including procedures for accidental leaks / spills to ground, as well as water quality monitoring to ensure compliance with environmental quality standards specified above.
- At no point during the construction phase will polluted/untreated water be discharged to the local surface water network.
- Fail-safe site drainage and bunding through drip trays on plant and machinery will be provided to prevent discharge of chemical spillage from the sites to surface water.
- To prevent the spread of any accidental discharge into the surface water network, oil booms will be on hand when construction activities are located beside aquatic habitats in order to control and minimise the spread of the spill.
- Washout of concrete plant will occur at a designated impermeable area with waste control facilities.
- Wherever reasonably possible, pre-cast concrete bridge features should be utilised to minimise the risk of a concrete-based pollution event.
- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete.
- Temporary stockpiles will be monitored for leachate generation. These stockpiles will be placed within designated areas and not located within the vicinity of watercourses, wetlands or artificial surface water drainage features.
- Excavated contaminated soils will be segregated and securely stored in a designated area where the possibility of runoff generation or infiltration to ground or surface water drainage has been eliminated through bunding and imperviable geotextile linings. The contaminated soils will then be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC. Furthermore, the contractor will ensure that no cross-contamination with clean soils happens elsewhere throughout the development site.
- Silt traps and fencing will be installed prior to the commencement of any construction works in order to enhance the protection of identified water features. Shallow interceptor trenches will be installed in front of these silt fences where possible. An Ecological Clerks of Works (ECoW) will be present during the installation of these protective measures to ensure that they are installed to best practice standard and correctly located in their assigned areas. The following sub-section will provide greater detail on specific locations of these silt fence / trench sections.
- Silt fences will be repaired and/or replaced as necessary by the principal contractor as part of the on-going environmental monitoring programme.

Pollution Control Plan

Spill kits containing absorbent pads, granules and booms will be stored in the site compound with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will be maintained at all times and site foremen's vehicles will carry large spill kits at all times. Absorbent material will be used with pumps and generators at all times and used material disposed of in accordance with the Waste Management Plan. All used spill materials e.g., Absorbent pads, will be placed in a bunded container in the contractor's compound. The material will be disposed of by a licenced waste contractor at a licenced facility. Records will be maintained by the environmental site manager.

Regular inspections and maintenance of plant and machinery checking for leaks, damage or vandalism will be made on all plant and equipment.

In the event of a spill the principal contractor will ensure that the following procedure are in place:

- Emergency response awareness training for all Project personnel on-site works.
- Appropriate and sufficient spill control materials will be installed at strategic locations within the site. Spills kits for immediate use will be kept in the cab of mobile equipment.
- Spill kits must include suitable spill control materials to deal with the type of spillage that may occur and where it may occur. Typical contents of an on-site spill kit will include the following as a minimum:
  - Absorbent granules
  - Absorbent mats/cushions
  - Absorbent booms
  - Track-mats, geotextile material and drain covers.
- All potentially polluting substances such as oils and chemicals used during construction will be stored in containers clearly labelled and stored with suitable precautionary measures such as bunding within the site compound.
- All tank and drum storage areas on the site will, as a minimum, be bunded to a volume not less than the following:
- 110% of the capacity of the largest tank or drum within the bunded area, or
- 25% of the total volume of substances which could be stored within the bunded area.
- All hydrocarbons to be utilised during construction are to be appropriately handled, stored and disposed of in accordance with the TII document 'Guidelines for the crossing of watercourses during the construction of National Road Schemes' (NRA, 2008).
- The site compound fuel storage areas and cleaning areas will be rendered impervious and will be constructed to ensure no discharges will cause pollution to surface or ground waters.
- Designated locations for refuelling are within site compound.
- Potentially contaminated run off from plant and machinery maintenance areas will be managed within the site compound surface water collection system.
- Damaged or leaking containers will be removed from use and replaced immediately.

Dust Management Plan

The following measures will be implemented to prevent excavation- and cement-based dusts entering the local surface water network and QI supporting ex-situ habitats:

- Limit the breaking of the topsoil or earth stripping from occurring during dry and windy weather.
- Wheel washing of vehicles leaving the site, covering of fine dry loads or spraying of loads prior to exiting the site, and if necessary regular cleaning of public roads in the vicinity of the entrance.
- The utilisation of pre-cast concrete features will minimise the generation of the concrete-based dusts throughout the development site.
- Stockpiling of spoil and spoil-like materials will be appropriately located and covered and/or sprayed where possible to minimise exposure to prevailing winds, which will in turn minimise the generation of dust within the site.

8.8.4 Concrete Management Procedures

The following measures will be implemented to prevent liquid concrete/ cement-based dust entering the adjacent habitats of ecological value.

- Wherever reasonably possible, pre-cast concrete features should be utilised to minimise the risk of a concrete-based pollution event.
- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete.

- Washout of concrete plant will occur off site at a designated impermeable area with waste control facilities.
- Raw, uncured or waste concrete will be stored appropriately prior to disposal by licenced contractor.
- The contractor's construction methodology will require the use of precast elements where practical; the use of secondary protection shuttering for concrete pours; all pours to be carried out in dry weather conditions; and that all trucks be cleaned prior to leaving respective depots.
- The contractor will be required to use experienced operators for the work; provide an appropriate level of continuous monitoring during any concrete pours by experienced management; and have method statements approved by the client prior to commencing works. Works will be carried out using recommendations from current guidance and relevant codes of practise as outlined in **EA (2011)** - *Managing concrete wash waters on construction sites: good practice and temporary discharges to ground or to surface waters*.

8.8.5 Construction of the Walls

There are proposed walls running along sections of the Carrickmines Stream, or on lands setback from the banks. These sections include within stretches where trenched silt fencing is not feasible in some of these locations due to the presence of trees nearby. Construction works will take place as follows:

If demolition of an existing wall takes place first, a light silt fence with shallow stakes will be placed between the existing wall and the adjacent habitats (woodlands or rivers) in advance of deconstruction. This light silt fence will be lined with Terram geotextile material, which will be held down with geotextile sandbags, the fence itself can also be reinforced with geotextile sandbags to the rear. This light-weight silt fence will sit on the surface of adjacent habitats and can be manoeuvred around vegetation, limiting damage to trees and particularly their roots. This method will be used instead of normal silt fencing which requires a shallow trench to be dug. The silt fence will prevent any silt or debris created during the deconstruction of the wall from entering the adjacent habitats.

After the wall is demolished/disassembled, excavations for the new wall foundations can be constructed. Once this work is complete, any sand and silt build up in the silt fencing will be removed in the direction away from the adjacent habitats. Any silt will be carefully disposed away from watercourses.

Protection of water from cement leachate: It is expected that the flood wall and foundations will be constructed in-situ using poured concrete however, there may be scope to propose pre-cast concrete units following the detailed design site investigations. The newly excavated space to facilitate the wall foundations should be lined with an impermeable geotextile to create a sealed working space with a fenced buffer between any works involving concrete or cement. Once this area is lined the foundation and wall can be constructed.

Once the wall is constructed the silt fencing will be carefully removed so as to not introduce any trapped pollutants into any adjacent habitat. This will be completed by hand with silt fencing transported out of the area by wheelbarrow. Alternatively, the silt fencing can be placed in a suitable container and lifted over the wall using machinery placed on the opposite site of vulnerable habitats

8.8.6 Badger

A toolbox talk will be given to all site staff on the identification of and protected status of Badger. There are no Badger setts present within the footprint of the works at present. A pre-works check will be undertaken to check if any new setts have been created ahead of the construction works and suitable mitigation will be put in place in this instance. In addition, the general avoidance measures outlined below in Section 8.8.12 will be followed.

8.8.7 Otter

A toolbox talk will be given to all site staff on the identification of and protected status of Otter. There are no Otter resting sites present within the footprint of the works at present. A pre-works check will be undertaken to check if any new holts have been created ahead of the construction works and suitable mitigation will be

put in place in this instance. In addition, the general avoidance measures outlined below in Section 8.8.12 will be followed.

8.8.8 Nesting birds

Where possible, all vegetation clearance will take place outside of the main breeding season for birds (March to Sept). Where this is not possible, any clearance will be preceded by a nesting bird check by a suitably experienced ecologist. Any active nests will be safeguarded until the chicks have fledged.

8.8.9 Amphibians

Clearance of any of the pond-edge vegetation outside of the winter months at Belarmine Park or of the dry ditch that runs through Clon Brugh will be subject to a two-stage cut in order to allow for any amphibians to displace to other habitats and reduce the risk of killing and injuring. This will involve first cutting the vegetation to approximately 150mm, before cutting again to ground level within 48 hours after a check to ensure that all amphibians have moved on.

8.8.10 Invasive species management plan

Due to the high risk of spreading INNS during the construction phase, an INNS report and management plan has been written and included Appendix 8.5 of the EIAR. This includes enhanced biosecurity measures and a plan for the removal of any contaminated soils where appropriate. In addition, all machinery, equipment and PPE entering a channel will have been subject to biosecurity measures such as the 'check, clean, dry' approach before they arrive on site to ensure no new INNS or pathogens are spread to the site, and seed and fragment checks on boots, tyres and machinery entering and leaving the site will take place.

8.8.11 Fish

Fish in the area will likely leave through disturbance. Where possible, all-in channel works will be undertaken in dry working conditions. Any over-pumping or dewatering works will use fish friendly pumps, and a section of channel will open to flow wherever possible. Where dewatering works are required, a fish rescue will be undertaken.

Translocation efforts will follow guidelines for standard electrofishing surveys as set out in Harvey and Cowx (2003)[25]. To successfully translocate fish (and Lamprey ammocoetes), this work should be carried out following the criteria below:

This work is conducted by an electrofishing team which is led by a qualified aquatic ecologist and/or ECoW under license - Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962.

- The precise location of the proposed in channel works must be communicated with the Electrofishing lead who will conduct the translocation work in tandem with the piling efforts. Stop nets reaching to the river bottom will be erected around affected areas.
- The electrofishing lead will assess the substrate conditions to determine if appropriate habitat is present before be fishing the areas using a zigzag pulse and draw manner with a minimum effort of 1 minute fishing per sq. m.
- Captured fish will be quickly removed using a dip net (not the electrofishing anode) and placed in a storage tank with aeration system. Lamprey will be spread out across appropriate habitat at a density of <10 sq. m.
- If adult salmon/trout and other coarse fish are trapped and subsequently recovered, they should be returned to the river as soon as they are caught. Others that may be caught during fishing efforts should

25 Harvey J & Cowx I (2003). Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri and Petromyzon marinus. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough.

be moved to an aeration system before being transported to a section of the Shanganagh River with appropriate habitat. Fish should not be kept within the aeration system for more than 2 hours.
- Fishing efforts should continue until it there is successive efforts with no catch return.
- Works should not take place if the water temperature exceeds 20°C to avoid thermal stress in fish. Dissolved oxygen levels should also be kept to 90% or above. If there is a significant reduction in oxygen level or if significant stress/mortality s observed fishing efforts should be suspended.
- Fishing efforts should be described in detail within the Construction Methodology and project CEMP. This methodology should be approved by IFI in advance of works.

8.8.12 General Avoidance Measures

General avoidance measures that should be incorporated by the contractors working on site include:

- Contractors must ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled; and
- Any pipes should be capped when not in use (especially at night) to prevent local fauna becoming trapped. Any excavations should be covered overnight to prevent animals from falling and getting trapped. If that is not possible, a strategically placed plank should be placed to allow animals to escape.
- Limit the hours of working to daylight hours, to limit disturbance to nocturnal and crepuscular animals;
- Due to the potential presence of; Red Squirrel, Hedgehog, Badger, Pine Marten and Pygmy Shrew and the confirmed presence of bats, the use of lighting at night should be avoided.
- In the case of the works at the N11 culvert upgrade, working at night is essential, as the current area of works will already experience high light levels, however, the following mitigations must be in place:
- Any lighting that is used in this area is to be cowled and focused down, and must not increase the spread of light disturbance up or downstream of the existing lighting impact from the N11.
- The works within this area will be monitored by an EcOW, who will monitor and ensure that the lux levels of the additional lighting will be 5lux or below, and will not be detrimental to local nocturnal species.

8.8.13 Protection of Trees and Hedgerows

An Arboricultural Impact Assessment (AIA) was prepared by Arbor-Care Ltd. on behalf of JBA Consulting. The assessment was written in accordance with the British standard BS5837:2012 which provides guidance on appropriate management of trees and hedgerows in relation to design, demolition, and construction. The full report, including a tree survey and tree work schedule, is available in Appendix 8.1.

A total of 45 trees will be removed which equates to 22% of all trees considered in the assessment. These trees are generally of low quality and value to the surrounding area. The following mitigation measures will be implemented during construction for retained trees:

- Appointment of an arboricultural consultant to be available to provide expertise and advice throughout the duration of the works;
- Preparation of a Tree Protection Plan through liaison between the arboricultural consultant, local authority and the site manager will include details of tree protection measures;
- All tree works will be carried out by a reputable arboricultural contractor in accordance with the recommendations given in BS 3998:2010 – Tree Work Recommendations;
- All tree works should be carried out in accordance with Section 40 of the Wildlife Act 1976 and Section 46 of the Wildlife (Amendment) Act 2000.
- A map of Root Protection Areas will be outlined in the Tree Protection Plan;

Tree Protection Plan

A Tree Protection Plan will be prepared and will outline detailed mitigation measures for the protection of retained trees and hedgerows. The Plan will include the following mitigation measures:

- A pre-commencement meeting with site manager and local authority will be agreed upon to confirm location of tree protection measures.

- Protective fencing will be constructed and installed in accordance with BS5837:2012. Alternatives to those shown must be agreed in advance by the client and approved by the arboricultural consultant.
- No materials or equipment other than those required to install tree protection will be delivered to the site until all fencing is in place.
- Post holes will be carefully positioned as far away from the stem of trees as possible (minimum 50 cm) to minimise contact with tree stems and significant tree roots.
- Holes will be manually excavated with the use of hand tools only and where roots greater than 25mm in diameter or large fibrous roots are present, the position of the hole will be slightly altered to avoid potential root damage.
- If the position of the hole cannot be altered, roots greater than 25mm in diameter or large fibrous roots will be protected with flexible plastic pipes and retained within the pit.
- Once the required depth has been excavated, the hole will be lined using 1000-gauge polythene and filled with the appropriate concrete mix.
- In cases where individual roots less than 25mm in diameter require pruning, a suitable sharp sterile tool will be used (e.g. secateurs or hand saw).
- Signs will be fixed to every third fencing panel stating, 'Tree Protection Area Keep Out – Any incursion into the protected area must be with the agreement of the local authority or arboricultural consultant'.
- The main contractor will inform the local authority and the arboricultural consultant that tree protection is in place before site clearance works commence.
- Inspection of all tree works and tree protection measures prior to the commencement of works.
- Any machinery / site operative within tree RPAs must operate on the appropriate ground protection at all times, this will include the installation and removal of ground protection.
- Supervision during the excavation works within the RPAs of retained trees.
- Supervision during the installation of all services/wall within tree RPAs.
- Supervision during any other works that may affect retained trees.
- No alteration, removal or repositioning of the tree protection will take place during construction without the prior consent of the arboricultural consultant
- All new service runs should be located outside the RPAs of retained trees to avoid impacting their condition. If it is found necessary to locate services within tree RPAs, it is recommended that these works are carried out under arboricultural supervision. Methods of work should follow the recommendations in the NJUG guidance. BS5837 (2012) recommends the NJUG guidance as a normative reference to be used in these circumstances.
- Any liquid materials spilled on site will be immediately cleared up and removed from the site. If liquid fuel or cement products are spilled within 2m of the tree protection zone, the contractor will report the incident to the arboricultural consultant immediately.
- No fires will be permitted within 20m of the crown of any tree.
- The principle of avoiding soil disturbance or changes in levels within the RPAs of retained trees should be followed unless arboricultural advice has been sought.
- Inspection upon completion. Following the completion of the development, a tree condition assessment may be required on all retained trees for health and safety purposes.

8.8.14 Reseeding of grassy verges

In the areas where grassy verges are damaged from the access of machinery, reseeding of flora using locally sourced grass and wildflower mixes will rejuvenate the damaged habitat after the works.

8.8.15 Remedial Planting / enhancement

Any trees or scrub that are removed or damaged will be replaced after the works with native plant species, such as Alder, Birch and Pedunculate Oak that currently exist throughout the Scheme area. Any replacement trees will help enhance floral diversity within the site and improve the area for terrestrial invertebrates, mammals, bats, and birds. The selection of tree species when planting new trees should consider their value for wildlife and similarity to the existing native vegetation. Where possible, riparian trees will be cut to ground level and allowed to regrow on completion of the works.

8.8.16 Root compaction and limb damage avoidance

In order to avoid the damage and compaction of roots and vegetation, storage and movement of machinery should be avoided in rooting zones adjacent to the trees, and fences should be in place in the areas of the of trees and hedges that are not scheduled for maintenance works. Mitigation should follow the recommendations provided in the scheme's AIA (Appendix 8.1)

8.9 Ecological Enhancements for the Operational Phase

8.9.1 Otter

The inclusion of the new bypass channel under the N11 road will increase the connectivity of the river corridor to Otter and offer a safer means of crossing under the road. This will be a **long-term positive effect of moderate significance** to the local Otter population.

8.9.2 Bat Boxes

In the interest of enhancing the site for the local bats (i.e., the Pipistrelles and Leisler's Bat that display high site fidelity) a series of bat boxes should be installed on-site. If possible, these bat boxes should be south-facing and at least 4m off the ground. If erecting on a mature tree, the placement must be free from ivy with no branches within a 1m radius around the location of the box.

Within the Irish context, it is recommended that bat boxes be installed in dark areas around the park. Example of suitable bat boxes include the 1FF Schwegler Bat Box with Built-in Wooden Rear Panel and the 2F Schwegler Bat Box (General Purpose).

Guidance on installing bat boxes can be found here: https://www.bats.org.uk/our-work/buildingsplanning-and-development/bat-boxes/putting-up-your-box.

Simple bat boxes suitable for Pipistrelle's and Leisler's bats can be bought online or constructed by local community groups e.g., Men's Sheds. Note that some bat box designs (that are enclosed at the base) require annual cleaning out, which must be carried out by a Bat Specialist or NPWS Ranger.

Guidance on installing bat boxes is detailed in the following resource document: http://www.batcon.org/images/InstallingYourBatHouse_Building.pdf.

A summary on installing bat boxes can be summarised as:

- Suggested locations include areas with mature trees within treelines.
- All bat boxes should be mounted at least 3-4 metres above the ground.
- Mount on the south facing side of the tree where the box exposed to the sun for part of the day.
- Do not install bat boxes on a tree that is near any lighting column.

These suggestions are generalised for the improvement of a site to become more bat friendly. As such, it is recommended that if there are intended to be bat enhancements on site, that a bat specialist provides more definitive advice on how and where to appropriately facilitate bat boxes.

The inclusion of bat boxes would be a **long-term positive effect of slight significance** to the local bat populations.

8.10 Monitoring

To determine the effectiveness of proposed measures, the site will be monitored prior to, during and from 1- 5 years post construction, depending on the receptor. This is to determine how measures are performing and if management strategies are effective at maintaining the function of the area, and its ecological benefits. Suggested monitoring procedures are presented in the following sub sections, targeted toward different habitats and organisms. Monitoring methods must be approved by the relevant competent

authority, have clearly defined objectives, and reports submitted to the competent authority and refined following their guidance. Data collection will be carried out in a systematic and standardised manner to allow for inter survey comparison and following established procedures to feed into national databases (e.g. EPA for water quality, I-WeBS for wintering birds, Breeding Bird Survey for bird monitoring, IFI for fish monitoring).

A copy of all data on species will be uploaded to the NBDC within 4 weeks of a survey being carried out, and all data will be made available in a public repository, in line with the Open Data Directive[26]. Data on sensitive species will have a restricted availability (e.g. Badger setts). Monitoring procedures should be carried out for a sufficient length of time (minimum 1 year, and up to 5 years) in order to assess effectiveness of the measures. At the end of the monitoring period, a review of the findings will be carried out, and if necessary, monitoring will be prolonged.

Monitoring will include the following methodologies/guidance:

- Monitoring of disturbed habitats to determine condition using indicators of disturbance and assessment of vulnerabilities, including invasive non-native species.
- Bird monitoring using I-WEBs methodology for winter birds, and countryside bird survey methodology for breeding birds, with a walk through of suitable habitat to determine presence/absence of breeding ground-nesting or non-calling birds.
- Monitoring should be carried out until it is established that the ecosystems are functioning well, and of good condition – this will allow for adjustment of management until such conditions are achieved.
- Annual post construction monitoring for a minimum of 1 to 5 years depending on ecological receptor, and to be reviewed at the end of each term until adequate outcomes are achieved.
- Water quality monitoring in conjunction with DLRCC standard water quality monitoring standards.
- Data to be submitted to National Biodiversity Data Centre (NBDC) 4 weeks post survey.

Otter monitoring should also take place to ensure the proposed works have not impacted the local population and to resurvey potential holts/inactive holts. Surveys should be completed once per year for two years after the construction works are complete.

All post construction monitoring should be devised and conducted by a suitably qualified ecologist in consultation with NPWS and the local county council's Biodiversity Officer.

[26] EU, "Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on Open Data and the Re-Use of Public Sector Information (Recast)," L 172/56 § (2019)

Table 8.12: Summary of the project's ecological impacts, mitigation, enhancement and residual impacts

Ecological Feature	Importance of Feature	Potential Impact	Significance Without Mitigation	Mitigation / Enhancement	Significance of Residual Effects
Construction Phase					
Loughlinstown Woods pNHA	National	Habitat loss; tree loss; damage through surface water pollution and air quality impacts; mechanical damage from construction machinery.	Permanent and temporary adverse effects of moderate significance	Replanting/ regeneration of trees within small island adjacent to new culvert; Standard Environmental Best Practice measures including a Surface Water Management Plan, Pollution Control Plan, Dust Management Plan and appropriate Concrete management measures	Not Significant
Other artificial lakes and ponds	High Local	Damage through surface water pollution and air quality impacts; mechanical damage from construction machinery.	Temporary adverse effects of slight significance	Re seeding/plug planting Standard Environmental Best Practice measures including a Surface Water Management Plan, Pollution Control Plan, Dust Management Plan and appropriate Concrete management measures	Imperceptible adverse impact.
Eroding/upland rivers	Regional		Short term adverse effects of slight significance		
Mosaic: Eroding/upland rivers / Depositing/lowland rivers	Regional		Short term adverse effects of slight significance		
Drainage ditches	High Local				
Dry meadows and grassy verges	High Local				
Wet grassland	High Local				
(Mixed) broadleaved woodland	High local	Tree loss; habitat loss; mechanical damage from construction machinery; damage through surface water pollution and air quality impacts	Short term adverse effects of slight significance	Re seeding/re planting of trees. Removing non-native trees and replacing with native species of local provenance will enhance these habitats. Standard Environmental Best Practice measures including a Surface Water Management Plan, Pollution Control Plan, Dust Management Plan and appropriate Concrete management measures	
Mosaic: (Mixed) broadleaved woodland / Scrub	High local				
Mixed broadleaved/conifer woodland	High local				
Mosaic: Mixed broadleaved/conifer / Scrub	High local				
Scattered trees and parkland	High local				
Treelines	High local				
Hedgerow	High local	Tree loss; habitat loss; mechanical damage from construction machinery;	Short term adverse effects of slight significance	Re seeding/re planting of trees. Removing non-native trees and replacing with native species of local provenance	Imperceptible adverse impact.

Scrub	High local	damage through surface water pollution and air quality impacts	Short term adverse effects of slight significance	will enhance these habitats. Standard Environmental Best Practice measures including a Surface Water Management Plan, Pollution Control Plan, Dust Management Plan and appropriate Concrete management measures	
Mosaic: Scrub / Dry meadows and grassy verges	High local	Habitat loss; Damage through surface water pollution and air quality impacts; mechanical damage from machinery			
Terrestrial Mammals (Badger, Hedgehog, Pine Marten, Pygmy Shrew and Red Squirrel)	High Local	Disturbance; Killing/injuring; habitat damage through surface water pollution	Temporary impacts of slight significance	Toolbox talks; General avoidance measures	
Terrestrial Mammals (Otter)	Regional		Temporary adverse impacts of moderate significance		
Bats	High Local	Loss of foraging opportunities from vegetation loss and surface water pollution.	Short term adverse effect of slight significance	General avoidance measures	
Breeding Birds	High Local	Destruction of bird nests if in the breeding season; habitat loss	Temporary adverse impact of slight significance	Pre-works nesting bird check; General avoidance measures	
Amphibians	High Local	Disturbance; potential killing/injuring	Temporary adverse impact of slight significance i	Two-stage vegetation cut for clearance outside winter months for pond edge and ditch vegetation	
Reptiles	High Local				
Fish (Salmonids, Eel & Lamprey)	Regional	Disturbance; potential killing/injuring/ impediment of passage during in channel works.		Working in the dry; fish friendly pumps; fish rescue Standard Environmental Best Practice measures including a Surface Water Management Plan, Pollution Control Plan, Dust Management Plan and appropriate Concrete management measures	
Invasive Non-native Species	Not applicable	Spread of INNS within or to the site from other catchments.	long term adverse impacts of high significance	INNS management plan; Biosecurity	
Operation Phase					
All features	As above	No adverse impacts	N/A	N/A	N/A
Otter	Regional	No adverse impacts	N/A	Enhancement: New high flow culvert will improve safety for Otter crossing the N11 road.	Moderate positive
Bats	High Local	No adverse impacts	N/A	Enhancement: Bat boxes	Slight positive

8.11 Interactions

The construction of flood walls and instream works could potentially increase the sediment loading to surface water environments. Adequate mitigation measures for sediment control relating to the construction phase are addressed above in Section 8.8 for surface water and in Chapter 10: Water - Surface and Groundwater.

8.12 Cumulative Impacts

Potential impacts that may arise as a result of relationships between sensitive receptors within and outside of the site have been addressed in this EIAR and the AA Screening. Guidance for the assessment of indirect and cumulative impacts, as well as impact interactions has been taken from the European Commission document 'Guidelines for the Assessment of Indirect and Cumulative Impacts' as well as 'Impact Interactions' (Walker and Johnston 1999) and 'Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland' (CIEEM 2016 and 2006).

The list of projects in Chapter 16 has been consulted. With the implementation of mitigation measures outlined in this chapter, no significant cumulative impacts are considered likely with regard to biodiversity.

9 Land and Soil

9.1 Introduction

This chapter of the EIAR comprises an assessment of the likely significant effects of the proposed development with respect to land, geology, and soil. This chapter should be read in conjunction with Chapter 10 (Water – Surface and Groundwater) due to overlapping impacts and mitigation measures.

The following legislation was consulted during the preparation of this chapter:

- Water Framework Directive (2000/60/EC);
- Groundwater Directive (2006/118/EC);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Union Environmental Objectives (Groundwater) (Amendment) Regulations, 2016 (S.I. No. 366 of 2016);
- Waste Management Act 1996, as amended;
- Habitats Directive (92/43/EEC).
- Classification of waste material that may be taken off-site for disposal is based on the Commission Decision of 18th December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European parliament and Council (2014/955/EEC) [the List of Waste (LoW)]. These enable waste to be classified as either hazardous, non-hazardous or minor (either hazardous or non-hazardous).

9.2 Methodology

9.2.1 Methodology

The methodology for assessment of the impacts on soil and geology has been undertaken in accordance with the following guidance documents and recommendations:

- Environmental Protection Agency (EPA) (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.
- Department of Housing, Planning and Local Government (DHPLG) (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.
- National Roads Authority (NRA) (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

Sources of Information

Several sources of information were used to establish baseline environment conditions, through desktop surveys and site work.

- EPA Maps – gis.epa.ie
- GSI maps – gsi.ie
- SEPM Strata – sepmstrata.org
- Teagasc soil and subsoil database and mapping keys
- Dún Laoghaire-Rathdown County Development Plan (2022-2028)
- Aerial photography
- Google Earth
- Google Maps
- Site investigation report by Ground Investigations Ireland (GII), March 2024.
- Site walkovers

9.2.2 Assessment Criteria

The significance or sensitivity of receptors and assessment of effects have been described following criteria outlined in the EPA Guidelines.

In accordance with the IGI guidance, the study area has been set as a 2km radius from the site boundary. This is the recommended minimum distance in the IGI guidelines and takes into account the lack of karstic or other sensitive subsurface features at the site, and the scale and nature of the development.

Table 9.1: Criteria for Rating Site Importance of Geological Features (NRA, 2008)

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale*	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale Degree or extent of soil contamination is significant on a local scale Volume of peat and/or soft organic soil underlying route is significant on a local scale*	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or highly fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale Degree or extent of soil contamination is moderate on a local scale Volume of peat and/or soft organic soil underlying route is moderate on a local scale*	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and/or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale Degree or extent of soil contamination is minor on a local scale Volume of peat and/or soft organic soil underlying route is small on a local scale*	Large historical and/or recent site for construction and demolition wastes Small historical and/or recent landfill site for construction and demolition wastes Poorly drained and/or low fertility soils Uneconomically extractable mineral resource

9.3 Receiving Environment

Table 9.2: Site feature importance raking

Feature		Ranking	Comment
Land/land take	Residential and urban areas	Medium	To facilitate the proposed works and operation of the scheme there will be some temporary and permanent land take from private and public land.
Soil and subsoil	Made Ground	Low	A monitoring program will be implemented during construction in order to detect the presence of any contaminants.
	Topsoil	Medium	Topsoils in locations of the proposed works are generally urban and of low value. Non-urban soils are highly fertile alluvial soils, Luvisols, or Brown Earths within urban areas. No land take from agricultural lands will take place.
	Quaternary Sediment	Low	Excavations are not expected to be deep and subsoils in areas of proposed works are predominantly low value till and gravel.
Geological Heritage	Murphystone Quarry – DLR009	High	Active quarry, upstream of all measures. Nearest works are ~1km to the northeast.
	Killiney Bay – DLR007	High	Includes the Dalkey Coastal Zone and Killiney Hill pNHA and is recommended as a geological NHA.
	Three Rock Mountain – DLR011	High	Mountain summit with naturally formed tors. Nearest works are ~2km to the northeast.

9.3.1 Land-use

The Carrickmines-Shanganagh River catchment is approximately 36km^2 and encompasses a wide variety of land uses ranging from rural mountainous areas in the west and south, to urban and residential areas in the north and east. Corine land use data shows that within the last 30 years the area has seen the construction of the M50 and the M11 and consolidation of residential areas including Clon Brugh, Belarmine, Stepaside Park, and residential sections off Glenamuck Road South. Cherrywood Business Park was established during the late 90s and has been a central point for satellite commercial and industrial developments since then. The Cherrywood zone is now a designated Strategic Development Zone (SDZ) incurring the Cherrywood SDZ Planning Scheme that endeavours to convert the land into a self-contained locality with a town and village centre, and educational, recreational, and commercial facilities, and residential zones.

Preservation of green spaces and natural amenity is increasingly important in this rapidly evolving landscape. Several parks and recreational facilities such as Stepaside Golf Course, Loughlinstown Woods, and Belarmine Park provide vital natural areas within the urban context and it is an objective of DLRCC to protect and enhance green spaces throughout the area.

The Proposed Development works will take place in suburban areas, often along riparian corridors or roads. Some temporary land take from private residences will be required particularly where there are space constraints. There will be minor permanent land take of a small section of Loughlinstown Woods to accommodate proposed measures. The Flood Relief Scheme is crucial to the sustainable development of the area and meeting the needs of the growing population.

9.3.2 Bedrock Geology

The Proposed Development is located close to the foothills of the Dublin Mountains which form the northern unit of the Leinster Granite batholith. This rock unit was produced during a mountain building period of collisions between tectonic plates, termed the Caledonian Orogeny. The bedrock is igneous and largely comprised of coarse-grained granite with embedded crystals of muscovite. A region of dark blue-grey slate is present towards the eastern coast.

Proposed works are underlain by four specific geological units according to GSI maps. The works at Clon Brugh, Belarmine, Kilgobbin Road and Glenamuck Road North overlie granite with large muscovite crystals. Glenamuck Road North also overlies equigranular pale fine grey to coarse-grained granite. Cherrywood Road, Lower Brides Glen and Bray Road works overlie an area of granite embedded with large microcline crystals. The downstream works sites of Commons Road, Brookdene, and Bayview overlie dark blue-grey slate, phyllite, and schist.

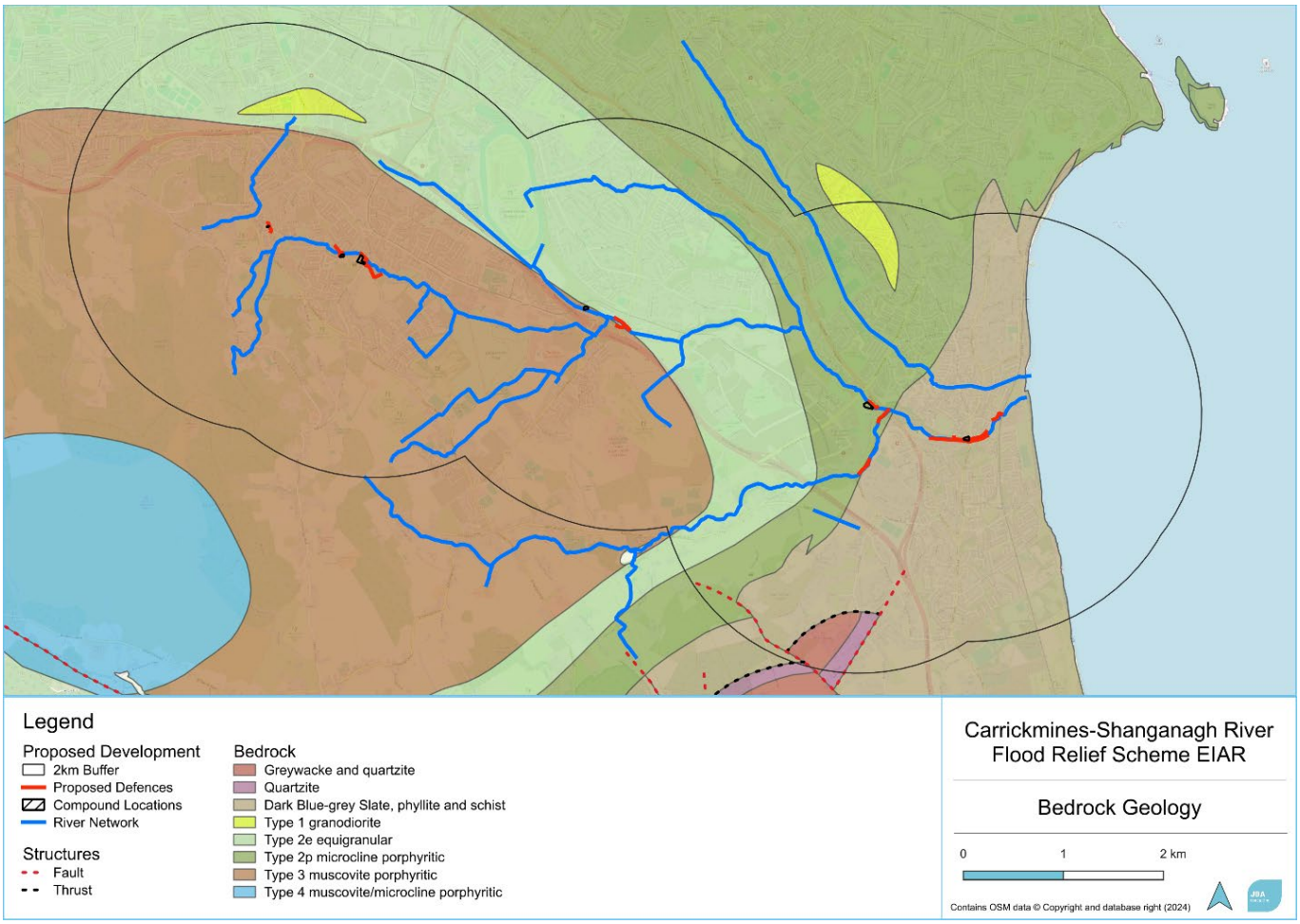


Figure 9.1: Bedrock Geology across the Carrickmines-Shanganagh catchment

9.3.3 Quaternary Sediment

Quaternary sediment across the Proposed Development area is derived from the composite granite bedrock. Towards the north the quaternary environment is increasingly man-made ground.

Specific measures overlie made ground, granite till, limestone till, and alluvium.

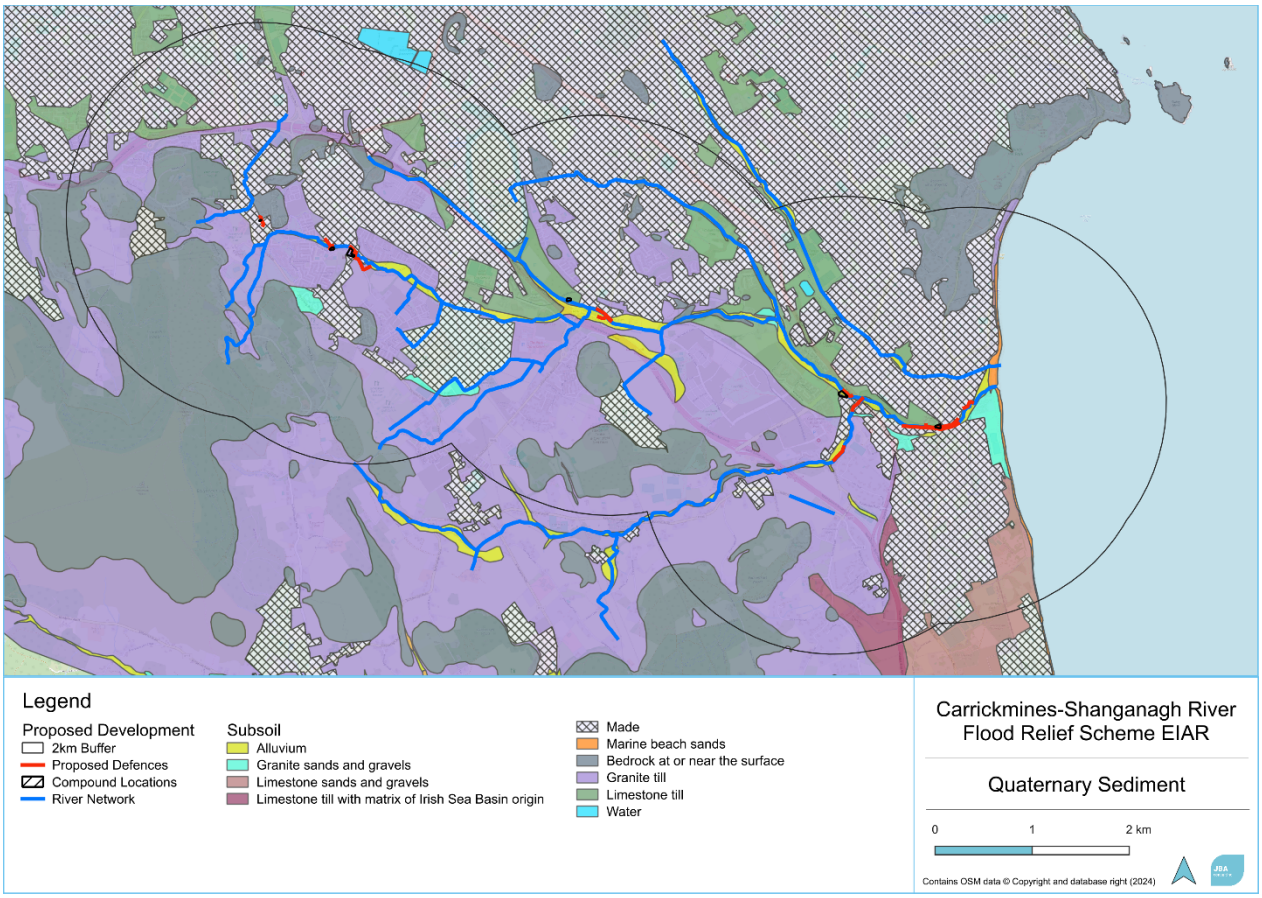


Figure 9.2: Quaternary Sediments across the Carrickmines-Shanganagh catchment

9.3.4 Topsoil

Topsoil across the catchment is generally made ground to the north and a mix of acidic poorly productive soils with neutral to mildly acidic relatively fertile soils to the south. These broad soil types are reflective of the underlying granite bedrock that often produce acidic subsoils and topsoil.

Table 9.3: Soil types across the Proposed Development area

Soil Association	Great Groups	Description
0410a	Lithosol, Podzol, Brown Podzol, Brown Earth, Ombrotrophic, Groundwater Gley	Loamy, generally acidic soils of poor fertility and shallow depth. Brown Earths and Ombrotrophic soils are more productive.
1100a	Brown Earth, Groundwater Gley, Brown Podzolic, Surface water Gley, Luvisol	Loamy, neutral to mildly acidic soils. Relatively fertile and well drained. Gleys are less productive, Luvisols are more productive.
05RIV	Alluvial	Loamy, silty, clayey, sandy alluvium. Highly fertile and vulnerable to erosion
1030a	Luvisol, Surface water Gley, Brown Earth, Groundwater Gley	Coarse to fine loamy with siliceous stones. Neutral to slightly acidic. Generally highly productive. Gleys are less productive due to water logging.
Urban	Urban	Made ground and urban soils

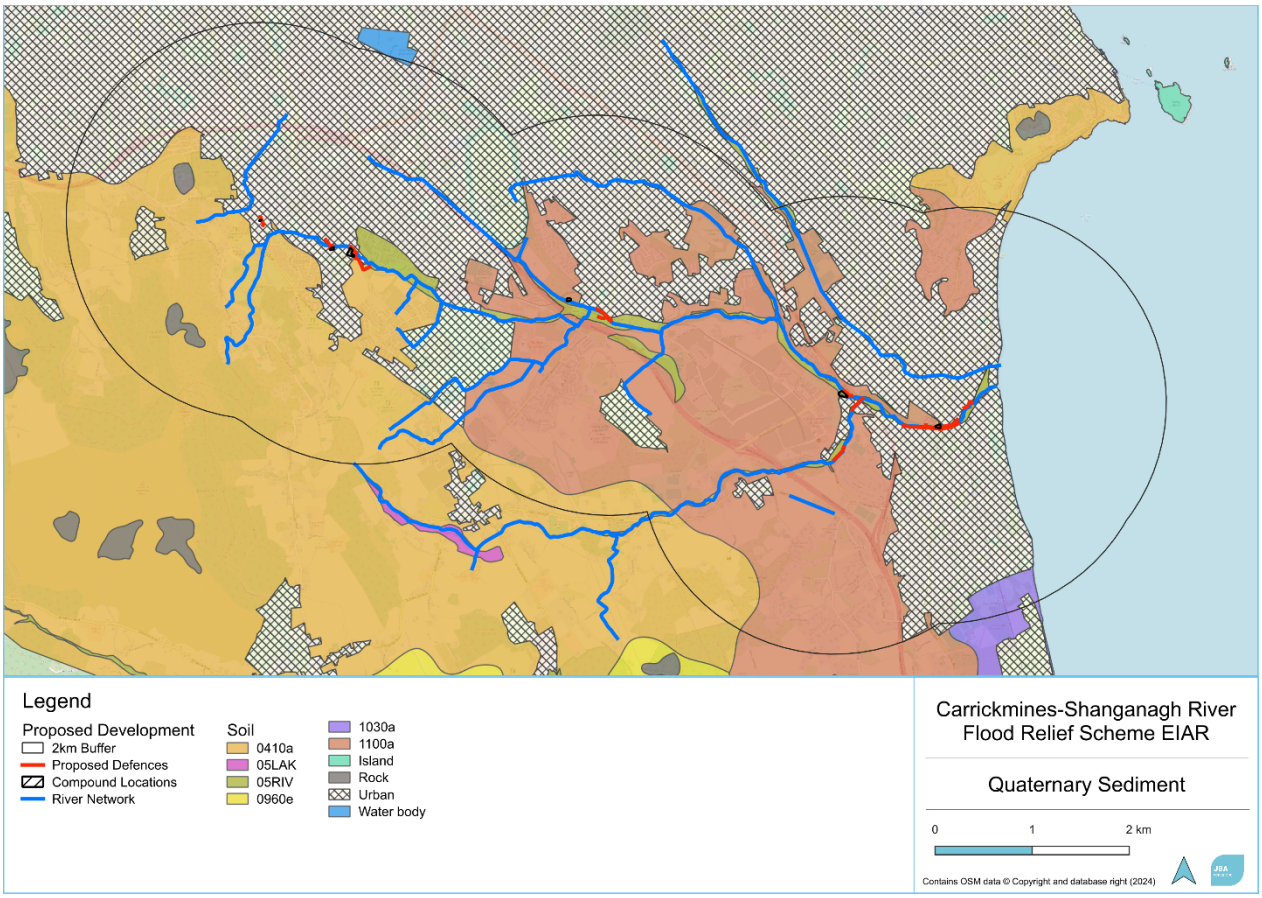


Figure 9.3: Topsoil across the Carrickmines-Shanganagh catchment

9.3.5 Karst

There are no karst features within the vicinity of the proposed development. The only well within the study area was identified as St. Patrick's Well, a holy well. Located on private grounds approximately 1.2km south of works proposed at Belarmine Park, it was formerly visited regularly on St. Patrick's Day[27].

9.3.6 Geohazards

There are no recorded landslides within the study area. Slumping has been noted along the Killiney cliffs. Radioactive minerals are more commonly found in igneous rocks like granite. According to the EPA Radon Risk Map, proposed measures take place in different levels of radon risk. Clon Brugh, Belarmine Park and Kilgobbin Road are in areas of high radon risk. Glenamuck Road North is within an area of medium risk and the works areas further east are in areas of low radon risk.

9.3.7 EPA Licensed Facilities and Waste Facilities

There are three EPA licenced facilities within 2 km of proposed works.

Ballyogan Landfill Facility Ballyogan Recycling Park – Waste Licence W0015. Located in Jamestown Park approximately 1.5 km from Measures 2 and 3. Both hazardous and non-hazardous household, commercial, and industrial waste is accepted at this facility for recycling and waste recovery. The facility has a maximum 400,000tpa capacity for landfill and 225,000tpa capacity for recycling.

[27] Joe Walsh Collection, St. Patrick's Well, 2011, https://hdl.handle.net/10599/7379

Sleever International Limited – Integrated Pollution Control Licence P0674-01. A manufacturing facility located in Sandyford Business Park approximate 1.3km north of Belarmine Park.

No environmental complaints have been made for 2023, however, five minor incidents relating to elevated values for BOD and COD for the year were reported which are in the process of being resolved. Water usage has remained stable between 2022 and 2023. Surface water analysis is now being conducted monthly since October 2023.

Shanganagh-Bray Wastewater Treatment Plant – Wastewater Discharge Licence D0038-01. Located less than 100m from measure 5.C, municipal wastewater is treated at a secondary level prior to discharge into the Irish Sea.

9.3.8 Minerals/Quarries/Mines

Granite deposits are located in the foothills of the Dublin Mountains in the areas of Stepaside and Jamestown. There is only one active quarry producing granite which is also a designated Geological Heritage Site. Murphystone Quarry (DLR009) is not accessible to the public and the nearest proposed measures in Clon Brugh are approximately 1km to the northeast.

A clay and brick deposit was identified on GSI maps in the area of Foxrock although there is no record of an associated quarry. Sand and gravel deposits are noted along Killiney Bay.

A historical mine is located between Kilternan and Shankill, in the area of Ballycorus. Elements of interest were Lead, Zinc, and Silver. Although some lead was mined at this location, the site is known predominantly for its smelter and the processing of lead mined in the Glendalough District[28].

9.3.9 Geological Heritage

There are three sites of County Geological Importance falling within the study area.

Murphystone Quarry – DLR009. A large working quarry extracting granite from the northernmost pluton of the Leinster Granite.

Figure 9.4: Murphystone Quarry as seen from the entrance[29]

[28] Geological Survey Ireland, Summary Report for Historic Mines Sites in Ireland; Ballycorus, 2009

[29] Dun Laoghaire-Rathdown County Geological Site Report - https://gsi.geodata.gov.ie/downloads/Geoheritage/Reports/DLR009_Murphystone_Quarry.pdf

Killiney Bay – DLR007. A 5km stretch of coast that exposes a succession of several units of glacial till. A particularly impressive exposure into deep till with many sedimentological characteristics exposed. Designation as a geological NHA has been recommended.

Coastal erosion is a threat at Killiney Bay, and the cliffs are prone to slumping. Baffles and mesh-wire structures have been installed to stop the recession of the cliffs. This now means many portions of the exposure at Killiney Bay are slumped, without the sea removing the slumped material, and the section is no longer continuously exposed.

Figure 9.5: Left: An example of layered glacial till; Right: Coastal protection measures 'rock armour' boulders

Three Rock Mountain – DLR011. A landmark mountain to the southwest of Dublin City, on which craggy stumps of granite stand proud. The granite outcrops (tors) look man-made but are natural, formed by differential weathering of granite bedrock. This is an important County Geological Site, because the granite tors are landmark features and the best examples in the Dublin and Wicklow Mountains.

The site is not fully within the 2km study area, and the closest measures are approximately 2km to the northeast in Clon Brugh.

Figure 9.6: Three-Rock Mountain tor[30]

[30] Dun Laoghaire-Rathdown County Geological Site Report - https://gsi.geodata.gov.ie/downloads/Geoheritage/Reports/DLR011_Three_Rock_Mountain.pdf

9.4 Site Investigation

A detailed Site Investigation has been conducted by GII (March 2024) which will include the following geotechnical assessment methods:

- Cable Percussion Borehole
- Rotary Core
- Dynamic Probe
- Window Sampling
- Slit Trench
- Trial Pit
- Foundation Inspection Pit
- Laboratory Testing incorporating environmental and chemical parameters

Strata encountered generally consisted of the following:

- Topsoil
- Made Ground
- Cohesive Deposits or Granular Deposits
- Weathered Bedrock
- Bedrock

Made ground was generally variable in depth and consisted of brown sandy slightly gravelly Clay with occasional cobbles and boulders, and contained rare fragments of concrete, brick, plastic, pipe, timber, metal, and roots.

The pH and sulphate testing carried out indicate the pH results are near neutral and that the water-soluble sulphate results are less than 500 mg/l for all soil samples tested.

Groundwater strikes were noted where they occurred and are discussed in full in Chapter 10: Water – Surface and Groundwater.

9.5 Potential Impact of the Proposed Development

9.5.1 Do-Nothing Scenario

Under the Do-Nothing Scenario it is likely that flooding will continue in the catchment. This would result in intermittent deposition of sediment across urban and green spaces. Flooded parts of the catchment would also be vulnerable to contamination through pollutants borne by flood waters settling onto the land as flooding recedes. Outside of flood events there would be no resulting effects on land and soils in the scheme area.

9.5.2 Construction Phase

Excavation

Changes to the soil and geological environment as a result of the scheme will arise predominantly through excavation and subsequent infilling. The total volume of material to be excavated will be confirmed following detailed design.

Topsoil will be reused where possible and exact volumes to be retained will be provided by the appointed contractor. Subsoils unsuitable to be used as infill material will be exported off-site and disposed of at a suitable licensed facility. Temporary storage of soil will be carefully managed in such a way as to prevent any potential adverse impact on the receiving environment and the material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.

Excavation depths and total area of land to be subjected to earthworks will be confirmed following detailed design. Without mitigation the effects of excavation on topsoil would be **temporary, slight, adverse**. Due to the shallow excavation depths, effects on subsoils are **not significant**.

Import of Soil

The importation of infill material can introduce contamination to the site if sourced from inadequate facilities, i.e., soil that is contaminated with hazardous materials or invasive plant species or their seeds could be imported, thereby spreading those materials or invasive species to the proposed development site. Without mitigation, the effects of importing contaminated soil would be **long-term, slight, adverse** and **not significant.**

An indirect impact of the soil import to the site during the construction phase will be the increase in truck movements to the site which are discussed in the next section. This will have a subsequent impact on air quality, noise and nuisance. These impacts are further described in the Material Assets chapter and are **not anticipated to be significant**.

Site Compounds

A total of six construction compounds will be set up to support the groups of proposed measures at five locations throughout the catchment.

These works will be taking place in a built-up area with space constraints. Consultation with landowners for temporary use of these sites will be required, with lands for compounds to be temporarily acquired by agreement with the landowners. Movement of vehicles and construction machinery to and from these sites could potentially impact soils locally through compaction or contamination through stored materials. Following construction, site compounds will be restored to their pre-construction state. There will be a **temporary slight adverse** and **not significant** effect on the site compound areas during construction, with **no long-term adverse effects** expected following remediation.

Accidental Spills and Leaks

There is a risk of localised accidental pollution incidences anywhere works are being carried out, with the highest risk in areas where oils and fuels are stored. The following are potential sources:

- Spillage or leakage of temporary oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- Run-off from in-situ concrete casting.
- Release of pollutants from contaminated excavated material.

All site and welfare compounds are proposed for areas where subsoil permeability is low, and the average groundwater recharge is between 1 – 100 mm/year.

Accidental spillages can result in localised contamination of soils, geology, and groundwater underlying the site, should contaminants migrate through the subsoils. In less permeable soils, the risk of potential contamination of surface water run-off could be higher, as contaminants would be less likely to infiltrate to ground and would instead be more likely to follow overland flow pathways. The impact of pollution on soils and geology would depend on the type of contaminant and extent of the spill. In a worst-case scenario with no mitigation in place, a spill could result in significant adverse impacts to soil health or underlying groundwater quality. The effect of this could be **long-term, moderate to significant, adverse.**

9.5.3 Operational Phase

Culvert installation

The overflow pipe installed across the N11 dual carriageway will mitigate flooding of the road during flood events resulting in no loss of transport amenity. Rip-rap will be added as a flow dissipation measure and to prevent erosion.

The replaced screen at Belarmine Park will help to reduce pollution and debris and in turn reduce the likelihood of contamination permeating through the hyporheic region into underlying subsoils, groundwater, and bedrock.

The additional culvert proposed for Kilgobbin Road is not anticipated to have significant effects on the pedological or geological environment.

The overall impact of culvert installation or upgrade on the geological and pedological environment is expected to be **long-term, neutral**.

Walls

Flood walls are proposed within or adjacent to the riparian zone of waterbodies. Removal of fertile alluvial topsoil to accommodate the foundations and walls will have a permanent, imperceptible, adverse impact on the quality of the soil function in localised areas. Foundations have been designed so as not to have a significant impact on groundwater flow patterns in the area. Impacts during the operational phase will be **permanent, imperceptible,** with a **neutral** effect on land, soils and geology.

Maintenance

Regular and routine maintenance is not expected to have any impact on land and soils. Any exceptional maintenance that requires construction work or excavation is considered unlikely. If it occurs, it would have localised and temporary impacts similar to those outlined in Section 9.5.2 above.

9.6 Mitigation Measures

9.6.1 Construction Phase

Site Compounds

Below are outlined the site-specific mitigation measures. A preliminary Construction Environmental Management Plan (CEMP) has been prepared which includes all of the mitigation measures as outlined in this EIAR. This will be taken by the contractor and used to implement all EIAR mitigation measures during the construction phase of the proposed development.

- Temporary pathways and roads will be constructed to allow for the movement of heavy machinery and minimise the risk of soil compaction.
- Temporary storage of soil will be carefully managed in such a way as to prevent any potential adverse impact on the receiving environment. Topsoil stockpiles will be covered with rapid vegetation or other means as part of the construction methodology. The material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.
- Stockpiles will not exceed 1.5m in height.
- Fill material will be tested and imported from a licensed facility to ensure no external contamination is introduced to the soil and geological environment.
- Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

- Re-fuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (or where possible off the site) which will be away, a minimum of 10m from any existing surface water gullies or drains, or exposed ground or excavations.
- An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in any refuelling areas and site compounds. All relevant personnel will be fully trained in the use of this equipment.
- Mitigation measures for concrete management are included in the Biodiversity chapter of the EIAR which include measures to prevent discharge of alkaline wastewaters or contaminated stormwater to the underlying subsoil.
- The pouring of concrete will take place within a designated area using a geo-synthetic material to prevent concrete runoff into the soil/ groundwater media. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility off site.

The contractor will be required to carry out a waste characterisation of the material that will be taken off site for disposal. Waste acceptance criteria (WAC) analysis, classification of soil samples using the HazWasteOnline tool and testing for asbestos levels shall be determined on any material that will be taken off site for disposal. All wastes in the European Waste Catalogue are classified by a unique 6-digit code. In this case (waste soil/stones), two List of Wastes (LoW) Codes are applicable to material that may be taken off site for disposal during the construction phase:

- 17 05 03* - Soil and stones containing hazardous substances
- 17 05 04 - Soils and stones other than those mentioned in 17 05 03.

Excavated material which is not used as fill on site could be reused on another site as a by-product while adhering to Article 27 of the EC (Waste Directive) Regulations (2011). This would further reduce the volume of waste generated during excavation. If this is not possible, the excavated material will be removed from the site as waste to an appropriate licenced soil recovery facility. The appointed contractor will investigate potential sites for soil reuse, prioritising the closest suitable sites in order to reduce haul distances.

The National Waste Collection Permit Office maintains a register of licenced waste recovery facilities. Numerous facilities are registered for the collection of uncontaminated soil and stone (17 05 04) in the DLRCC area. The contractor will consult the register to determine the closest appropriate facilities (https://www.nwcpo.ie/permitsearch.aspx)

Any soil samples that are found to contain contaminants should be subjected to full quantification analysis. If the waste soil is sent to a waste licenced soil recovery facility, the chemical analysis of the soil must meet the requirements given in Table 3.3 (Summary of Soil Trigger Levels for Soil recovery Facilities) of the Environmental Protection Agency's Draft Publication – Waste Acceptance Criteria and Development of Soil Trigger Values for EPA-Licenced Soil Recovery Facilities, December 2017. The acceptance of this material at a licenced soil recovery facility will be subject to the approval of the facility operator. As above, the NWCPO register will be consulted by the contractor. Numerous facilities which are licenced for soil and stone containing hazardous substances (17 05 03*) are on the register and licenced in in the DLRCC area (https://www.nwcpo.ie/permitsearch.aspx).

Accidental Spills and Leaks

- No bulk chemicals will be stored within the active construction areas. Temporary oil and fuel storage tanks will be kept in the material storage area in suitable containers and will be appropriately bunded as required. Refuelling of vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in designated areas of the site, where possible, which will be kept a minimum of 10m away from surface water drains.
- Spill protection equipment such as absorbent mats, socks and sand will be available to be used in the event of an accidental release during refuelling. Training will be given to appropriate site workers in how to manage a spill event.
- The following mitigation measures will be taken at the construction site in order to prevent any spillages to ground of fuels during machinery activities and prevent any resulting soil and/or groundwater quality impacts:

- Refuelling will be undertaken at a designated refuelling location off-site;
- Where mobile fuel bowsers are used the following measures will be taken:
  - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use
  - The pump or valve will be fitted with a lock and will be secured when not in use
  - All bowsers must carry a spill kit
  - Operatives must have spill response training
- Portable generators or similar fuel containing equipment will be placed on suitable drip trays

Sourcing of fill materials

Responsible sourcing will ensure that impacts with regard to accidental import of invasive species do not occur. Clean soil will be imported to the site, and the contractor will be required to source the soil from areas that are free of invasive species, i.e., containing no Japanese Knotweed seed or legumes.

9.6.2 Operational Phase

No significant effects are anticipated during the operational phase. Therefore, no other mitigation measures have been proposed.

9.7 Residual Effects

9.7.1 Do-Nothing Scenario

Under the Do-Nothing Scenario flooding is likely to continue in the catchment. This would result in intermittent deposition of sediment across urban and green spaces. Flooded parts of the catchment would also be vulnerable to contamination through pollutants borne by flood waters settling onto the land as flooding recedes. Outside of flood events there would be no resulting effects on land and soils in the scheme area.

9.7.2 Construction Phase

Following the implementation of the proposed mitigation measures, the residual effects of the proposed development on land and soil will be minimised. Therefore, the effects during the construction phase will be **temporary, imperceptible, neutral** and **not significant.**

9.7.3 Operational Phase

The design of the scheme has been such that there are no predicted effects on land and soils during the operational phase of the development.

Overall, the effects of the proposed development during operation will be **permanent, imperceptible, neutral** and **not significant**.

9.8 Monitoring

9.8.1 Construction Phase

Visual monitoring will be undertaken during the construction phase, including the mitigation measures. Any potential contamination such as hydrocarbon and concrete spillages should be immediately investigated and remedied.

9.8.2 Operational Phase

Direct discharge to the underlying geological environment during the operational phase is not anticipated and will require no further monitoring.

9.9 Interactions

Surface and Groundwater

Soils and geology share direct links with groundwater and surface water. Soil quality and characteristics such as granularity, pore space, moisture content and texture have effects on the rate of groundwater recharge, infiltration, percolation, transmissivity, and run-off. Similarly, surface water run-off can affect soil quality and condition through deposition or withdrawal of chemicals, suspended solids, and nutrients.

Proposed flood relief measures at Bayview, Kilgobbin, Glenamuck Road, Cherrywood, Commons Road, and Brookdene will involve instream works or works within the riparian zone. All waterbodies at these locations have a 'Good' WFD status. It is therefore imperative that proposed flood measures do not have adverse impacts or cause a reduction in quality status. Effects arising from surface water run-off are further discussed in Chapter 10 of this EIAR. Without mitigation, the interaction between effects on Hydrology and Soils and Geology could result in a **short-term, significant, adverse** effect.

Through implementation of mitigation measures outlined in this chapter and Chapter 9 of the EIAR, the potential impact through interaction is reduced to **short-term, slight, adverse.**

Biodiversity

Interactions between soils, geology, and biodiversity can occur through surface, groundwater, and air pathways. The proximity of the Loughlinstown Woods and Dalkey Coastal Zone and Killiney Hill pNHAs poses a significant risk for the entry of contaminants via surface water run-off, dewatered groundwater, and soil erosion. Introduction of contaminants and suspended solids could lead to habitat degradation.

The import and export of soil or fill material could lead to movement of invasive species if contaminated soil sources are used. This could have an adverse interaction with biodiversity. The potential for adverse effects from invasive species is assessed in the Biodiversity chapter, with biosecurity mitigation measures developed in that chapter and above in Section 9.6. The effects of the development due to invasives are not expected to be significant.

Without the implementation of mitigation measures outlined in this chapter and Chapter 8, potential impacts through interaction would be **short-term, significant, negative**. With the implementation of appropriate mitigation measures, these combined effects would be reduced to **short-term, imperceptible, negative**.

Material Assets

A significant proportion of proposed flood relief measures are in urban areas adjacent to houses or along roads. The temporary use of public and private roads will be required during the construction phase. Access to private properties will require appropriate liaison with owners. Diversions, temporary disruptions, and increased traffic volumes are anticipated as a result of the increase in truck movements for the movement of materials.

It is likely that there will be interaction with utility networks such as ESB substations and networks, underground and overhead electric cables and masts, sewer networks, and streetlights which fall within the footprint of works proposed across the proposed development area. Without mitigation, the resulting interaction effects could be short-term, significant, negative. Through the implementation of appropriate mitigation measures these effects will be short-term, imperceptible, neutral.

Climate

Works where excavation of soil is proposed may occur in areas of seasonal waterlogging. Anaerobic conditions in soils can lead to an increase in carbon dioxide. Excavation of material across the scheme area will release sequestered carbon increasing greenhouse gas levels in the air. These effects are further discussed in the chapter addressing Chapter 6: Air Quality and Climate. The interaction of these effects will be **long-term, imperceptible, not significant**.

Air quality and Dust

Impacts to the land and soil can interact with air quality and create additional dust, during the earthworks phase of construction. The effect of the proposed development on air quality and dust is assessed in the Construction Impacts chapter and is not expected to be significant. No significant interaction is expected.

9.10 Cumulative Impacts

Cumulative effects are the result of several minor or insignificant effects combining to create a larger, more significant effect. The assessment of cumulative effects considers existing stresses on the baseline environment as well as developments that are in planning or are underway.

Figures 16.1 to 16.3 and Table 16.1 in Chapter 16 provide summary details of the projects/developments that have the potential to impact resources, traffic, or the local area, and so could have potential cumulative effects with the proposed flood relief scheme. This list has been consulted for potential cumulative impacts with regard to land and soils.

Several residential developments are planned in the area. Due to the size and nature of these developments they are not expected to result in significant cumulative effects on soils and geology. Overall, ensuring relevant legislation and proposed mitigation measures are adhered to and implemented, the cumulative effects associated with developments in the area are long-term with an imperceptible impact on land, soils, and geology.

No cumulative impacts on land and soils are expected due to the Dublin Array project.

10 Water – Surface and Groundwater

This chapter assesses and evaluates the surface and groundwater aspects of the proposed FRS. It should be read in conjunction with Chapter 8 (Biodiversity) and Chapter 9 (Land and Soil) due to overlapping impacts and mitigation measures.

The following legislation was consulted during the preparation of this chapter:

- The Water Framework Directive (WFD)(2000/60/EC) that established a framework for the protection of groundwater, surface water and transitional waters;
- The European Communities Environmental Objective (Surface Water) Regulations 2009 as amended (S.I. No. 792 of 2009);
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77 of 2019);
- European Communities (Quality of Salmonid Waters) Regulations (S.I. No. 293 of 1988);
- The Foreshore Acts, as amended;
- The European Communities (Water Policy) Regulations (S.I. No. 722 of 2003);
- The EU Floods Directive 2007/60 EC;
- Groundwater Directive (2006/118/EC); and
- The European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

10.1 Methodology

The methodology used in this assessment follows current Irish guidance as outlined above in Chapter 1 and in the following:

- OPW / DoECLG planning guidance (2011), "The Planning System and Flood Risk Management".
- Environmental Protection Agency (2022) 'Guidelines on the Information to be contained in Environmental Impact Statements'.
- Department of Housing, Planning and Local Government (DHPLG) (2018) 'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment'.
- National Road Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'.
- Institute of Geologists of Ireland (2013) 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements'.
- Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU) as amended by 2014/52/EU). European Union 2017.

10.1.1 Scale of Assessment

This chapter has considered all possible waters in the FRS area. This includes all surface waterbodies, such as rivers, streams, ditches, drains and the stormwater network, transitional and coastal waterbodies, and groundwater.

Potential impacts were assessed on a river reach scale. River reaches were delineated based on lengths of channel that are likely to behave predictably in terms of sediment transport processes and associated geomorphological form[31]. Figure 10.1 shows the location of the proposed development relative to these reaches. Note that the individual reaches make up the watercourses as named in Figure 3.1. Proposed flood relief measures are proposed for installation in the following river reaches:

[31] 20108-JBA-00-XX-RP-Z-00110_Hydromorphology_assessment_P01.06

- BO2 Ballyogan Stream; proposed measures 1.A, 1.B, 2.B, 2.D, 2.E, 2.G,
- CM3 Carrickmines River; proposed measure 3.A,
- CM1 Carrickmines River; proposed measure 5.D,
- BGS1 Bridges Glen River; proposed measures 4.A, 4.B, 4.C,
- SG2 Shanganagh River; proposed measure 5.A, and
- SG1 Shanganagh River; proposed measure 5.C.

The wider context of the surface waters in terms of their designation as part of Water Framework Directive (WFD) waterbodies was also considered where relevant.

Groundwater was assessed on a groundwater body or aquifer scale (details provided at Section 10.2.3), with consideration also given to potential impacts on the water table within the immediate vicinity of the proposed works.

10.1.2 Assessment Criteria

The criteria for assessment of impacts in the receiving environment are explained in the first chapter of this report. In addition to the EPA (2022) Guidelines, the NRA (2009) criteria for assessing the importance of surface water and hydrogeological attributes are useful (Table 10.1 and Table 10.2). These criteria have been used to assist in rating the importance of features, which are then combined with the description of effects as shown in the matrix of significance in Figure 1-1 in Chapter 1.

Table 10.1: Criteria for Rating Importance of Hydrological Attributes (NRA, 2009)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g., 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

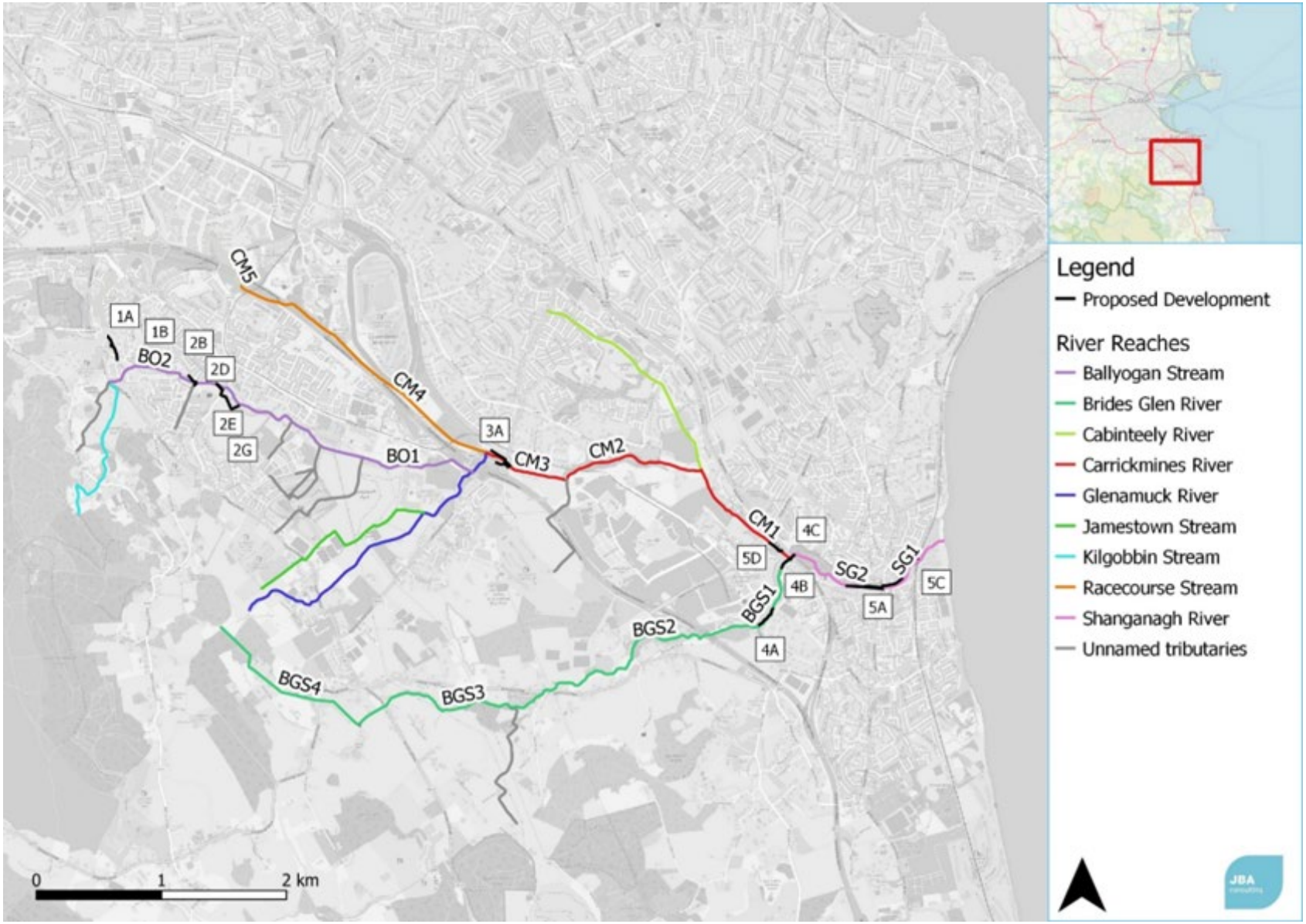


Figure 10.1: Proposed flood relief measures and associated river reaches.

Table 10.2 Criteria for Rating Importance of Hydrogeological Attributes (NRA, 2009)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g., SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes

Note: “Extremely high”, “very high”, and “high” in Tables 10.1 and 10.2 all correspond to “high” significance or sensitivity of a feature in the effects significance matrix (EPA, 2022).

10.2 Existing Environment

10.2.1 Baseline Assessment

This assessment was considered in the context of the available baseline information, potential impacts, consultations with statutory bodies and other parties, and other available relevant information. In collating this information, the following sources of information and references were consulted:

- Latest EPA water quality monitoring data for watercourses in the area, available on www.epamaps.ie;
- EPA Catchment website (www.catchments.ie);
- Dun Laoghaire Rathdown County Development Draft Plan 2022 - 2028[32];
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW);
- Office of Public Works flood mapping data (www.floodmaps.ie);
- Classification (regionally important, locally important) and extent of aquifers underlying the site perimeter area (www.gsi.ie);
- Natural hydrogeological/karst features in the area and potential for increased risk presented by the activities at the site (www.gsi.ie);
- National Parks and Wildlife Services (NPSW) www.npws.ie on-line database; Protected Register; and
- River Basin Management Plan 2018-2021.

10.2.2 Surface water: hydrological environment

The proposed FRS includes measures to be situated on several stretches of watercourse within the Carrickmines-Shanganagh River network.

The river network is located in the Ovoca-Vartry WFD catchment, Dargle_SC_010 sub-catchment, and Carrickmines Stream_010 and Shanganagh_010 sub-basins. These sub basins comprise several streams and tributaries including Kilgobbin Stream, Ballyogan Stream, Carrickmines River, Shanganagh River,

[32] Dun Laoghaire Rathdown County Development Draft Plan 2022 - 2028. Available at: County Development Plan 2022-2028 | Dún Laoghaire-Rathdown County Council (dlrcoco.ie) [Accessed, April 2024]

Ticknock Stream, Glenamuck River, Brides Glen River, Cabinteely River, and Racecourse Stream. Information about the condition of these WFD waterbodies is provided in subsequent sections to provide contextual information about the existing environment. However, the impact assessment is conducted at the river reach scale (see Figure 10-1) and considers all possible watercourses within the site boundary, as described above in Section 10.1.

The proposed scheme includes interventions on some of the rivers and streams including: Kilgobbin Stream, Ballyogan Stream, Carrickmines River, Brides Glen River and Shanganagh River as shown in Figure 10.2. These streams and rivers will be referred to collectively as **Carrickmines-Shanganagh River network** in the following sections.

The river network also includes inputs from the existing stormwater network. The stormwater network in the area of the proposed development is shown in Figure 10.2. Overland flows in the area are typically collected by the existing stormwater network, and eventually conveyed to retention areas or directly discharged to the river network. The contributing sub-catchments (based on a combination of topography and the stormwater network) of the stretches of river that works will take place on are shown in Figure 10.2.

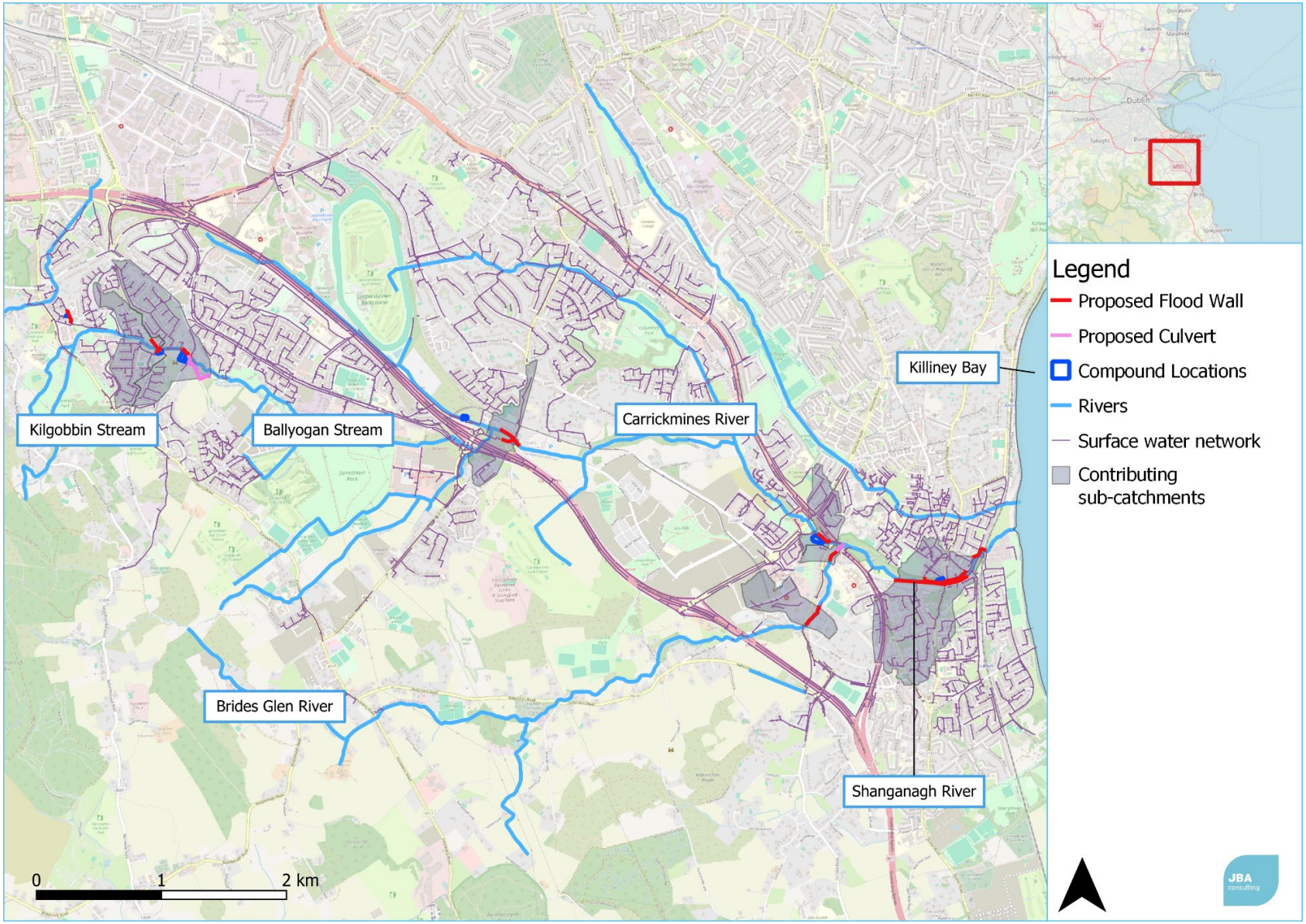


Figure 10.2: Waters in the area of the proposed development

The Carrickmines-Shanganagh River network

Kilgobbin Stream

The Kilgobbin Stream originates from the Dublin mountains near Kilternan village, composed by two tributaries flowing through Fernhill Park. It is culverted in the Rosemont School area where the two tributaries meet and continue flowing through green spaces along Clon Brugh. Downstream of this point, it becomes the Ballyogan Stream.

Ballyogan Stream

The Ballyogan Stream flows in a southeasterly direction collecting small streams from Stepaside and green spaces of Jamestown Park. It flows to the rear of properties at Ballyogan before flowing under the M50 in a culvert. From here it flows along the Glenamuck Road North and past the Glenamuck Road North Roundabout. Further downstream it joins the Carrickmines River.

Carrickmines River

The Carrickmines River flows through diverse green and urban landscapes, including residential and recreational areas. It is fed by the Ballyogan Stream just downstream the roundabout and further downstream by the Cabinteely River. The river has an important role as an ecological corridor within a highly urbanized area. It is straightened and culverted along the urban areas and is characterized by a more natural course in green spaces. After its confluence with the Cabinteely Stream the river becomes larger, and it flows in greenspaces along the residential areas of Loughlinstown. At Bray Road it flows close to the rear of properties. In this part it is engineered with flood walls on the left bank. The river flows under the N11 in a culvert, just upstream of its confluence with the Shanganagh River.

Brides Glen River

The Brides Glen River originates from the Dublin Mountains and meanders through agricultural land and woodland before entering more urban landscapes as it flows east toward the Cherrywood area. This watercourse is fed by different small streams acting as natural drainage. The Brides Glen River eventually flows beneath the N11 in a culvert, and into the Shanganagh River.

Shanganagh River

After the confluence with the Carrickmines the Shanganagh River flows through Loughlinstown Woods, a proposed Natural Heritage Area (pNHA). The river is straightened as it flows along Commons Road toward the Shanganagh Road Bridge, with flood walls along the right bank. Vegetation is present on both banks of the river in this area. Downstream of the Shanganagh Road Bridge it flows northeast. Continuous flood walls are present along the river on the right bank and a riparian vegetation on the left bank. The river continues north and east through a narrow riparian corridor before flowing underneath the railway line, along the Shanganagh-Bray wastewater treatment plant, onto the beach where it enters Killiney Bay and the Irish Sea.

Stormwater Network

The stormwater or surface water network in the area of proposed works is shown in Figure 10.2. This is composed primarily of roadside gullies and gully pots, underground pipes, and retention areas in open green spaces. The stormwater network contributes to the Carrickmines-Shanganagh River Network at various points; the contributing sub-catchments to the areas of works are shown in Figure 10.2.

The stormwater network is outside the scope of the proposed development (i.e., no changes to the network are allowed or proposed). Hydraulic modelling took place during the development of the proposed works to ensure that no surcharging of the stormwater network would take place as a result of the FRS.

Killiney Bay

The Carrickmines-Shanganagh River Network drains into Killiney Bay. Killiney Bay also receives water from the Deansgrange Stream (outfall approx. 200m north of the Carrickmines-Shanganagh River outfall) and from the wider Irish Sea and other nearby coastal waters, including Dublin Bay. Killiney Bay is designated as a WFD Coastal Waterbody (Southwestern Irish Sea - Killiney Bay (HA10)). Its ecological status for 2016-2021 is High, and its risk status is Not at Risk.

Shanganagh-Bray Wastewater Treatment Plant (WwTP)

Shanganagh-Bray WwTP, Co. Dublin, has a capacity of 186,000 Population Equivalent (PE) and occupies a site area of approximately 3.25 hectares. All units within this WwTP are covered and strict odour and noise controls exist at the boundary of the site. The area around the plant is landscaped and used by the local community for walking, playing pitches and a community garden. It consists of primary and secondary (biological) treatment. The treated effluent discharges directly to the sea approximately 1.7 km offshore, and a stormwater overflow discharges just off the beach. According to the latest Annual Environmental Report (Irish Water, 2022[33]), the plant complies with environmental requirements, identifying non-compliances, BOD (Biological oxygen demand) related, at the discharge.

Flooding

Areas at risk of flooding in the OPW National Flood hazard maps are defined through collection of recorded data and observation of flood events. Major flooding was recorded in 1982 when the Shanganagh river overflowed. At Cabinteely, debris was washed downstream, which together with mature instream vegetation, blocked a culvert forcing the river to overtop. In October 2011, river flooding was reported immediately upstream of the N11 at Bray Road. Most recent flood events occurred in November 2014 and March 2018 in the Sandyford area, impacting several properties and roads, making them impassable. The same occurred in the upper catchment areas of the Brides Glen River.

The main flood mechanisms in the scheme area are:

- Constriction of flow by structures, which increase levels upstream;
- Areas where there are low bank levels and flood flows are allowed to escape;
- Constrained channels forcing water levels to increase and overtop;

The scheme area is divided into five flood cells, which were identified based on the flood mechanisms impacting each area and the risk of flooding. The five flood cells are shown in Figure 10.3 and the number of properties at risk in each of them are summarised in Table 10.3 below.

Table 10.3 Flood mechanisms and properties at risk in each flood cell

Flood Cell	Name	Number of properties at risk in the 1% AEP event	Flood mechanism
1	Carysfort-Maretimo overflow	4	Overland flow transferring from the Carysfort-Maretimo River.
2	Belarmine-Kilgobbin	15	Constricting structures: -Culvert along the southern boundary of Sandyford Hall estate -Undersized structure under the road downstream Kilgobbin Road
3	Carrickmines	1	Increased flow spills out of the river channel due to low bank levels and two restrictive culverts at the roundabout

[33] Annual Environmental Report, Shanganagh, Irish Water, 2022,available at: D0038-02_2022_AER.pdf (water.ie)

Flood Cell	Name	Number of properties at risk in the 1% AEP event	Flood mechanism
			and Luas Park & Ride facility
4	Brides Glen	22	Constricting structure under the viaduct increases levels upstream where the left-hand bank is low, resulting in out of bank spill. The overland flow from this location travels down Cherrywood Road eventually re-entering the Brides Glen River by flowing through several properties. Flood flows entering the N11 culvert cause a backwater effect with increased levels upstream triggering out of bank flooding impacting properties and the N11 road
5	Loughlinstown Village and Commons Road	56	Low bank levels causing spill into properties and on to the road before any potential backwater effect from the culvert downstream has any impact In the key area of flooding at Commons Road a combination of narrow channel shape and constricting bridges along the reach generates increased water levels upstream.

Further details are provided on the Carrickmines-Shanganagh Flood Relief Scheme Options Report. [34]

The design flood event for the Carrickmines-Shanganagh FRS is the 1% AEP event. Figure 10.3 shows the extents for the 1% AEP event with additional detail for key areas provided in the following sections.

Water Framework Directive and EPA Q values

According to the WFD 2016-2021 assessment, the Carrickmines Stream_010 and Shanganagh_010 WFD waterbodies have a Good Ecological Status and are Not At Risk. However, urban runoff from diffuse sources has been identified as a significant pressure for both waterbodies. For Carrickmines Stream_010, WFD monitoring data from 2013-2018 notes a Moderate status for invertebrates and ongoing biological monitoring. For Shanganagh_010, chemical monitoring identified Moderate conditions for Phosphate and ortho-Phosphate during 2013-2018 however trends are now upward (improving).

The EPA's biological river water quality classification (Q values) is based on macroinvertebrate biological sampling at water monitoring stations[35]. There are five EPA water monitoring stations with Q rating records in 2003 and 2020, within the proposed development site. The water quality status recorded at the proposed site varies from Good to Poor, for different monitoring stations. While the results of 2003 monitoring in Loughlinstown and Glenamuck stations show a Poor status in these locations, monitoring in 2020 for all the other stations shows Good Status. Details on the monitoring of Q values are given in Table 10.4.

[34] Carrickmines - Shanganagh Flood River Relief Scheme Option Development Report. JBA and EGIS, February 2024
[35] EPA river quality surveys: Biological. Available at https://epawebapp.epa.ie/qvalue/webusers/

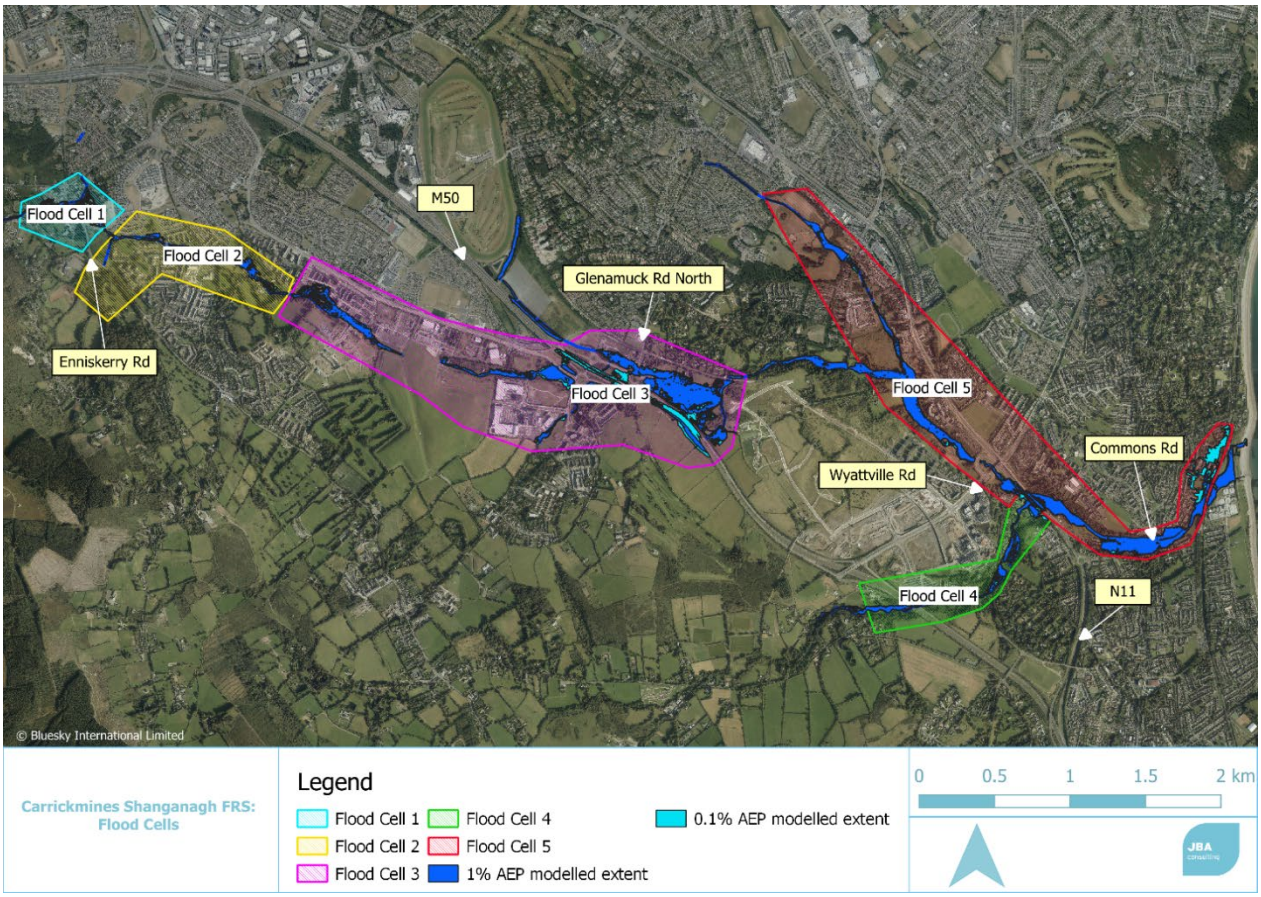


Figure 10.3: Design flood event – 1% AEP event baseline scenario

Table 10.4: Q values recorded at monitoring station within and close to the site

No	Station code	Location	Year measured	Q rating	Status
1	RS10S010600	Commons Road	2020	4	Good
2	RS10C040400	Loughlinstown	2003	3	Poor
3	RS10S010460	(Heron Ford Lane)	2020	4	Good
4	RS10C040350	Herron Ford Lane	2020	4	Good
5	RS10C040200	CARRICKMINES STREAM - Glenamuck Rd Br, at the proposed site (hydrologically connected)	2003	3	Poor

10.2.3 Groundwater

The Wicklow groundwater body (IE_EA_G_076) underlies the proposed development area. It has a good status according to the WFD 2016-2021 assessment and is Not At Risk. Anthropogenic pressures have been identified as a significant pressure on the groundwater body. The permeability of subsoil is classified overall between 'low' and 'moderate', with the possibility for saturation of the subsoils following heavy rain and increased overland flow.

The underlying bedrock of the site is mainly composed of Granite with muscovite phenocrysts, and Pale grey fine to coarse-grained granite in the centre and western region. In the southern and eastern region, the bedrock is composed of a small extension of granite with microcline phenocrysts and dark blue-grey slate, phyllite & schist.

The subsoils present within the study area are mainly composed of: Made ground; Granite till; Till derived from limestone with traces of Alluvium, sand and gravel. The GSI dataset was consulted for groundwater karst data (GSI, 2024). No karst features were identified within 2km of the proposed development.

The EPA groundwater abstractions register was also consulted. This shows all registered groundwater abstractions which are above 25m^3 per day, with grid locations rounded to the nearest kilometre (for privacy reasons). There is 1 registered groundwater abstraction within the 2km study area (plus 1km to account for grid location rounding). This abstraction site is not for the purpose of drinking water or residential use, is utilized for recreational purposes: horse racing and golf course. The abstraction type is reservoir, and the total annual volume is 28,800 (m^3/yr). There are no Groundwater Drinking Water Protection Areas, neither Public Source Protection Areas and nor Group Scheme preliminary Source Protection Areas.

Two boreholes fall within 2 km of the site, a spring south-east, at Jamestown and a borehole with a good yield to the east, at Loughlinstown.

Aquifer Classification and Groundwater Vulnerability

The central and western areas of the scheme are underlain by a Poor Aquifer composed of muscovite, microcline porphyritic, and equigranularity (GSI, 2024). The aquifer underlying the eastern part of the scheme, including Commons Road, Brookdene, Bayview, and part of Cherrywood Road, is classified as locally important, and sits atop layers of dark blue-grey slate, phyllite, schist, and quartzite.

Groundwater vulnerability underlying Carrickmines-Shanganagh (the hydrological and geological characteristics controlling the ease at which a groundwater body may be contaminated) is variable. In the western part of the proposed scheme the vulnerability is classified as extreme, in the central part high, and in the eastern part low.

Groundwater Testing (Site Investigation)

Groundwater testing was conducted in different sites within the proposed FRS area in June 2023 by GII (Ground Investigations Ireland)[36]. Utilizing Cable Percussion with Rotary Core (CP/RC) and Cable Percussion with Rotary Core follow-on boreholes (CP/RC-BH), any water strikes encountered during boring were recorded. Results showed that groundwater levels were between 2.3m below ground level at Killiney to a maximum of 4.5m below ground level at Cherrywood Park. Table 10.5 displays al the monitoring records while Figure 10.4 showing test locations.

Table 10.5: Groundwater monitoring Record in the Carrickmines-Shanganagh FRS area (GII, 2023)

Exploratory Hole ID	Study Area	Groundwater Monitoring Record (mBGL) - min	Groundwater Monitoring Record (mBGL) -max
2022-CP/RC-001	Stepaside	2.65	2.91
2022-CP/RC-006	Cherrywood Park	4.01	4.50
2022-CP/RC-007	Commons Road	2.75	3.20
2022-CP/RC-009	Brookdene	2.38	2.49
2022-CP/RCBH016 DG	Killiney	2.30	2.78

[36] Ground Investigations Ireland Ground Investigation Report (2023)

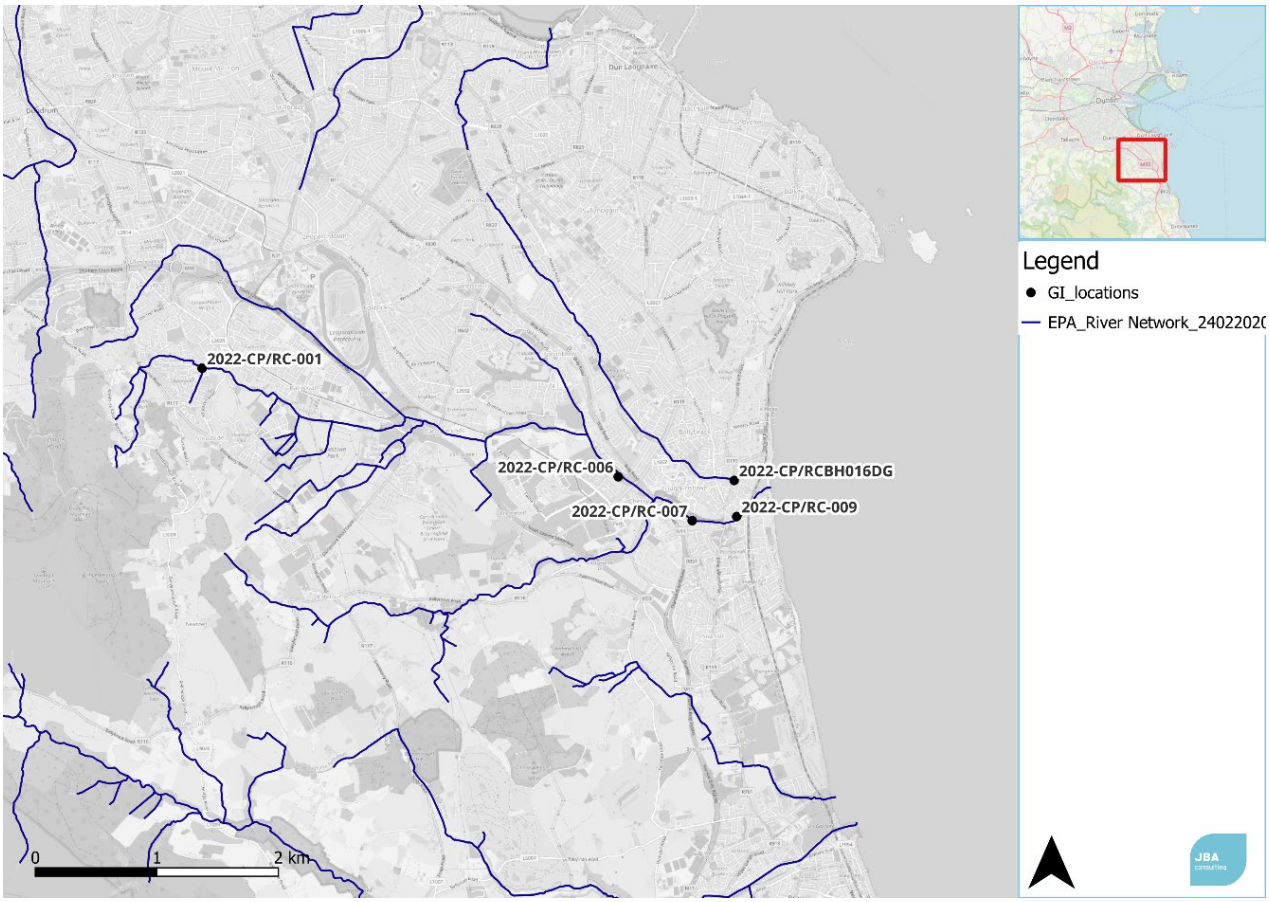


Figure 10.4: Locations of ground investigations where groundwater data was collected (GII, 2023).

10.2.4 Hydromorphology

Descriptions of each reach associated with the proposed flood relief works are outlined below. These descriptions are informed by field visits in March and July 2021[37] and April 2024, as well as a fisheries assessment conducted in January 2024[38].

Ballyogan Stream

The upper Ballyogan Stream (Reach B02) is located at the top of the catchment in a narrow valley bottom between residential developments through Stepaside. The river corridor is part of a continuous urban greenspace (complete with footpaths) that extends from the back of Belarmine Hall to the Gaelscoil at Belarmine Vale. Some urban drainage enters the reach via piped stormwater connections and surface pathways through the greenspace for stormwater inflows e.g., from the Clon Brugh estate (which is a formalised surface runoff pathway, essentially a swale, that is an intermittent stream that activates after heavy rain).

Ballyogan Stream features natural banks along most of the reach length and exhibits active sediment erosion, transport, and deposition processes. Evidence includes deposition of some lateral bar features and mobile sediment within the lee of in-channel boulders, as well as several locations exhibiting active undercutting of banks.

[37] 20108-JBA-00-XX-RP-Z-00110_Hydromorphology_assessment_P01.06
[38] Fisheries assessment for the Carrickmines Shanganagh River Flood Relief Scheme, Co. Dublin. January 2024. Triturus Environmental Ltd for JBA Consulting.

Channel planform is generally straight however bar features have created low flow channel sinuosity in some locations. Narrower channel sections tend to feature an exposed coarse gravel-cobble bed with a mobile fine-coarse sand and fine gravel component. These exposed coarse bed sections provide shallow, fast flowing riffle-like areas, which combined with woody debris, in-channel boulders, and undercut banks, provide a diversity of hydraulic habitats.

In wider, lower energy channel sections (particularly where bank undercutting is evident on both banks), the coarse bed is covered predominantly in silt with some fine sands. This suggests possible excessive fine sediment supply most likely derived from diffuse urban sources, though bare banks were observed towards the downstream end through Belarmine Park where people and pets (dogs) have easy access to the watercourse. Bank material also begins to exhibit finer composition towards the downstream end. A large culvert with trash screen is present at the end of Belarmine Park.

Downstream of Kilgobbin Road, the watercourse is overly straight with high banks as it passes behind residential developments. Bed material is mobile fine to coarse gravel, with sands and some silt. Some deposition is occurring mid-channel at the deer screen where the river turns eastward at an old boundary wall into the modern Castle Court Estate greenspace. Immediately downstream of the boundary wall and deer screen, there is notable scour and undercutting of the left bank suggesting active erosion of the primarily clay and fine sediment bank under high flow conditions (with some large cobble observed within the matrix). There is some undercutting of the boundary wall itself with concrete foundations exposed. The watercourse is overly straight through the downstream greenspace with limited geomorphic diversity. Some large cobbles are exposed on the bed with the same mobile substrate as upstream, though there is greater fine sediment covering the mobile coarse material.

Downstream near Clay Farm, the channel exhibits similar typology to the upper sections of Reach B02. Channel is generally straight but there is evidence of some in-channel features supporting low flow sinuosity as the channel passes through a vegetated area under the greenway footbridge with good connectivity to the right bank floodplain terrace. From the Carrickmines substation, a new reach is delineated (Reach B01) with the channel being heavily modified via straightening, hard bank protection (gabion baskets), and culverting of approximately 270 m between the substation and Ballyogan Recycling Centre. There are few access points along Reach B01, however at the Ballyogan Link Road bridge into the shopping complex the channel was observed to have greater sinuosity with some cobble riffles and was deeper relative to bank height than was observed upstream. Banks were composed of very coarse gravel to cobble within a fine matrix.

Carrickmines River

The upper reaches of the Carrickmines River (reaches CM4, CM3) are modified through straightening and culverting, historically to accommodate agricultural land use, with the contemporary purpose to accommodate the M50 and associated infrastructure (ramps, car parks, etc.). After passing under the Luas line near Brennanstown Road, Reach CM2 is a cascading cobble and boulder bed river, with a moderate to high gradient within a relatively confined valley. It has been modified through the addition of weirs but maintains a semi-natural woodland riparian buffer and has good floodplain connection along its length.

After the confluence with the Cabinteely River, the Carrickmines River flows south eastward through a widened floodplain. This reach (CM1) maintains a healthy riffle-pool ecosystem in the section northwest of the N11 offramp to the R118 Wyattville Road. The bed is cobble and sand, with fine sediment deposited on point bars. Downstream of the N11 offramp, the channel looks to have been straightened, possibly widened, and planform is controlled along the back of the buildings at Bray Road via hard bank protection (left and right bank, a mixture of constructed stone banks and concrete walls). Bank tops are vegetated with trees and shrubs. Geomorphic diversity is reduced through this reach with no geomorphic features (plane bed), though some in-channel boulders will contribute limited low flow hydraulic diversity. Bed composition is largely cobble, with compacted fine sediment deposition including silts and sands, and limited evidence of any mobile gravel bed. This reach is likely primarily transportational for sediment given the modifications and shows some evidence of excessive fine sediment inputs. The river is culverted under the N11.

Brides Glen River

The majority of reach BGS1 is comprised of a fast-flowing river within a naturally steep valley setting, with a dense riparian buffer along much of its length (that prohibited access except in a small number of locations). The bed is predominantly boulder and cobble with a mobile bed of sand to coarse gravel, and little siltation. Geomorphic features include riffle-pool sequences, and banks were stable. From approximately 120 m upstream of the N11 culvert, hard bank protection is present on both left and right banks. On the left bank, the top of bank environment is being utilised by homeowners for vegetable gardens, whereas the right top of bank is left as overgrown greenspace. The river is culverted under the N11.

Shanganagh River

The Shanganagh River begins at the confluence of the Carrickmines and the Brides Glen rivers and flows for 1.6 km before discharging into the Irish Sea. The upper section of Reach SG2 through the Loughlinstown Pitch and Putt area features a meandering single-thread river with geomorphic features including riffles, pools, and gravel bars. Slight undercutting was observed on both left and right banks, and some fine sediments overlay the mobile coarse material.

After the golf course, the Shanganagh River follows a straight path closely aligned to Commons Road. A flow measurement station operated by Dún Laoghaire-Rathdown Council since 12/05/1980 is located at a small weir (ITM: 725038, 723004). Bed material consists of compacted cobble material and is suspected to be armoured. Limited mobile coarse material was observed upstream of Shanganagh Bridge. Some sand and silt were present at the foot of the natural bank sections. Natural bank material opposite the existing flood gate on Commons Road appears to be a fine (likely silt heavy) matrix with large gravel to cobble clasts. Hard bank protection is present along the left and right banks from the private land access crossing (ITM: 725247, 722988) to Shanganagh Bridge, though there is consolidated and vegetated material lining the toe of both banks adjacent to the stone masonry. It is unclear whether the hard bank protection forms the entirety of the bank, and this material has been subsequently deposited, or whether it is the natural bank on which the stone wall was imposed. Together with the lack of geomorphic features, observations suggest Reach SG2 along Commons Road is largely transportational for sediment.

Some deposition of mobile coarse sediment (final to coarse gravel) was observed in the lee of the Shanganagh Bridge parapets, and at the banks immediately downstream of the bridge where the channel widens slightly. With the exception of a small section of natural left bank material immediately downstream of the bridge, both left and right banks of Reach SG1 along River Lane are highly modified. The right bank is formed from sheet piling adjacent to the road, while the left bank is natural however both are boulder-lined along the toe. This section along River Lane forms a large outer meander bend, likely contributing additional pressure to the right bank. Sediment has accumulated, consolidated and vegetated at the toe of the right bank sheet piling for approximately 20-30m before the boulders begin. Bed material is primarily boulder-cobble, likely armoured, with algae growth suggesting boulders are immobile under the current flow regime. Some cobble material looks to be mobile, and there are pockets of gravel deposition at the lee sides of boulders. Lining of the bank toes has effectively narrowed the channel along River Lane, and it is exhibits signs of being largely transportational.

Downstream of River Lane, the channel becomes more confined with natural, heavily vegetated banks that appear (but could not be confirmed due to access) to display some undercutting. There appears to be some areas of slightly shallower flow though these could be the result of boulder emplacement as opposed to riffle features and their nature could not be confirmed due to access limitations. The channel takes a more sinuous planform through this part of the reach and is deeply set relative to both banks.

10.2.5 Overall evaluation of Hydrological and Hydrogeological Features

Following the NRA (2009) guidelines on the evaluation of hydrological features, the surface water bodies around Carrickmines – Shanganagh are of Extremely High Importance, due to the designation of the Dalkey Islands SPA and Rockabill to Dalkey Island SAC. The importance of hydrogeological characteristics is medium, as the Aquifer has a Local Importance. Natura 2000 sites within the FRS area do not have groundwater dependent QIs, and as such, groundwater pathways are not relevant.

10.3 Predicted Impacts

Predicted impacts during construction and operation of the scheme, and under a 'Do Nothing' scenario which presents an outline of the evolution of the baseline in the absence of the proposed scheme, are discussed below. This EIA focused on likely significant effects.

10.3.1 Do Nothing Scenario

As large parts of Carrickmines are within Flood Zones A and B, there is a medium to high probability of continued flooding of residential and commercial buildings under the do-nothing scenario. There is also a risk of failure of existing flood defences at Commons Road, and failure or damage to informal flood defences such as the stone walls at Kilgobbin House and Bray Road. Failure of these could increase residual flood risk or lead to contamination of the river with damaged masonry.

In the do-nothing scenario there is no expected change in hydromorphological conditions with the current climate i.e., the current sediment dynamics and river behaviour are expected to continue. However, flow and sediment dynamics may respond to future environmental change. For example, an increase in the intensity of rainfall as predicted under climate change could alter stormwater runoff dynamics within this urbanised catchment. This may result in the river network receiving greater volumes of water, or receiving runoff more rapidly. A potential effect could be an increase in the likelihood of overbank and/or pluvial flooding and altering of sediment dynamics within the channel as greater flow volumes may increase its erosive capacity. Changes in land use, e.g., an expansion of urban development, could also alter runoff dynamics in the catchment. Given the possibility of future climatic and/or land use change, the Do Nothing scenario presents an ongoing flood risk to residential and commercial buildings.

The effect of the do-nothing scenario is **long-term, significant, adverse**.

10.3.2 Construction phase

Construction will take place adjacent to the Carrickmines-Shanganagh River network as described in Chapter 3. The key civil engineering works which have potential to impact on the surface and groundwater environment are detailed in Section 3.4.5. The potential impacts of these works to the water environment (without mitigation) are discussed below:

Fine Sediment Pollution

During construction, the water environment is at risk from fine sediment pollution from the following sources:

- Excavation of, or import of, fill material on site that is stored near or adjacent to the river network;
- Ground that is exposed following vegetation clearance adjacent, or near to, the river network;
- Interaction between machinery and the riparian environment, such as for excavations required for flood wall installation;
- Instream works to excavate and construct/reconstruct concrete structures; and
- Instream works to regrade channel bed level.

There are several potential pathways for fine sediment to be mobilised from these sources to receptors. Surface water runoff during a precipitation event could wash fine sediment from stores or exposed ground into the river network, either directly via surface runoff pathways or indirectly via the stormwater drainage network. During construction, machinery operating within the riparian environment may knock exposed sediment directly into the river channel or move material to a position where, should a precipitation event occur, it would be more vulnerable to mobilisation by surface water runoff (either as sheet flow or slumping of sediment piles into the channel). Instream works offer a direct pathway from source to receptor by mobilising fine sediment within the water column or within the riverbed and bank environment.

Fine sediment pollution refers to both the fine sediment itself and urban pollutants that can be adsorbed onto the fine particles and transported along with them. Once fine sediment enters the water, it can disperse through the water column as suspended sediment. Suspended sediment affects physico-chemical water quality parameters by increasing turbidity and reducing dissolved oxygen. Changes in these conditions,

along with toxicity effects associated with adsorbed urban pollutants, can pose a risk to the life of aquatic species. Settlement of fine sediment over instream geomorphic features such as coarse sediment deposits (e.g., riffles and bars) can smother these important physical habitat environments, rendering them unsuitable for aquatic species.

A fine sediment pollution event would be expected to immediately impact the local environment, and to subsequently affect downstream environments as the fine sediment is flushed through the system during flushing flow conditions (e.g., winter high flow events). It may take several years for a single fine sediment event to be flushed through the system, but given flushing is expected the effect on water quality and instream features is expected to be reversible. The effects of urban pollutants on aquatic life are unclear. While these pollutants are expected to already be entering the river network to some degree, a fine sediment pollution event would represent an intensification of that pollution pressure. Taken together, the magnitude of potential impacts on water without mitigation measures in place is high, leading to a **significant, short term, adverse** impact on the surface water environment due to fine sediment pollution.

Accidental Spills and leaks

During construction, there is a risk of localised accidental pollution incidences from the following sources:

- Spillages or leakage of temporary oils and fuels stored on site;
- Spillages or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site; and
- Run-off from concrete and cement during the construction of flood walls.

There are several potential pathways for these pollutants from their sources to receptors. A direct hydrological link to surface water exists should an accidental spill or leak occur directly into the watercourse during construction, or on land and be allowed to flow overland to the watercourse. A spill or leak could also discharge to the existing surface water drainage network and subsequently discharge to the river network. During construction, compaction of the soil or subsoil could occur due to the use of heavy machinery in green areas. This could reduce infiltration rates and increase surface water runoff, further acting as a pathway for potential pollutants.

There is also potential for contaminants to migrate through the subsoils to the underlying groundwater. Soil stripping and foundation construction have the potential to further reduce the thickness of subsoils and the natural protection they provide to the underlying aquifer.

The potential pollutants described above could negatively impact surface water or groundwater quality if allowed to reach them. Concrete (specifically, the cement component) is highly alkaline, and any potential spillages can be detrimental to surface and groundwater quality. Changes in pH of the waterbody resulting from spills of concrete material would have a consequent effect on aquatic species. Spillage of oil or other similar contaminants which are likely to be in use during construction would similarly negatively impact the water environment.

An accidental spill or leak is likely to be an isolated event if it occurs, in a specific geographical area. The entire water environment as described above is therefore not likely to be affected, with effects likely on one reach and the immediate area downstream, or likely to be contained to the local groundwater environment. Based on the likely length of construction at any one works site being not greater than one year, an unmitigated spill or leak would be temporary. The effect on water quality of such an unmitigated leak would be reversible. According to the significance of effects matrix (EPA, 2022) the magnitude of potential impacts on water will be medium, leading to a **moderate, temporary, adverse** impact on surface and groundwater due to accidental spills and leaks.

Groundwater pumping

Groundwater pumping will be needed at each works area, to maintain a safe working space wherever temporary dry areas through the use of trench supports or other temporary works (e.g., sheet piles, trench box) are required. This will have the potential to temporarily alter the groundwater level locally.

According to the significance of effects matrix (EPA, 2022), the magnitude of potential impact on water will be low, leading to an overall **imperceptible** impact on groundwater due to groundwater pumping.

Instream Works

During construction, there is a risk that instream works could directly affect both the in-channel and riparian environments in additional ways to the fine sediment pollution discussed in the previous section. Sources include:

- Use of heavy machinery within the river channel environment;
- Temporary channel narrowing due to cofferdam emplacement; and
- Bankside vegetation clearance.

Within the channel, damage to coarse sediment bed features (e.g. gravel riffles) through direct movement (surface smoothing) or compaction by heavy machinery can alter their suitability as instream habitat. Temporary channel narrowing due to cofferdam emplacement may also create localised changes in hydraulic conditions that alter local sediment dynamics (e.g. promote winnowing of riverbed fines or bankside erosion). This can create additional fine sediment pressures and/or promote undercutting of banks near important infrastructure (such as private homes). Vegetation clearance may temporarily reduce localised bank stability depending on the nature of the existing bank material and the stabilising effect of the local specific vegetation.

Changes to the hydromorphology of the river network are likely to be temporary as the river will adjust once the works are completed and the pressure removed. However, it may take several years for natural sediment dynamics to restore a compacted instream gravel habitat, or to flush fine sediments through the network. Impacts on bank stability, particularly whether banks will naturally revegetate and in what timeframe this may occur, is an uncertainty that requires monitoring following construction of the scheme – see Section 10.4.4. The magnitude of potential impacts on water will be medium, leading to a **moderate, short-term, adverse** impact on the surface water environment due to instream works.

10.3.3 Operational Phase

The potential impacts on the water environment during the operation phase refer to both the static ongoing operation of the scheme and to any specified maintenance requirements.

Water Quality

In general, due to the static operating nature of the scheme, the effect on water quality once construction has finished will be neutral. However, the proposed FRS will result in decreased fluvial flooding of urban areas. Flooding of urban areas can mobilise urban pollutants (waste, vehicle pollutants such as hydrocarbons and tyre microplastics) which, either directly or via the stormwater drainage, can enter the river network. With a reduction in flooding of these urban areas, input of pollutants to the water environment will be decreased, which is an **intermittent, long-term, positive impact.**

Maintenance

Section 3.5 outlines the proposed maintenance regime. This includes proposed annual inspection (once per year at a minimum) of all existing and proposed flood defence walls and conveyance measures, spot repairs to walls where needed, and removal of materials which could act as blockages, e.g., large tree branches which have fallen into the river or waste. Maintenance will not include removal of natural sediment deposition or in-channel or riparian vegetation. If such removal of sediment or vegetation is required in order to ensure proper conveyance, mitigation measures outlined in Section 10.4.4 will be followed. During normal maintenance, no impacts are expected on water. The effect of normal scheme maintenance will therefore be **neutral**.

Occasionally, more intensive maintenance activities may be required, in cases of damage to the scheme or following a heavy flood. This may necessitate instream works in order to access areas of damage or inspection. In such cases, the magnitude of potential impacts on water will be medium, leading to a

moderate, short-term, adverse impact on the surface water environment due to instream works. Should maintenance inspections or subsequent works identify a need for instream works in the future, then the same mitigations outlined in Table 10.8 and Table 10.9 apply for the instream environment See Section 10.4.4 for instream work mitigation measures.

Operation: Hydromorphology

Assessment of the static operation of the proposed scheme (Table 10.6) is based on two key considerations. Firstly, the potential impact of proposed flood relief measures on hydromorphology at reach-scale, which informs assessment of the impact on the relevant water body and any resultant potential change in water quality elements and ecological status. Secondly, any notable changes in river hydraulics with and without the proposed scheme. This allows potential changes to in-channel sediment dynamics to be inferred because of changing scour and erosion dynamics with repeated high flow events over time. Changes to sediment dynamics can result in knock-on impacts for habitats and species. Outputs from the hydraulic modelling undertaken for the proposed scheme (averaged across the model cross-section) were reviewed at specific locations of interest for the following flow conditions:

i) Approximately bankfull, defined as the 50% Annual Exceedance Probability (AEP), and also referred to as the 2-year event.
ii) Design flow event for the scheme, defined as the 1% AEP.

Data for the stormwater network sourced from the Greater Dublin Strategic Drainage Study has also been reviewed to establish possible interactions with the proposed scheme.

Table 10.6 summarises the reach-scale potential impacts from each measure. The table also includes a potential opportunity to improve hydromorphology at one location via instream and/or minor floodplain works. This represents an opportunity to demonstrate synergies between the Floods Directive and Water Framework Directive to provide benefits for both the local community and the environment, therefore it is included in the hydromorphology assessment table below. However, this opportunity is not part of the scheme.

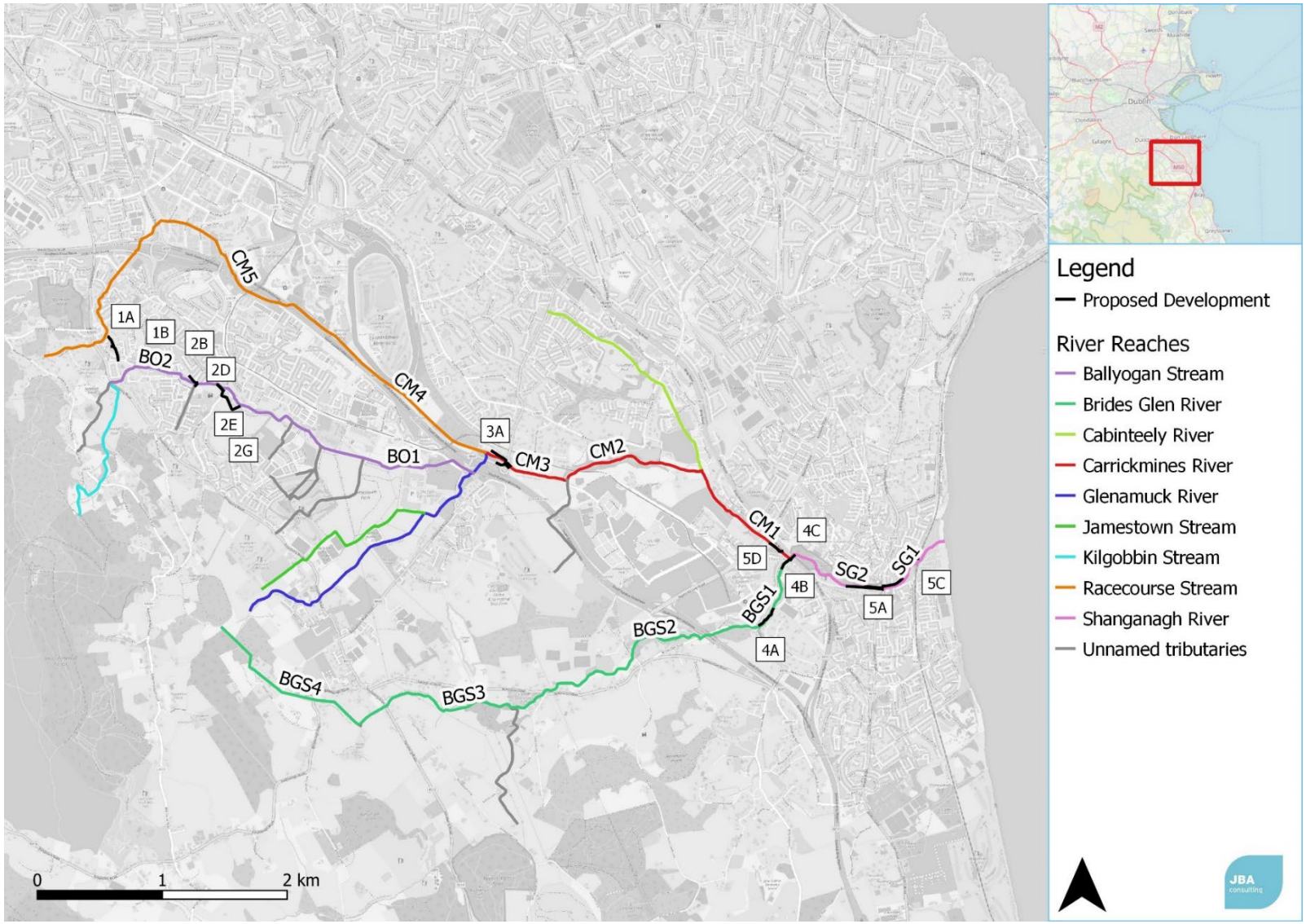


Figure 10.1: Proposed flood relief measures and associated river reaches.

Table 10.6: Hydromorphology assessment of proposed flood relief measures

Reach	Proposed flood relief measure	Hydromorphology assessment
BO2 CM3 BGS1 SG2 SG1	Flood walls and their interaction with the overland runoff during rainfall events (Measures 1.A, 2.D, 2.E, 3.A, 4.B, 5.A and 5.C)	Proposed installation of new flood walls may alter surface runoff pathways that could feed into the stormwater network or directly into the river reaches. Given the heavily urbanised nature of this catchment, surface water runoff is likely to contain chemical and fine sediment pollutants that may affect water quality and hydromorphological condition (via blanketing gravel features with fine sediment). This necessitates two considerations: 1) It is assumed that under the proposed scheme the river continues to receive the same volume of surface water runoff as under current conditions. While installation of new flood walls may alter overland flow pathways in terms of where they enter the larger drainage network (this comprising the stormwater network and the river system), ultimately these pathways continue to be routed to the river channel. There is no net change to the runoff received by river reaches. **No impact.** 2) Should the installation of new flood walls block surface runoff pathways and in changing the route of these pathways create temporary ponding, then there is a potential risk of fine sediment settlement behind the walls and a concentration of pollutants within the local environment. The potential impact is identified as **Negative, Slight, Short term.** Recommendations for monitoring of surface runoff pathways and their interaction with the scheme have been made in Section 10.4.4.
BO2	1.A Flood walls (installation) 1.B Flood walls (alterations to existing)	These measures relate to a formalised surface runoff flow path and not a perennial watercourse. See Section 1.8 Limitations and Assumptions in relation to potential impacts on the piped stormwater drains in the vicinity of the measure. This uncertainty should be confirmed during detailed design (See Section 10.4.4). **No impact.**
	2.B Culvert (upgrade existing)	Currently the concrete slab at the upstream entrance to the culvert is slanted slightly upwards in the opposite direction of the overall river grade line, and therefore promotes fine sediment deposition at and immediately upstream of the culvert entrance. Vertical realignment to restore the overall grade line of the river represents an improvement that should support improved conveyance of fine sediment downstream under normal flow conditions. **Positive impact**.
	2.D Flood walls (installation)	Flood walls are proposed to be set back from the bank top and riparian zone. **No impact.**
	2.E Flood walls (installation and upgrade existing)	Some sections of flood walls are proposed to be set back from the bank top and riparian zone. Existing bank shape and material will remain. For some sections, the proposed flood walls sit at the top of bank (i.e. within the riparian zone). However, the length is limited in the context of the overall reach. **No impact.** See Section 1.8 Limitations and Assumptions in relation to potential impacts on the piped stormwater drains in the vicinity of the measure. This uncertainty should be confirmed during detailed design (See Section 10.4.4).

		Modelling results indicate some potential change in channel hydraulics (increased velocity as more flow is retained in channel) under 50% AEP events and greater. There is potential for erosion within the channel to the bed and banks which may, over successive high flow events, result in bank instability and effect the structural integrity of the proposed flood walls or other important structures. Monitoring of potential channel change (i.e., scour) is recommended. See Section 10.4.4.
	2.G Weir and pipe installation, scour protection	Proposed works are designed for high flow conditions and do not affect normal channel dynamics upstream of the overflow pipe. For the channel downstream of the pipe outlet, modelling results do not indicate notable change in the hydraulics. However, there is potential for localised channel response at the pipe outflow location, particularly on the left bank. Evidence of left bank scour approximately 40 m downstream of the proposed outflow location indicates bank material may be vulnerable to erosion under high flow conditions, and therefore may represent a risk over the long term to the left bank private property (garden). Monitoring of potential channel change (i.e., scour) is recommended. See Table 10.9 in Section 10.4.4. Some flow dissipation measures may be required for the right bank associated with the outflow headwall (e.g., rip rap or soft rock solutions for scour protection). Design details (i.e., length, location and materials proposed) are required to be resolved at detailed design stage. Given this uncertainty and noting that these dissipation measures would replace natural bank materials, the potential impacts are identified as **Negative, Moderate, Long term**. Design requirements are outlined at Table 10.7 in Section 10.4.4.
CM3	3.A Flood walls (installation and upgrade existing).	Flood walls are proposed to be set back from the bank top and riparian zone. See Section 1.8 Limitations and Assumptions in relation to potential impacts on the piped stormwater drains in the vicinity of the measure. This uncertainty should be confirmed during detailed design (See Section 10.4.4). **No impact**.
	3.A Debris screen	Debris screen is designed to enable sediment transport. Concrete foundations will be laid at a minimum 500mm depth below existing bed level. A natural bed will be maintained over the foundations and the existing gradient preserved so that sediment dynamics and fish passage are not negatively impacted. **No impact**. These design requirements are outlined at Table 10.7.
BGS1	4.A Flood walls (installation)	New flood walls are proposed to be positioned at the top of the bank along most of the reach and existing bank material maintained. For a short section (approx. 40 m), wall placement is within the left bank environment as this gradually slopes towards the stream, which represents a localised loss of bankside habitat. However, given the scale of the whole reach (approx. 200m) this is not considered a significant impact. Additionally, the right bank and riparian zone topography along this length is gradual, allowing room for the river to adjust to this change in channel geometry. **No impact.**

	4.B Flood walls (installation)	Flood walls are positioned at the top of the existing hard bank protection. **No impact**.
	4.C Weir and pipe installation, scour protection	Proposed measures relate to a highly modified section of channel. Use of proposed static lateral weir structure ensures proposed piped connection is relevant to flood flows only. **No impact**.
SG2	5.A Flood walls (installation and upgrade existing) at Commons Road	Flood walls are positioned well back from the top of bank with existing bank material maintained or are modifications to existing wall structures. See Section 1.8 Limitations and Assumptions in relation to potential impacts on the piped stormwater drains in the vicinity of the measure. This uncertainty should be confirmed during detailed design (See Section 10.4.4). **No impact**.
	5.A Bridge reinforcement	Maintaining a natural riverbed over the top of the concrete apron is critical for fish passage and a requirement of Inland Fisheries Ireland guidelines[39]. Hydraulic modelling results indicate only minor upstream velocity changes at the 50% AEP event, but notable velocity increases for the 1% extreme high flow event. This raises the possibility of scour at either the upstream or downstream ends of the apron in single events or as a cumulative change over time, potentially leading to perching of the concrete apron. This has potential knock-on impacts for longitudinal sediment connectivity and fish passage. Taking these considerations on board, the proposed design embeds the concrete apron at a minimum 500mm depth below existing bed level and extends the upstream and downstream ends of the concrete apron to a greater depth to prevent scour and undermining of the apron. Following construction of the apron, natural bed material will be restored to the existing riverbed level (less a small portion of deposited sediment in the left archway that will be removed). With this mitigation in place, **no impact** is expected. These design requirements are outlined at Table 10.7. Given importance of monitoring the potential for long term channel change (despite all possible protections), monitoring is recommended in Table 10.9.
SG1	5.A Flood walls (installation)	At Brookdene, flood walls are proposed to be set back from the bank top and riparian zone. See Section 1.8 Limitations and Assumptions in relation to potential impacts on the piped stormwater drains in the vicinity of the measure. This uncertainty should be confirmed during detailed design (See Section 10.4.4). **No impact**.

[39] Inland Fisheries Ireland (2008). Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters, IFI/2016/I-4298

SG1	5.C Flood walls (installation)	At Bayview, flood walls are proposed to be set back from the bank top and riparian zone. See Section 1.8 Limitations and Assumptions in relation to potential impacts on the piped stormwater drains in the vicinity of the measure. This uncertainty should be confirmed during detailed design (See Section 10.4.4). **No impact**.
CM1	5.D Flood walls (installation)	Left bank flood walls are positioned within the riparian zone/at top of bank, with the exception of the walls to be installed immediately behind the buildings. For that approximately 85m length, the walls will be constructed within the existing channel. However, the left bank is already highly modified with hard bank protection along the length where the in-channel walls are proposed, making the installation of flood walls not dissimilar to a like-for-like replacement. **No impact**.
	5.D Stream realignment	Channel geometry for the proposed realignment maintains the existing river width and will replace existing hard bank protection (right bank) in favour of naturalised banks. This represents a positive improvement to geomorphology over the long term as the river channel will be able to interact with natural bed materials to support sediment dynamics and channel adjustment. **Positive impact.**
	Potential opportunity	There is a potential opportunity for instream and minor right bank floodplain works as part of the realignment to improve the diversity of in-channel hydraulic conditions. For example, inset berm features could be used to narrow the channel in specific locations to improve sinuosity under normal flow conditions and promote targeted fine sediment deposition. Efforts to improve lateral connectivity between the channel and the right bank -floodplain under normal flow conditions (such as a typical winter flow) e.g., via an inset floodplain feature could also be explored to support fine sediment deposition and creation of wetland habitat. Riparian and floodplain planting could also be explored to provide additional filtration of runoff before it enters the watercourse.

Operation: Groundwater Recharge

Potential impacts to recharge during operation phase are related to ground hardening due to access creation for trucks and vehicles for maintenance purposes, by reducing the infiltration capacity. Increased runoff could occur due to compaction of surfaces, which has the potential to reduce infiltration and groundwater recharge. Considering the scale of the proposed project the impacts on groundwater recharge are not expected to be significant.

According to the significance of effects (EPA, 2022), the magnitude of potential groundwater impacts will be **low**, leading to an overall **Temporary Slight Adverse** impact on water due to changes to the groundwater and surface water quality.

The operational impacts on surface and groundwater, with no mitigation measures in place, will be ***Long-term Moderate*** **Adverse.**

10.4 Mitigation Measures

In the impact assessment discussed above, a range of potential effects on water were identified. Mitigation measures in the construction and operational phase of the proposed scheme will be implemented to reduce these adverse effects. Most measures are required during the construction phase as it will pose the greatest level of risks due to the construction activity on site, plant construction and use of construction materials and the soil on site. In the sections below the mitigation measures for the do-nothing scenario, construction phase and operation phase are discussed.

10.4.1 Do Nothing Scenario

In the do-nothing scenario, no mitigation measures will be required.

10.4.2 Construction Phase

Mitigation measures during the construction phase are discussed below. These mitigation measures have been developed with the source-pathway-receptor links above in mind and are designed to break this link either by removing the source or disrupting the pathway for pollution.

Best Practice Construction Methods

A preliminary Construction Environmental Management Plan (CEMP) has been prepared for the proposed scheme and will be put in place by the appointed contractor. The preliminary CEMP was prepared in accordance with the following:

- National and International Legislation;
- Environment Liability Regulations; and
- Best Management Guidelines.

The CEMP will be used by the contractor to prevent and minimise environmental effects during construction. It includes the below to mitigate impacts on water:

Fine Sediment Pollution

Mitigation for the protection of surface and groundwater quality from runoff carrying fine sediments and urban pollutants involves silt control measures. These include proper planning of works, site compound construction, storage management and excavation plans, as follows:

- The CEMP will include the mitigation measures outlined in this EIAR to address sediment control during construction and the potential risk of sediments and various pollutants release into local watercourses. This includes silt fencing, runoff control and measures to prevent contaminant entering the stormwater by proper storage of hazardous materials and waste management practice;
- Planning of works will be conscious of available weather forecasts and avoid working during heavy rain/storm events to minimise the risk of runoff that may be in excess of the capacity of the runoff control

measures outlined in this EIAR. If working during precipitation events cannot be avoided, then runoff control measures will be actively monitored during the works to ensure their capacity is not compromised;
- Adherence to best practice guidance for pollution prevention and sediment management measures (e.g., use of oil booms, spill kits, and silt fences etc.) will be applied.
- The contractor will construct a site compound at a location remote from any drains, in a minimum distance of 10m;
- Storage locations and topsoil piles will be placed in appropriate places, distant to existing drains/sewerage with a minimum distance of 10m;
- All soil stockpiles will be covered (i.e., with a tarpaulin or vegetated) to minimise the risk of rain/wind erosion. Vegetation will be established as soon as possible on all exposed soils;
- In the event of an extended dry period, stockpiles will be dampened using water to minimise the risk of airborne particles entering watercourses;
- Excavations will remain open for as little time as possible before the placement of fill to minimise the potential of water ingress into excavations;
- Management/Response plans will be implemented to identify mobilisation of soil particles/pollution and initiate the interception and treatment of pollution/silt run-off;
- Silt fencing or other appropriate measures will be put in place downstream of exposed soils or soil stockpiles.

Accidental Spills and Leaks

To avoid and manage accidental spills and leaks a series of measures listed below will be implemented. The main contractor and sub-contractors will be responsible for ensuring their implementation:

- An Emergency Plan for the site will be established by the main contractor prior to work commencing at the site. The Emergency Plan will contain contact details for statutory bodies such as the NPWS, Dún Laoghaire-Rathdown Co. Co. and IFI. All site workers will be made aware of the plan and its location in the site offices;
- There will be no refuelling of machinery within or near the watercourses of the Carrickmines-Shanganagh River network. Refuelling will take place at designated locations at distances of greater than 30 metres from the watercourse;
- No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times;
- Any fuel needed to be stored on the site will be stored appropriately and at a location that is set back from the river. All other construction materials will be stored in this compound. The compound will also house the site offices and portable toilets. This compound will either be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation;
- All vehicles will be regularly maintained and checked for fuel and oil leaks;
- All liquids, solids and powder containers will be clearly labelled and stored appropriately in sealable containers. Storage of fuels and oils will be in the main contractor's compound only;
- Spill protection equipment such as spill kits, absorbent mats, oil booms, and sand will be available for use in the event of an accidental spill. These will be disposed of correctly if used and replaced with new ones immediately. Disposal records for used absorbent materials will be retained by the Site Manager;
- The contractor will implement measures for the regular inspection of bunds and emptying of rainwater (when uncontaminated). Bunding must have a minimum capacity of 110% of the volume of the largest tank or 25% of the total storage capacity, whichever is the greater. Bunding will be impermeable to the substance that is being stored in the tank;
- The use of settling lagoons, settling tanks, or equivalent, with outflow control measures will be used for the interception of surface water or groundwater pumped from an active working area;
- If a spillage of a hazardous material to groundwater occurs, the groundwater will be contained and pumped to a tank or holding vessel prior to shipment off site for disposal. The contractor will maintain disposal records. The contractor will identify the cause of the spillage and mitigation measures and controls will be put in place to prevent a repeat. The CEMP for the site will be updated and contractors and sub-contractors will be made aware of the amendments;

- The Contractor will clean equipment prior to delivery to the site. The Contractor will avoid using any equipment which leaks fuel, hydraulic oil, or lubricant. The Contractor will maintain equipment to ensure efficiency and to minimise emissions;
- No excavation will take place below the water-table on the site;
- Management/Response plans will be implemented to identify mobilisation of soil particles/pollution and initiate the interception and treatment of pollution/silt runoff; and
- Precast elements should be maximised to avoid wet concreting in close proximity to water. The new culvert inlet upgrade at the Belarmine Park will be precast, as will elements at Kilgobbin Road. Use of precast sections will also be explored during detailed design for the works at Glenamuck Road North, Cherrywood Road, Bray Road, Lower Brides Glen and the N11 Crossing, and Commons Road and Brookdene.

Instream Works

To reduce the potential impacts from instream works the following mitigation measures are proposed:

- All instream works will be supervised by ECoW, and safe concreting measures during construction will be implemented;
- All measures that alter the channel bed via installation of concrete foundations or aprons must reinstate the natural bed material to the existing grade line of the river following construction.
- Cofferdam emplacement will occupy as little of the in-channel environment as possible, and no more than 50% of total channel width at any given time. The cofferdam will be set as low as possible to protect instream works but will not cause additional flood risk upstream, and will be designed as part of the contractor's temporary works.
- To mitigate impacts to any fauna or flora as a result of instream works, including fish passage, refer to Chapter 8 Biodiversity.

Flooding during construction

There is a possibility that a flood will occur during the construction phase. The contractor will be required to monitor weather and water level conditions that may cause inundation. In the event of a storm event, temporary flood barriers will be erected at exposed locations where existing protections may be temporarily removed or modified as part of the scheme construction (e.g., reconstruction of existing walls). All works undertaken near the banks will be fully consolidated to prevent scour and run-off of silt. Consolidation may include use of protective and biodegradable matting or geotextiles on the banks and the sowing of grass seed on bare soil.

10.4.3 Operation Phase

To reduce the predicted impacts on groundwater recharge and hydromorphology the following mitigation measures are proposed:

Hydromorphology

Given the uncertainty over how some design elements may interact with the hydromorphology of the receiving environment, several recommendations to refine aspects of the detailed design and to monitor operation of the scheme are required (see Section 10.4.4 Recommendations and Monitoring).

10.4.4 Recommendations and Monitoring

Table 10.7 outlines design requirements and Table 10.8 and Table 10.9 outline additional monitoring required during construction and operation to identify potential hydromorphological impacts. These are informed by a number of uncertainties including but not limited to:

- Design details that require clarification to account for environmental concerns, including uncertainty around the existing stormwater network.
- Whether proposed new flood walls may alter surface runoff pathways.
- How channel hydraulics will respond to temporary flow constrictions due to cofferdam emplacement during construction.

- Whether banks will naturally revegetate or whether bank stability issues may be present following vegetation removal during construction.
- How minor velocity changes will interact with riverbed and bank materials during extreme high flow events (both single events and cumulatively over time) during the operation of the scheme.

Table 10.7: Design requirements to mitigate potential impacts on the water environment (to be applied during detailed design of the scheme)

Proposed measure	Detailed design requirement
2.G	The need for any flow dissipation measures at the downstream pipe outflow will be resolved at detailed design. The extent of any measures will be minimised and restricted to the right bank only. The left bank will remain as specified in the design (i.e., natural). Depending on the design requirement, alternatives to traditional rip rap such as pre-filled rock rolls will be prioritised given, they offer better potential for bank revegetation and support bankside fine sediment deposition. .
3.A	Foundations will be at least 500mm below existing bed level to mimic the grade line of the natural stream bed[40]. There will be reinstatement of the natural bed over the top to existing bed level following construction.
5.A Bridge reinforcement	Design of the concrete apron will consider and incorporate (as appropriate) all relevant guidance pertaining to the preservation of the existing channel grade line over the long term and the avoidance of perching - see National Roads Authority (2008) guidance[41] and Inland Fisheries Ireland (2016) guidance[42]. The concrete apron will: a. Be laid at least 500mm below existing bed level. b. Mimic the natural grade line of the river i.e., the overall river gradient from up to downstream of the bridge. c. Be covered with the natural bed material that was removed to allow for its installation. This material will be reinstated to the existing riverbed level. d. Scour protection should be included at both the upstream and downstream faces of the concrete apron to prevent undercutting of the apron. The above referenced documents do not represent an exhaustive list of relevant guidance and those undertaking detailed design are expected to undertake best practice in consideration of all relevant guidance documents available.
Stormwater network	Detailed design must clarify that no components of the stormwater network (e.g., piped network) will be affected by the proposed new flood walls at measures 1.A, 2.E, 3.A, 5.A and 5.C. See Section 1.8 Limitations and Assumptions.

[40] As per guidance for culvert design from the National Roads Authority (2008) 'Guidelines for the crossing of watercourses during the construction of national road schemes'. Available at: https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Crossing-of-Watercourses-during-the-Construction-of-National-Road-Schemes.pdf (Accessed 23 May 2024).

[41] As per footnote 40.

[42] As per footnote 39.

Table 10.8: Required monitoring to mitigate potential impacts on the water environment during the construction phase of the scheme

Proposed measure	Monitoring requirements during construction phase
Instream works	1. Monitoring via visual assessment of channel response to cofferdam emplacement for any reach where this construction method is applied. This will focus on how river flows are interacting with the temporary flow constriction in terms of the potential for, or evidence of, geomorphic effects such as increased scour. Bed or bank scour could potentially require mitigation should it indicate a risk to important bankside infrastructure such as public paths or to the flood scheme itself. This survey will be conducted by a geomorphologist **and** a civil engineer so that practical and effective measures can be put in place. 2. Monitoring via visual assessment of any existing surface water connections that may be temporarily protected or diverted during the works. This assessment will ensure downstream connectivity of flows is maintained at all times. This survey will be conducted by a civil engineer. 3. Monitoring via visual assessment by contractor of fine sediment plumes that may be entering the channel from the works – both during local works and the decommissioning of any instream work. The presence, or absence, will be recorded in daily site logs. Any recommendations resulting from these monitoring activities will be detailed in an updated CEMP and referred to in an updated Construction Methodology report prior to any continuation of construction activities. Consultation with relevant authorities should be undertaken as appropriate.
Bank revegetation and stability	In locations where removal of large vegetation has occurred (i.e., tree removal or cutting down of trees but some part of the trunk and root network remains), inspection of local bank stability will occur. This survey will be conducted by a civil engineer to i) identify locations where bank stability is an immediate concern, and ii) identify locations for ongoing monitoring during operation of the scheme. Should bank stability measures be determined immediately necessary by the civil engineer, then green measures such as low sheet piling and coir rolls (as alternatives to rip rap) will be pursued if technically feasible and appropriate.

Table 10.9: Required monitoring to mitigate potential impacts on the water environment during the operation phase of the scheme

Proposed measure	Monitoring required during operation phase
Bank revegetation and stability	During the planned annual maintenance inspections, specific locations where vegetation removal was identified as having the potential to influence bank stability should be inspected for evidence of bank instability. This survey will be conducted by a geomorphologist **and** civil engineer. Should bank stability measures be determined immediately necessary by the civil engineer, then green measures such as low sheet piling and coir rolls (as alternatives to rip rap) will be pursued if technically feasible and appropriate.
Surface runoff pathways	Following heavy rainfall events, the new flood walls at measures 1.A, 2.D, 2.E, 3.A, 4.A, 4.B, 5.A and 5.C will be inspected by a civil engineer to determine whether surface runoff pathways are blocked, causing temporary ponding of stormwater during rainfall events. Monitoring will continue for as long as required to establish whether there is any impact on surface runoff pathways. Appropriate measures to improve routing of stormwater to the network, or to remove any deposited sediment, will be progressed as required by a civil engineer.

General in-channel environment	Following flood events equal to or greater than 14.82 m^3/s (equivalent to Qmed at Commons Road gauge (#10021), the in-channel environment will be examined for any obvious new scour. Further development of bed or bank scour could potentially require mitigation should it indicate a risk to important bankside infrastructure such as public paths, to the flood scheme itself, or in the case of Measure 5.A identify any potential scour of, or near, the concrete apron at Shanganagh Bridge. This survey will be conducted by a geomorphologist **and** a civil engineer. Locations to examine include: • 2.E (length of proposed flood walls). • 2.G (adjacent to pipe outflow location and the reach downstream to Castle Circuit). • 5.A (at, upstream and downstream of Shanganagh Road Bridge, particularly at the edges of the concrete apron). These same locations will be included in the regular inspection and condition surveys as part of the planned maintenance of the scheme.
Maintenance involving instream, bank and riparian zone works	Should maintenance inspections reveal a requirement for works that require operating within, or adjacent to, the river channel environment (defined as instream, banks and riparian zone environments) then all relevant guidance must be followed. This includes, but is not limited to: • Inland Fisheries Ireland – Planning for watercourses in the urban environment: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning. • Inland Fisheries Ireland – Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters, IFI/2016/I-4298. • OPW – Environmental Guidance: Drainage Maintenance and Construction. • Environment Agency (UK) – Channel Management Handbook, Report SC110002. • Environment Agency (UK) – Aquatic and Riparian Plant Management: Controls for vegetation in watercourses, Report SC120008/R1. • Environment Agency (UK) – Aquatic and Riparian Plant Management: Controls for vegetation in watercourses, Technical guide, Report SC120008/R2.
Debris screens	Debris screens will be inspected as part of planned annual maintenance, prior to expected heavy rain or flooding **and** following large flood events to determine: 1. Immediate clearing requirements. 2. Inform the refinement (frequency) of longer term clearing that may be required for the scheme to operate effectively i.e., is pre-storm clearance of the debris screen required for the flood scheme to perform.

10.5 Residual Effects

Following the implementation of the recommended mitigation measures and the final design and layout of the scheme, the magnitude and significance of the residual effects is discussed in the following sections.

10.5.1 Construction Phase

With mitigation measures in place during construction phase of the scheme, the residual effects to surface water and groundwater bodies will be reduced to **temporary, slight, adverse** to **imperceptible** and **not significant.**

10.5.2 Operation Phase

During the operation phase of the project, considering the design considerations benefitting surface and groundwater bodies, the residual effects will be **long-term, imperceptible**, with a **neutral impact on quality** and **not significant**, i.e., an effect which causes noticeable changes to the character of the environment without affecting its sensitivities.

10.6 Monitoring

Monitoring will ensure the proper implementation of mitigation measures during construction, set out in this EIAR. The frequency and reporting procedures should be agreed with the NPWS and IFI before commencement of the work. All monitoring records should be maintained by the Project Manager or his nominated assistant. The monitoring will include:

- Records of regular inspection, on bunds, vehicles oil storage on site according to the CEMP
- Records of silt fencing conditions and placement
- Records of any water ingress during excavation

Monitoring of surface water on quantitative and qualitative parameters during construction will be carried out. As a minimum the following parameters will be recorded in surface waters: pH, conductivity, chemical oxygen demand, suspended solids and total dissolved solids. If monitored levels exceed the threshold levels outlined in S.I. No. 77/2019 European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019, mitigation measures to protect surface water will be reviewed by the environmental manager acting on behalf of the contractor. On-going water quality monitoring in the Carrickmines-Shanganagh River network will identify the success of the mitigation measures/operating practices installed.

10.7 Interactions

Impacts to surface and groundwater have the potential to interact with the following environmental factors:

Biodiversity, discussed in Chapter 8: The Carrickmines-Shanganagh River Network is a valuable ecological corridor and provides habitat for a number of significant and protected species. Impacts on waterbodies could affect aquatic habitats and species. The main potential impacts identified in the Biodiversity chapter include accidental sediment release or pollution due to spills or leaks, or disruption to habitats due to instream or bank-side works. Mitigation measures included in the Water chapter and the Biodiversity chapter will ensure that no significant interactive effects occur.

Land and Soil, discussed in Chapter 9: Soils and geology share direct links with groundwater. Hydrogeology is further linked with surface water networks. Soil quality and condition affects the rate of recharge, infiltration, percolation, and drainage for groundwater bodies. Similarly, surface water run-off can directly affect soil quality and condition through deposition or withdrawal of chemicals, suspended solids, and nutrients. During construction eroded material can enter the surface and ground water causing influx of sediments. This has the potential to increase suspended sediments. Through implementation of mitigation measures outlined in Chapters 9 and 10 of the EIAR, the potential impact through interaction is reduced to short-term, slight, negative.

10.8 Cumulative Impacts

Chapter 16 discusses the identification of nearby projects that have the potential to cause cumulative impacts with the proposed FRS.

The Dublin Array wind farm project has the potential for adverse effects on water in the Irish Sea due to its offshore elements, and on the Carrickmines-Shanganagh river network due to its onshore elements. The proposed wind farm will undergo full environmental assessment in the form of an EIAR. Any potential impacts to surface water quality as a result of the wind farm would have appropriate mitigation measures in place.

Other projects outlined in Chapter 16 will not have a significant cumulative impact with the proposed development, due to their small size and lack of complex likely effects.

11 Material Assets – Traffic and Transport

11.1 Introduction

11.1.1 Background

This chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of the existing environmental setting and the likely significant impacts on the surrounding transport network, associated with the proposed works for Carrickmines Shanganagh River Flood Relief Scheme (hereafter called "Scheme"). This includes the likely impact of the construction and operational generated traffic on the surrounding road network. Mitigation measures are recommended as appropriate. A detailed description of the proposed Scheme is provided in Chapter 3 of this EIAR.

11.2 Assessment Methodology

11.2.1 Legislation and Policy

Specific legislation relating to traffic and transport which has been considered as part of the preparation of this chapter includes:

- Roads Act, 1993 – 2023, as amended;
- Roads Regulations 1994 (S.I. No. 119 of 1994), as amended; and
- Roads (Amendment) Regulations 2019 (S.I. No. 486/2019).
- Consideration has been given to the following relevant policy documents in the preparation of this chapter:
- National Planning Framework 2040 (Department of Housing, Planning and Local Government [DHPLG],
- 2018);
- National Development Plan (Department of Public Expenditure and Reform [DPER], 2018);
- National Investment Framework for Transport in Ireland 2021 (Department of Transport, 2021);
- National Roads 2040 [in Draft] (Transport Infrastructure Ireland [TII], 2022);
- Road Safety Strategy 2021-2030 (RSA, 2021);
- National Sustainable Mobility Policy and Action Plan 2022-2025; and
- Dun Laoghaire Rathdown County Development Plan.

11.2.2 Methodology

The methodology adopted for this chapter is summarised as follows:

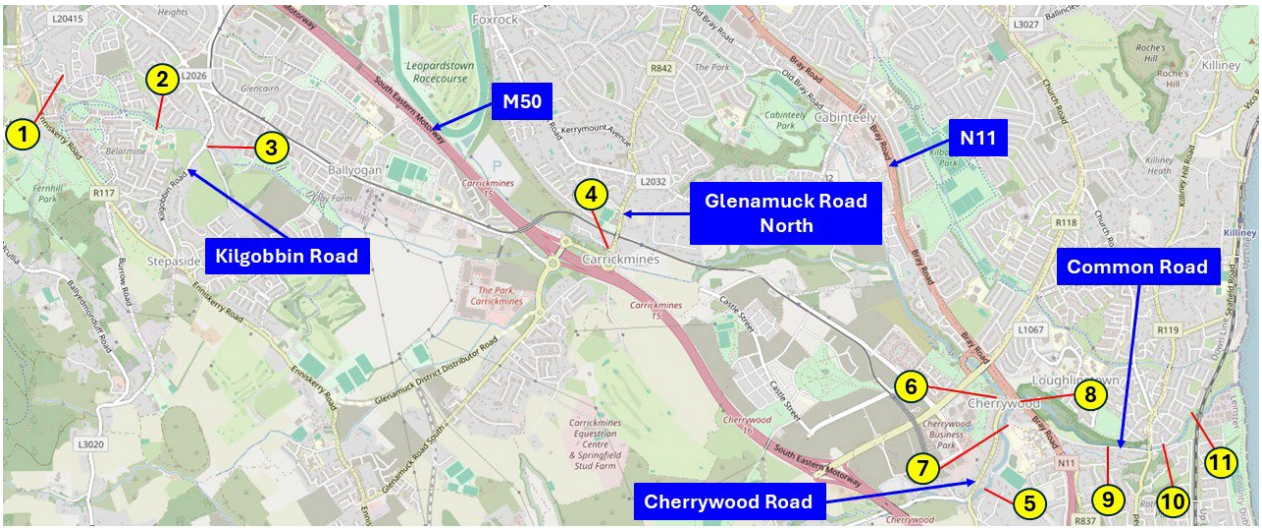
- Reference was made to proposed Scheme plans;
- The trip generation was estimated for the operational and construction phases; and
- The traffic and transport impacts were assessed associated with the proposed Scheme during the construction and operational phases.

The assessment is based on the findings of site visits, traffic observations, plans associated with the proposed Scheme and discussion with the Design Team.

11.3 Receiving Environment

11.3.1 Site Location

The proposed Scheme will be carried out at 11 locations as shown in Figure 11.1. Further description of each location is provided in section 11.3.3.



Location No.	Description
1	Clon Brugh
2	Belarmine Park
3	Kilgobbin
4	Glenamuck Road North

Location No.	Description
5	Cherrywood Road
6	Bray Road
7	Lower Brides Glen
8	N11 Crossing

Location No.	Description
9	Commons Road
10	Brookdene
11	Bayview

Figure 11.1: Site Location Plan
(*Source: OpenStreetMap, annotation by EGIS*)

11.3.2 Design Team Road Data

The Transport Infrastructure Ireland (TII) Traffic Data website presents data collected from the TII traffic counters located on the road network. According to the aforementioned website, six TII Automatic Traffic Count (ATC) stations are located in the vicinity of the proposed Scheme. The locations of six ATC stations and its respective annual average daily traffic (AADT) are shown in Figure *11.2* and Table *11.1* respectively. The road data details can be referenced here: https://trafficdata.tii.ie/publicmultinodemap.asp.

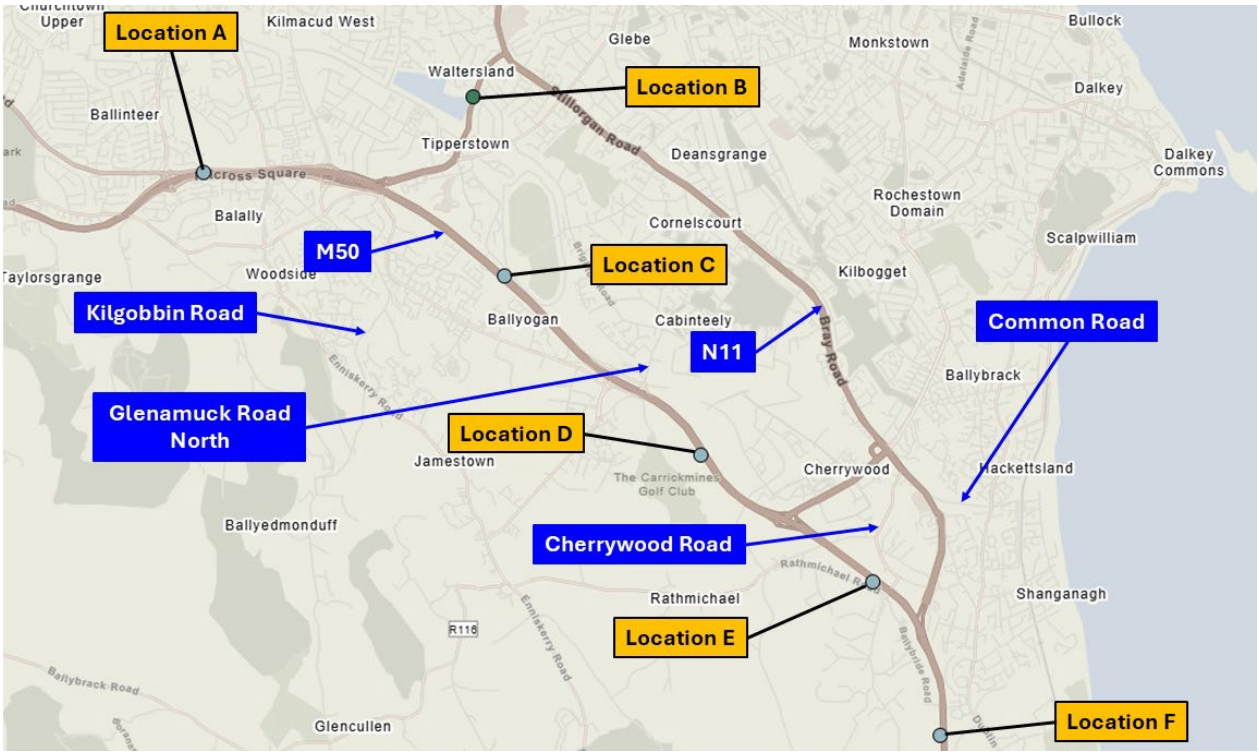


Figure 11.2: Six ATC Locations in the vicinity of the Proposed Scheme
(*Source: https://trafficdata.tii.ie/publicmultinodemap.asp, annotation by EGIS*)

Table 11.1: Annual Average Daily Traffic Flows at Six ATC Locations

Location No.	Station ID	Description	AADT in 2024
A	TMU M50 035.0 S	M50 Between Jn13 Dundrum and Jn14 Dun Laoghaire, Sandyford, Co. Dublin	80,419
B	TMU N31 000.0 E	N31 Brewery Road, Leopardstown, Co. Dublin	14,067
C	TMU M50 040.0 S	M50 Between Jn14 Dun Laoghaire and Jn15 Carrickmines, Cabinteely, Co. Dublin	77,712
D	TMU M50 035.0 N	M50 Betweenn Jn15 Carrickmines and Jn16 Cherrywood, Cabintely, Co. Dublin	74,489
E	TMU M50 040.0 N	M50 Between Jn16 Cherrywood and Jn17 M50/M11, Shankill, Co. Dublin	53,488
F	TMU M11 010.0 N	M11 Between M50/M11 and Bray North Jn, Bray, Co. Dublin	80,241

Note: 1) More road data details can be referred to https://trafficdata.tii.ie/publicmultinodemap.asp.

11.3.3 Site Description

Clon Brugh

The proposed works, which are described in section 3.3.1, within the Clon Brugh estate are located within the existing public green space and lie adjacent to a section of the pedestrian footpath. The pedestrian footpath has no cycle track/lane and adjoins the estates local access road. The sections of the estate's local access road immediately adjoining the works area includes a bi-directional two-lane single carriageway with some local widening as shown in Figure 11.3, two cul de sacs and some parking areas. Generally, the road pavement width of the two-lane single carriageway adjoining the works area is approximately 5.6m. The pedestrian footpath is present along both sides of this road section too.

Figure 11.3: Clon Brugh

Belarmine Park

The proposed flood defence measures, which are described in section 3.3.2, are predominantly contained within Belarmine Park and the adjacent property boundaries to Sandyford Hall. A portion of the parkland to the immediately adjoining the works area will be utilised as a potential site compound. The works area and compound are accessed via Belarmine Vale to the south. A walkway, including footbridge, within Belarmine Park lies adjacent to the proposed flood defence works whilst a small portion of the walkway traverses the site compound.

Figure 11.4: Belarmine Park

Kilgobbin Site

The proposed flood defence measures, which are described in section 3.3.3, at Kilgobbin are located within private greenfield spaces, private residence including the adjoining property curtilage, Kilgobbin road and a

private access road. The proposed overflow pipe will traverse beneath both Kilgobbin Road and the private access road. Kilgobbin Road is a bi-directional two-lane single carriageway with a road pavement width of approximately 5.8m as shown in Figure 11.5. Also, a pedestrian footpath is present along both sides of the road, but no cycle track/lane exists. The works will also traverse private access road which connects local residence and premises to Kilgobbin Road. The private access road as shown in Figure *11.6*: Private Access Road is a bi-directional one-lane single carriageway with road pavement width of approximately 3.5 metres as shown in Figure 11.6. No pedestrian footpath or cycle track/lane exist.

Figure 11.5: Kilgobbin Road

Figure 11.6: Private Access Road

There are two bus stops located on Kilgobbin Road close to the works area (refer to Figure 11.7). All stops adjacent to Kilgobbin Site are served by Dublin Bus. At the time of writing, the bus routes passing through the Kilgobbin Site via Kilgobbin Road are listed in Table 11.2.

Figure 11.7: Bus Stop Locations near the Kilgobbin Site
(*Source: OpenStreetMap, annotation by EGIS*)

Route No.	Route Direction	Frequency of Services			Bus Stop No.
		Mon-Fri	Sat	Sun	
44	DCU – Enniskerry	19 services (06:45 – 23:00)	16 services (07:30 – 23:00)	14 services (09:30 – 23:00	Stop 3472 on Kilgobbin Road
	Enniskerry - DCU	18 services (06:35 – 23:30)	17 services (07:00 – 23:30)	15 services (09:00 – 23:30)	Stop 3486 on Kilgobbin Road
47	Poolbeg Street – Belarmine	19 services (07:40 – 23:30)	17 services (07:30 – 23:30)	15 services (09:30 – 23:30)	Stop 3472 on Kilgobbin Road
	Belarmine – Poolbeg Street	20 services (06:30 – 23:30)	17 services (07:30 – 23:30)	15 services (09:30 – 23:30)	Stop 3486 on Kilgobbin Road
118	Kilternan – Eden Quary	1 service (07:45)	No service	No service	Stop 3486 on Kilgobbin Road

Note: 1) The bus timetable can be referred to https://www.dublinbus.ie/timetables.

Table 11.2:Bus Routes Passing through the Kilgobbin Site via Kilgobbin Road

Glenamuck Road North

The proposed flood defence measures which are described in section 3.3.4 are located on lands adjoining the public roadways of Glenamuck Road North, Castle View, Ballyogan and within the green spaces of Priorsland House.

Glenamuck Road North is a bi-directional two-lane single carriageway with minimum road pavement width of approximately 7m and provides a direct access to/from M50 motorway. For Glenamuck Road North (East-West direction), a pedestrian and cycle track are present at the northern side of the captioned road section as shown in Figure 11.8. For Glenamuck Road North (North-South direction), a pedestrian and cycle track are present along both sides of this road section as shown in Figure 11.9.

Castle View is a bi-directional two-lane single carriageway with road pavement width of approximately 5.5m as shown in Figure 11.10. It is a local access road connecting between Glenamuck Road North and Ballyogan Grove to provide access to some residential premises. Also, a pedestrian footpath is present along northern side of the road, but no cycle track/lane exist.

Ballyogan Grove is a bi-directional one-lane single carriageway with road pavement width of approximately 3m as shown in Figure 11.11. It is a local access road connecting to Castle View to provide access to some premises. Also, a pedestrian footpath is present along northern side of the road, but no cycle track/lane exist.

Figure 11.8: Glenamuck Road North (East-West direction)

Figure 11.9: Glenamuck Road North (North-South direction)

Figure 11.10: Castle View

Figure 11.11: Ballyogan Grove

There are two bus stops located on Glenamuck Road North (refer to Figure 11.12). All stops adjacent to the site are served by Dublin Bus and Go-Ahead Ireland. At the time of writing, the bus routes passing through the Glenamuck Road North site are listed in Table 11.3.

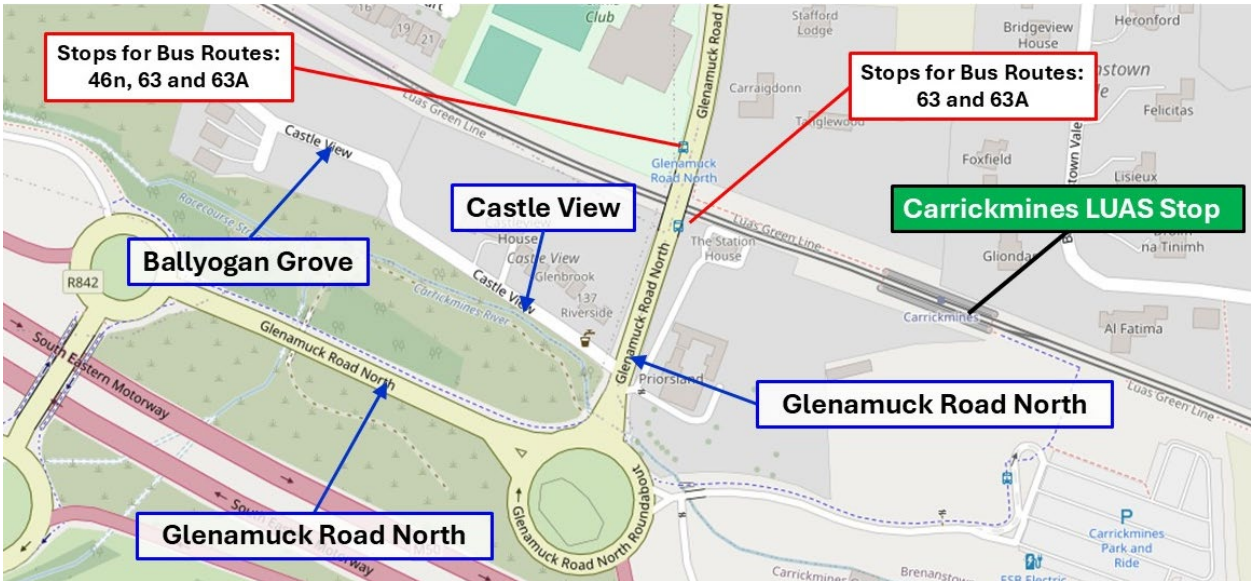


Figure 11.12: Bus Stop and LUAS Stop Locations near the Glenamuck Road North (*Source: OpenStreetMap, annotation by EGIS*)

Route No.	Route Direction	Frequency of Services			Bus Stop No.
		Mon-Fri	Sat	Sun	
63	Kilternan – Dun Laoghaire via Leopardstown	33 services (06:09 – 22:53)	34 services (06:23 – 22:53)	30 services (08:23 – 22:53)	Stop 7373 on Glenamuck Road North
	Dun Laoghaire – Kilternan via Leopardstown	34 services (06:40 – 23:40)	34 services (07:10 – 23:40)	30 services (09:10 – 23:40)	Stop 7372 on Glenamuck Road North
63A	Kilternan – Dun Laoghaire via Foxrock	1 service (10:30)	No service	No service	Stop 7373 on Glenamuck Road North
	Dun Laoghaire – Kilternan via Foxrock	1 service (12:35)	No service	No service	Stop 7372 on Glenamuck Road North
46n	Dublin City South, D'Olier Street – Dundrum	No service from Monday to Thursday, 5 services on Friday (00:30 – 04:00)	5 services (00:30 – 04:00)	No service	Stop 7373 on Glenamuck Road North

Note: 1) The bus timetable can be referred to https://www.dublinbus.ie/timetables and https://www.goaheadireland.ie/services.

Table 11.3: Bus Routes Passing through the Priorsland Site via Glenamuck Road North

The closest LUAS Stop to the Glenamuck Road North site is Carrickmines LUAS Stop, which is located approximately 250m from the captioned site as shown in Figure 11.12. This equates to an approximate 3min walk from the captioned site to the LUAS. The Carrickmines LUAS Stop provides linkages to Broombridge, Brides Glen and the City Centre via the LUAS Green Line. At the time of writing, the timetable of LUAS services provided at Carrickmines LUAS Stop are shown in Table 11.4. Exact times can be found on the LUAS website (https://luas.ie/operating-hours.html).

LUAS Direction*	Timetable**		
	Mon – Fri	Sat	Sun
Southbound Towards Brides Glen	05:39 – 01:14	06:39 – 01:14	07:07 – 00:14
Northbound Towards Parnell or Broombridge	05:36 – 00:06	06:36 – 00:06	07:06 – 23:06

*Note: * The LUAS fares and tickets details can be referred to https://luas.ie/ticket-types.html.*
*** The LUAS timetable can be referred to https://luas.ie/operating-hours.html.*

Table 11.4: Operating Hours of LUAS Green Line Service (www.luas.ie)

Cherrywood Road

The proposed flood defence measures which are described in section 3.3.5 are located on the bank of the Lower Brides Glen River which are adjoined by the residential gardens of existing private properties at Cherrywood Road. The works area will be confined to these residential gardens.

Bray Road

The proposed flood alleviation and defence measures which are described in section 3.3.6 are located within the confines of the Carrickmines River and on the adjoining banks which include greenspaces within Cherrywood Park and on privately owned lands to the south of Bray Road.

Lower Brides Glen

The proposed flood defence measure which is described in section 3.3.7 are located on the riverbank adjoining existing residential properties to the west of the N11 dual carriageway and may be accessed via Cherrywood Road.

N11 Overflow Culvert

The proposed flood alleviation measure which is described in section 3.3.8 will traverse beneath the N11 dual carriageway in and northeast – southwest direction. The upstream face of the culvert infrastructure including headwall and overflow weir will be located with a private residence whilst the downstream outlet structure will be in Loughlinstown Park. Generally, the N11 is a two-lane dual carriageway running in a southeast to northwest direction.

At the proposed works area and within the southeast bound carriageway of the N11, a two traffic lane slip road from the R118 (inclusive of one bus lane) merges with the main carriageway of the N11. This section of the main carriageway consists of two traffic lanes as shown in Figure 11.13. At the location of proposed works, the road pavement width of N11 southeast bound carriageway is approximately 14.3m. Also, a pedestrian footpath and cycle track are present in this area. To the south of the works area the N11 south bound carriageway consists of three traffic lanes (inclusive of one bus lane) as shown in Figure 11.14.

At the proposed works area, the northwest bound carriageway of the N11 consists of two main traffic lanes with an additional flare lane to Cherrywood Road as shown in Figure 11.15. At the location of proposed works, the road pavement width of N11 northwest bound carriageway is approximately 10.2m. The N11 northwest bound carriageway and Bray Road are separated by a central median as shown in Figure 11.15.

Figure 11.13: N11 Southeast Bound at the Location of N11 Crossing Site

Figure 11.14: N11 Southeast Bound at the Location after the N11 Crossing Site

Figure 11.15: N11 Northwest Bound at the Location of N11 Crossing Site

Bray Road is a local access road which connects local residence, businesses and premises with access to the northwest bound carriageway of the N11 and Cherrywood Road. A small section of Bray Road as shown in Figure 11.16 is one-way with only a single traffic lane. The remaining section of Bray Road (including the location of N11 Crossing Site) is a bi-directional two-lane single carriageway with road pavement width of approximately 4.8m as shown in Figure 11.16. Thus, Bray Road southeast bound is a cul-de-sac. A pedestrian footpath is present along western side of Bray Road, but no cycle track/lane exist.

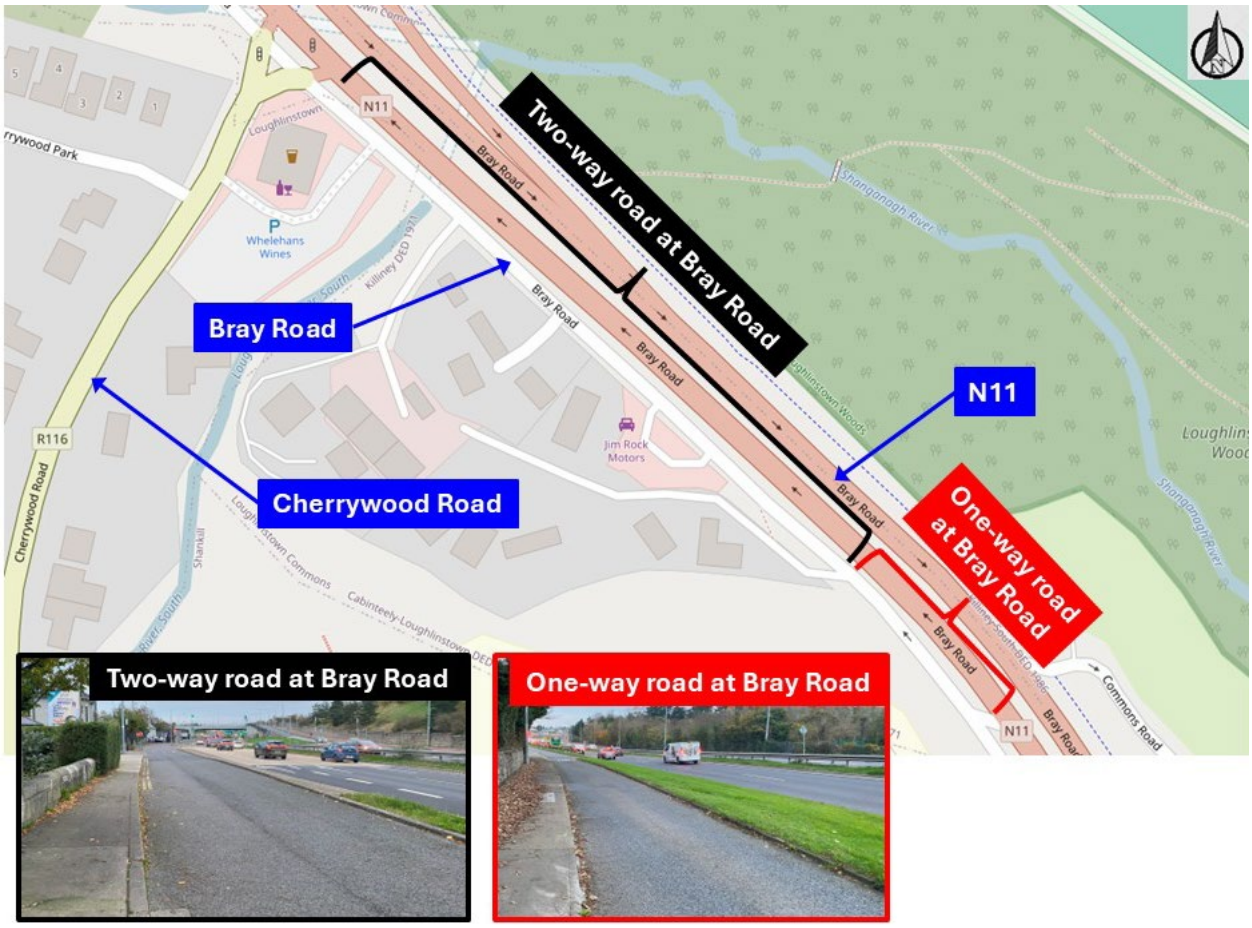


Figure 11.16: Bray Road
(*Source: OpenStreetMap, annotation by EGIS*)

There are four bus stops located on the N11 close to the proposed works (refer to Figure 11.17). All stops are serviced by Bus Éireann, Dublin Bus, Go-Ahead Ireland, Finnegan Bray, St. Kevins Bus Service, Wexford Bus and Aircoach. At the time of writing, the bus routes passing through the N11 Crossing Site via N11 are listed in Table 11.5.

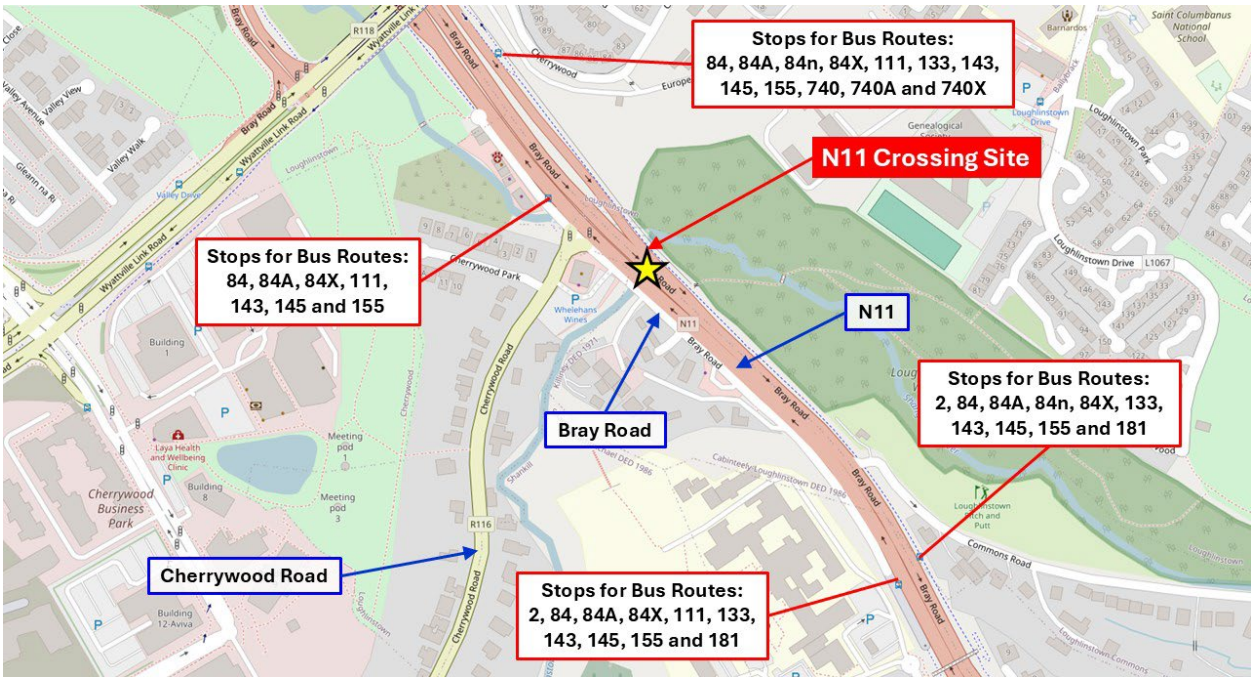


Figure 11.17: Bus Stop Locations near the N11 Crossing Site
(*Source: OpenStreetMap, annotation by EGIS*)

Route No.	Route Direction	Frequency of Services			Bus Stop No.
		Mon-Fri	Sat	Sun	
2	Wexford – Dublin Airport	15 services (02:00 – 20:30)	15 services (02:00 – 20:30)	12 services (02:00 – 20:30)	Stop 3143 on N11
	Dublin Airport – Wexford	15 services (06:00 – 00:00)	15 services (06:00 – 00:00)	12 services (06:00 – 00:00)	Stop 3135 on N11
84	Newcastle – Blackrock	28 services (05:00 – 22:50)	17 services (05:15 – 23:30)	14 services (08:55 – 23:30)	Stops 3143 and 3144 on N11
	Blackrock - Newcastle	25 services (07:10 – 23:30)	17 services (06:40 – 23:30)	12 services (10:35 – 23:30)	Stops 3134 and 3135 on N11
84A	Newcastle – Blackrock	3 services (08:15 – 10:20)	No service	No service	Stops 3143 and 3144 on N11
	Blackrock - Newcastle	1 service (10:15)	No service	No service	Stops 3134 and 3135 on N11
84n	Dublin City South, D'Olier Street – Charlesland Road	No service from Monday to Thursday, 3 services on Friday (00:00 – 04:00)	3 services (00:00 – 04:00)	No service	Stops 3134 and 3135 on N11
84X	Newcastle/ Kilcoole – Eden Quay	12 services (06:10 – 13:30)	No service	No service	Stops 3143 and 3144 on N11
	Hawkins Street – Newcastle / Kilcoole	8 services (12:00 – 18:30)	No service	No service	Stops 3134 and 3135 on N11
111	Brides Glen – Dalkey via Dun Laoghaire	18 services (06:43 – 23:33)	18 services (06:43 – 23:33)	15 services (09:33 – 23:33)	Stops 3134, 3135, 3143 and 3144 on N11
	Dalkey – Brides Glen via Dun Laoghaire	19 services (06:11 – 23:23)	19 services (06:11 – 23:23)	15 services (09:01 – 22:49)	Stops 3134, 3135, 3143 and 3144 on N11
133	Dublin – Wicklow via Rathnew	23 services (06:15 – 00:15)	19 services (06:15 – 00:15)	19 services (06:15 – 00:15)	Stops 3134 and 3135 on N11

Route No.	Route Direction	Frequency of Services			Bus Stop No.
		Mon-Fri	Sat	Sun	
	Wicklow – Dublin via Rathnew	23 services (05:00 – 23:00)	19 services (05:00 – 23:00)	19 services (05:00 – 23:00)	Stop 3143 on N11
143	Bray, Southern Cross Road (Killarney Road – Sandyford, Blackthorn Avenue at LUAS Station	18 services (06:45 – 18:45)	No service	No service	Stops 3143 and 3144 on N11
	Sandyford, Blackthorn Avenue at LUAS Station – Bray, Southern Cross Road (Killarney Road)	22 services (07:30 – 19:15)	No service	No service	Stops 3134 and 3135 on N11
145	Ballywaltrim – Heuston Rail Station	91 services (06:10 – 23:20)	58 services (06:40 – 23:20)	47 services (07:30 – 23:20)	Stops 3143 and 3144 on N11
	Heston Rail Station – Ballywaltrim	96 services (06:20 – 23:25)	60 services (07:00 – 23:25)	44 services (08:30 – 23:20)	Stops 3134 and 3135 on N11
155	Bray Rail Station – IKEA (Ballymun)	53 services (06:00 – 23:20)	53 services (06:00 – 23:20)	47 services (08:00 – 23:20)	Stops 3143 and 3144 on N11
	IKEA (Ballymun) – Bray Rail Station	53 services (06:00 – 23:20)	53 services (06:00 – 23:20)	47 services (08:00 – 23:20)	Stops 3134 and 3135 on N11
181	St Stephens Green – Glendalough Visitor Centre	2 services (11:30 – 18:00)	2 services (11:30 – 19:00)	2 services (11:30 – 19:00)	Stop 3135 on N11
	Glendalough Visitor Centre – St Stephens Green	3 services (07:00 – 16:30)	2 services (09:45 – 17:40)	2 services (09:45 – 17:40)	Stop 3143 on N11
702	Dublin Airport – Greystones	8 services (06:05 – 20:05)	8 services (06:05 – 20:05)	8 services (06:05 – 20:05)	Stop 3129 on N11
	Greystones – Dublin Airport	8 services (04:10 – 18:00)	8 services (04:10 – 18:00)	8 services (04:10 – 18:00)	Stop 3145 on N11
740	Wexford – Dublin Airport	18 services (01:30 – 19:30)	16 services (01:30 – 19:30)	14 services (01:30 – 19:30)	Stop 3145 on N11
	Dublin Airport – Wexford	19 services (05:45 – 23:00)	16 services (05:45 – 23:00)	15 services (07:00 – 23:00)	Stop 3134 on N11
740A	Gorey – Dublin Airport	9 services (06:00 – 17:40)	3 services (09:40 – 15:40)	3 services (09:40 – 15:40)	Stop 3145 on N11
	Dublin Airport – Gorey	10 services (09:45 – 23:00)	6 services (12:10 – 23:00)	6 services (12:10 – 23:00)	Stop 3134 on N11
740X	Wexford – Dublin Airport	3 services (06:55 – 10:20)	2 services (08:20 – 10:20)	2 services (08:20 – 18:30)	Stop 3145 on N11
	Dublin Airport – Wexford	3 services (14:00 – 16:40)	2 services (14:00 – 16:40)	No service	Stop 3134 on N11

Note: 1) The bus timetable can be referred to https://www.buseireann.ie/, https://www.dublinbus.ie/timetables, https://www.goaheadireland.ie/services, https://www.finnegan-bray.ie/scheduled-services/timetable, https://www.glendaloughbus.com/timetable.aspx, https://bookings.wexfordbus.com/ and https://www.aircoach.ie/timetables.

Table 11.5: Bus Routes Passing through the N11 Crossing Site via N11

Commons Road & Brookdene

The proposed flood defence measures are described in section 3.3.9 predominantly located on the banks of the Shanganagh river adjoining a private residence, public yard, the greenspace adjoining the Brookdene estate, Shanganagh Road, River Lane and Commons Road.

Commons Road connects between N11 southeast bound and the junction of Commons Road / Shanganagh Road / River Lane and provides access from N11 to Hackettsland and Rathsallagh. A small section of Commons Road as shown in Figure 11.18 is a one-way road with one traffic lane, where is outside the Commons Road Site. The remaining section of Commons Road (including the location of proposed works) is a bi-directional two-lane single carriageway with road pavement width of approximately 5.2m as shown in Figure 11.18. Thus, Commons Road westbound is a cul-de-sac. At the location of Commons Road Site, a pedestrian footpath is present along both sides of the Commons Road, but no cycle track/lane exist.

Figure 11.18: Commons Road
(*Source: OpenStreetMap, annotation by EGIS*)

Shanganagh Road is a bi-directional two-lane single carriageway. For the Shanganagh Road (Bridge Section), it has a road pavement width of approximately 5m as shown in Figure 11.19. Also, a pedestrian footpath is present along eastern side of the captioned road, but no cycle track/lane exist.

Figure 11.19: Shanganagh Road (Bridge Section)

River Lane is a bi-directional two-lane single carriageway with a road pavement width of approximately 5m as shown in Figure 11.20. Also, a pedestrian footpath is present along both side of the captioned road, but no cycle track/lane exist.

Figure 11.20: River Lane

There are two bus stops located on Shanganagh Road close to the proposed works at Commons Road (refer to Figure 11.21). All stops close to Commons Road are served by Dublin Bus and Go-Ahead Ireland. At the time of writing, the bus routes passing through the Commons Road site via Shanganagh Road are listed in Table 11.6.

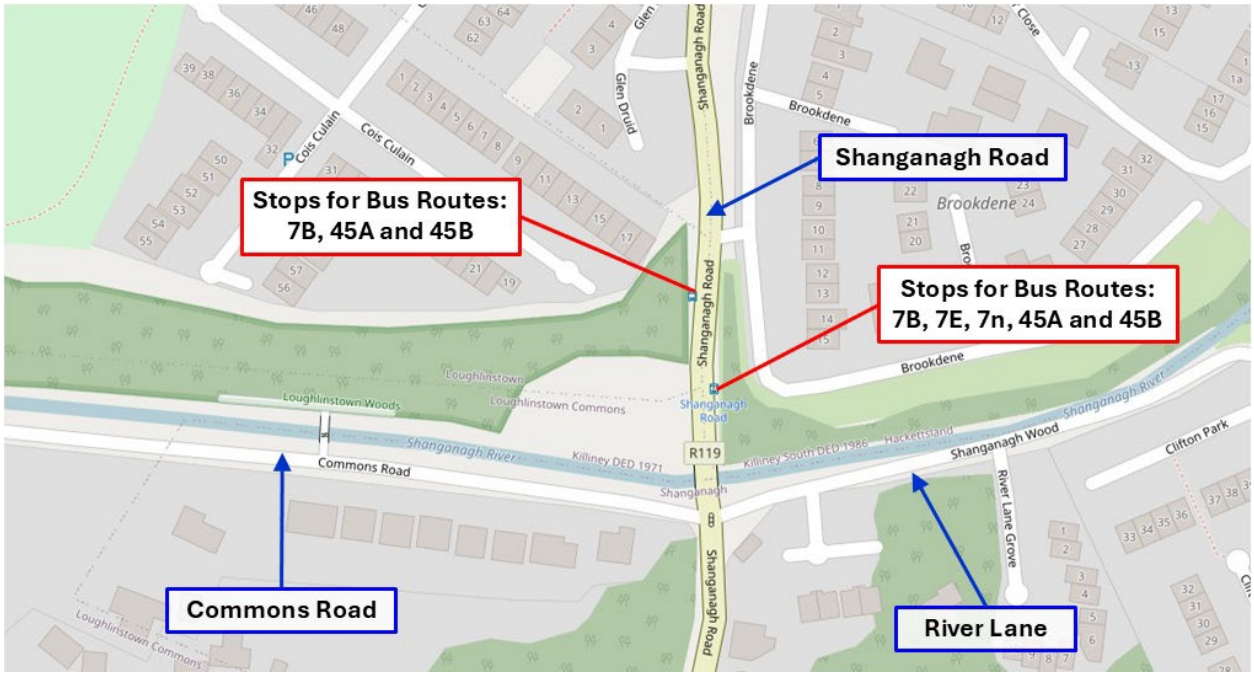


Figure 11.21: Bus Stop Locations near the Commons Road Site
(*Source: OpenStreetMap, annotation by EGIS*)

Route No.	Route Direction	Frequency of Services			Bus Stop No.
		Mon-Fri	Sat	Sun	
7B	Mountjoy Square – Shankill	4 services (17:10 – 17:40)	No service	No service	Stop 3540 on Shanganagh Road
	Shankill – Mountjoy Square	5 services (06:50 – 08:10)	No service	No service	Stop 3554 on Shanganagh Road
7E	Dalkey – Mountjoy Square	1 service (05:20)	1 service (05:45)	No service	Stop 3540 on Shanganagh Road

7n	D'Olier Street – Shankill	No service from Monday to Thursday, 5 services on Friday (00:00 – 04:00)	5 services (00:00 – 04:00	No service	Stop 3540 on Shanganagh Road
45A	Kilmacanogue – Dun Laoghaire	46 services (06:25 – 23:35)	44 services (06:25 – 23:35)	31 services (08:30 – 23:35)	Stop 3554 on Shanganagh Road
	Dun Laoghaire – Kilmacanogue	46 services (06:30 – 23:40)	43 services (06:25 – 23:45)	31 services (08:25 – 23:35)	Stop 3540 on Shanganagh Road
45B	Kilmacanogue – Dun Laoghaire via Shanganagh Cliffs	1 service (09:30)	1 service (10:10)	No service	Stop 3554 on Shanganagh Road
	Dun Laoghaire – Kilmacanogue via Shanganagh Cliffs	1 service (12:50)	1 service (12:55)	No service	Stop 3540 on Shanganagh Road

Note: 1) The bus timetable can be referred to https://www.dublinbus.ie/timetables and https://www.goaheadireland.ie/services.

Table 11.6: Bus Routes Passing through the Commons Road Site via Shanganagh Road

Brookdene is a bi-directional two-lane single carriageway with pavement width of approximately 6.8m as shown in Figure 11.22. Brookdene is a local access road with a dead-end to provide access to some residential premises. Also, a pedestrian footpath is present along northern side of the road, but no cycle track/lane exist.

Figure 11.22: Brookdene Estate

Bayview

The proposed defence works at Bayview are described within section 3.3.10 and are located within the public greenspace adjacent to Bayview Lawns. The proposed measure will interact with the curtilage of an existing property and the adjoining rail network.

11.4 Potential Impact of the Proposed Scheme

It is anticipated that construction will commence in 2027, subject to planning approval and procurement. The construction works are anticipated to take approximately 24 months, with all works completed in 2029. Additionally, it is expected that construction period for each site will be less than 6 months. It is envisaged that multiple sites will be progressed concurrently as part of the overall phasing of the proposed Scheme in order to optimise the programme duration.

11.4.1 Construction Phase for Proposed Scheme

Construction Compound

Six potential construction compounds will be provided for the proposed Scheme during the construction phase. It is anticipated that an individual construction compound will be provided for at the following works sites:

- Clon Brugh,
- Belarmine Park,
- Kilgobbin Road and
- Glenamuck Road North.

The following works sites will share use of one construction compound as follows:

- Cherrywood Road, Bray Road, Lower Brides Glen and the N11 Overflow Culvert will share use of one construction compound; and
- Commons Road Site, Brookdene and Bayview will share use of one construction compound.

Proposed Haulage Route

Access to and egress from the sites is envisaged to be along dedicated construction vehicle routes. It is assumed that all national roads and regional roads in the immediate vicinity of the proposed Scheme will be used by construction vehicles.

The following National Roads are expected to be used as construction vehicle access routes during the construction phase:

- N11;
- M50 Motorway; and
- M11 Motorway.

The following Regional Roads are expected to be used as construction vehicle access routes during the construction phase:

- R113;
- R117;
- R842 - Glenamuck Road North;
- R118;
- R116; and
- R119.

Additionally, the following Local Roads are expected to be used as access routes during the construction phase:

- Village Road;
- Clon Brugh;
- Belarmine Vale;
- Kilgobbin Road;
- Castle View;
- Ballyogan Grove;
- Bray Road;
- Commons Road;
- Brookdene; and
- Bayview Lawns.

Construction Traffic Trip Generation

Construction traffic for proposed flood defences was estimated based on the potential number of construction staff arriving/departing works sites and construction activities involving haulage and delivery of materials. It would be expected that most works throughout the day would be contained within the site boundaries, with occasional deliveries of materials and plant to these sites. The exact programme and sequence of works will be determined by the appointed Contractor to ensure that traffic impacts are kept to a minimum. Throughout the construction phase, the construction workforce numbers will vary, and activities may be limited by the site constraints.

For the impact assessment, it is estimated that maximum 10 staff (3 x 3 person gangs and foreman) will work at any one works site. It has been conservatively estimated that staff will arrive/depart to the works individually by vehicle during the AM and PM peak hours.

For the most part delivery of plant, construction materials and product would be intermittent and involve low trip generation. The activities which would be expected to generate the largest construction trips per site are those associated with haulage of excavated material, delivery of backfill or concrete. The maximum daily construction trip generation for these activities is not expected to exceed 24 HGV arrivals and 24 HGV departures at any one site. It is assumed that working hour per day is 8 hours. To provide a robust analysis of the impact caused by construction traffic, it has been assumed that HGV associated with the construction phase will only arrive or departure to/from the site within 4 hours per day. As a result, the peak hourly trip will be 6 HGV (i.e. 24 HGV / 4 hours = 6 HGV per hour).

The combined maximum AM peak hour trip generation for staff and haulage vehicles (HGVs) and for each site is presented in Table 11.7.

	HGVs	Staff	Total
Arrivals	6	10	16
Departures	6	1	7
Total	**12**	**11**	**23**

Table 11.7: Maximum AM Peak Trip Generation for Each Site During Construction

The PM peak hour is assumed to be the inverse of the AM peak hour presented in Table 11.7, with 10 staff departures and 1 staff arrival for each site.

Belarmine Park, Cherrywood Road, Bray Road, Lower Brides Glen, Brookdene and Bayview

The proposed works at Belarmine Park, Cherrywood Road, Bray Road, Lower Brides Glen, Brookdene and Bayview will be undertaken within the parkland / residential properties / private lands / greenfield areas so the works areas will not occupy any carriageway or footpath to facilitate the works. However, some loading / unloading activities may be carried out at public roads so traffic management will be required to ensure that vulnerable road users and vehicular traffic can use the roads safely during the construction phase.

Normal working hours will be between 08:00 and 18:00, five days per week, with some working on Saturday mornings, subject to any conditions set down by the Local Authorities. It is expected that most workers will be on-site prior to the AM peak hour and construction traffic generated during the construction phase will be generally outside the AM and PM peak hours. Therefore, construction related traffic will not contribute to the existing AM and PM peak hours. It should be also noted that total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours.

In view of the above analysis, the impact during the construction phase of the Belarmine Park, Cherrywood Road, Bray Road, Lower Brides Glen, Brookdene and Bayview works on traffic and transportation will be considered as “temporary” and “not significant”.

Prior to the commencement of construction in these areas, the appointed Contractor shall liaise with the relevant stakeholders / local residents / sensitive receptors (i.e. Stepaside Educate Together National School near the Belarmine Park Site) about the arrangement of construction works (i.e. duration, working period and site access arrangements, etc.).

However, it is anticipated that works at

1. Clon Brugh,
2. Kilgobbin,
3. Glenamuck Road North,
4. N11 Overflow Culvert and
5. Commons Road

will occupy some carriageways or footpaths to facilitate the works. The impacts during the construction phase for the aforementioned sites are discussed in the following sections.

1. Clon Brugh

As the proposed works at Clon Brugh are located adjacent to the public green space / footpath, it is anticipated that some work areas will occupy some footpath to facilitate the works. Temporary traffic management for the captioned works associated with its potential impact is discussed as follows.

Temporary Traffic Management for Clon Brugh

To facilitate the construction of new flood walls located east of Clon Brugh (refer to Area A as shown in Figure 11.23), the existing footpath within Clon Brugh will be closed temporarily to facilitate the works. To minimise disruption to public, the appointed Contractor will consider dividing the captioned works into several sub-stages. If necessary, temporary footpath or pedestrian diversion routes will be proposed by the appointed Contractor and submit it to the relevant Authorities (i.e. Dún Laoghaire-Rathdown County Council (DLRCC) and An Garda Siochána) for approval prior to the commencement of works.

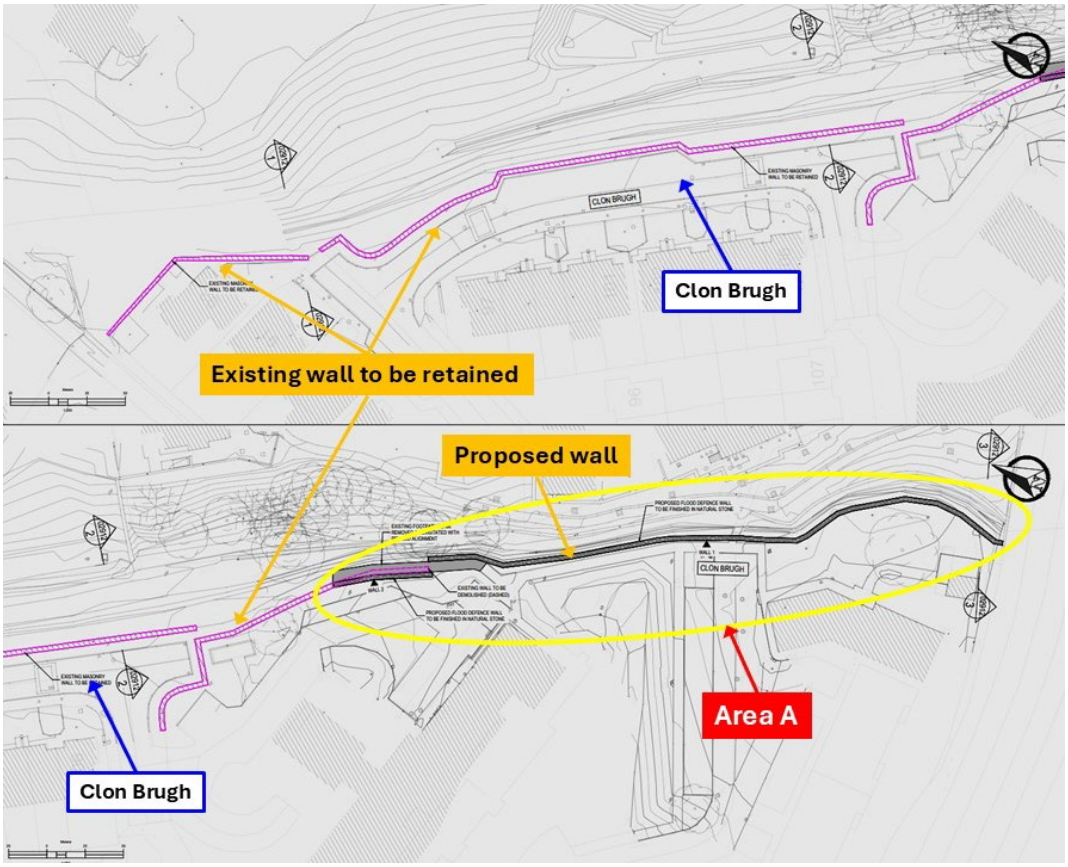


Figure 11.23: Section of Proposed Works at Clon Brugh

Vehicular and pedestrian access must always be made available to all premises during the works. Additionally, a minimum lane width of 2.5m for cars and light vehicles must be provided at Clon Brugh. Prior to the commencement of works, the appointed Contractor shall liaise with the relevant stakeholders and submit a temporary traffic management design (together with proposed working period) to the relevant Authorities (i.e., DLRCC and An Garda Siochána) for approval.

Potential Impact for the Clon Brugh Site

To minimize the traffic impact to public, all construction related traffic will be outside the AM and PM peak hours, and will not have significant impact to the operation of the adjoining junctions. Additionally, the total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours. Moreover, the temporary loading / unloading activities will only be implemented within Clon Brugh so it is anticipated that the traffic impact during the construction phase will be localised. In view of the above analysis, the traffic and transportation impacts arising from Clon Brugh during the construction phase will be considered as “temporary” and “not significant”.

2. Kilgobbin

As the proposed works at Kilgobbin are located at greenfield areas, private lands, carriageway / footpath of Kilgobbin Road and Private Access Road, it is anticipated that some work areas must be required at the carriageway and footpath to facilitate the works. It should be also noted that trench excavation at Kilgobbin Road and Private Access Road are required to facilitate the pipe laying works. Temporary traffic management for the captioned works associated with its potential impact is discussed as follows.

Temporary Traffic Management for the Kilgobbin Site

The pipe laying works (refer to Area A as shown in Figure 11.24), upgrading works of existing walls and construction of new flood walls (refer to Area D as shown in Figure 11.25) are located in greenfield areas and private lands. To facilitate the captioned works, the appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

To facilitate the pipe laying works at Private Access Road (refer to Area B as shown in Figure 11.24), temporary traffic management will be required along this route for the duration of this work. As the road pavement width of Private Access Road is approximately 3.5 metres only, it is necessary to fully close the Private Access Road, which only serves a few premises, to facilitate the captioned works. The appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

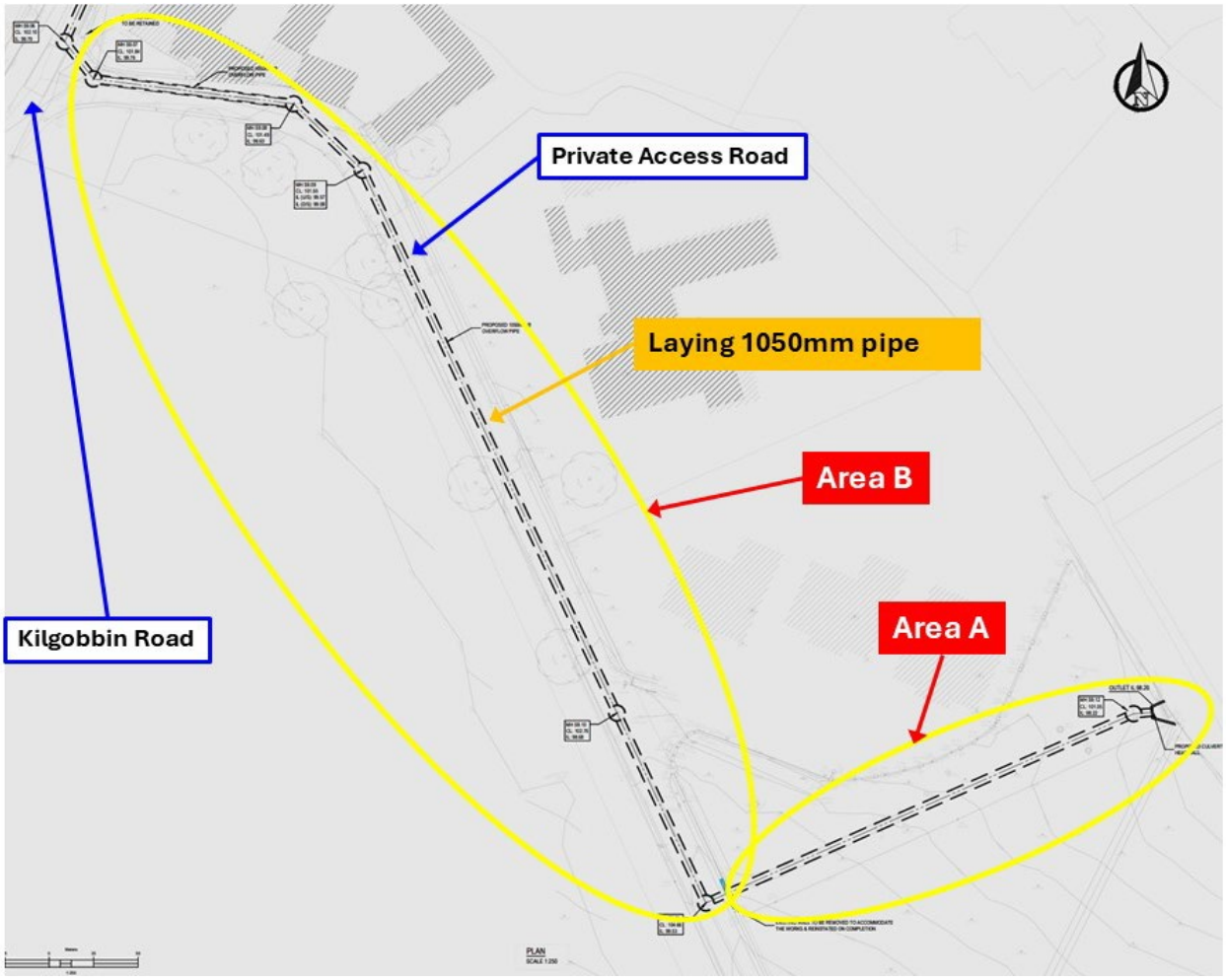


Figure 11.24: Section of Proposed Works at Kilgobbin Site (Part 1 of 2)

To facilitate the pipe laying works at Kilgobbin Road (refer to Area C as shown in Figure 11.25), temporary traffic management will be required along this route for the duration of these works. These measures will include temporary closure of footpath and one traffic lane at Kilgobbin Road. It is anticipated that either a temporary traffic signals or a STOP/GO traffic management system (with at least 2-arm control) will be utilised to maintain two-way traffic flow on Kilgobbin Road and access to residential premises for the duration of these works. To minimise the traffic impact to public, the works will be carried out during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities (i.e. DLRCC and An Garda Siochána). The temporary closure of traffic lane at Kilgobbin Road will re-open for public use outside the working hours.

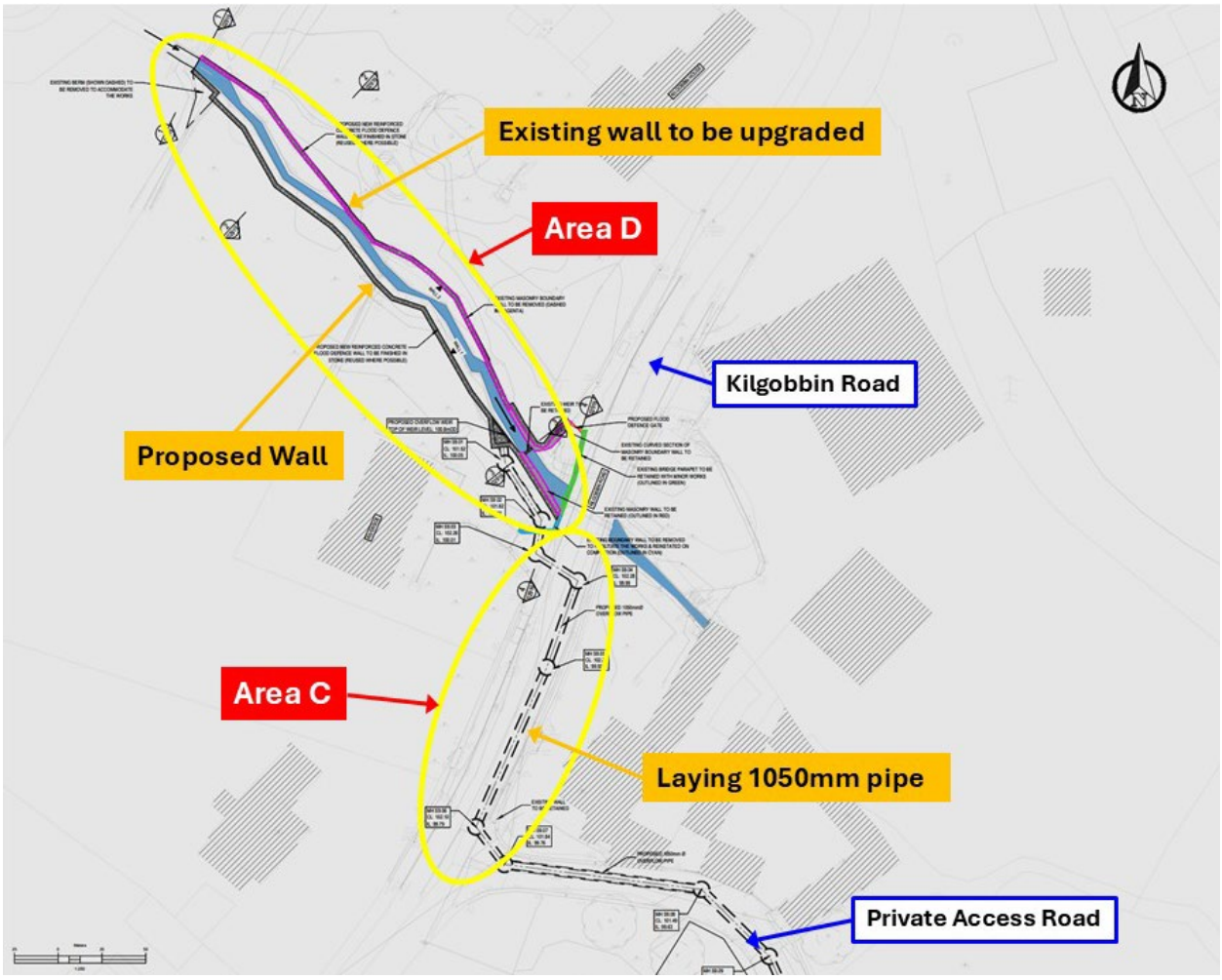


Figure 11.25: Section of Proposed Works at Kilgobbin Site (Part 2 of 2)

Vehicular and pedestrian access must always be made available to all premises during the works, except the works at the Private Access Road. Additionally, a minimum lane width of 3m for HGVs and buses must be provided at Kilgobbin Road. Prior to the commencement of works, the appointed Contractor shall liaise with the relevant stakeholders / local residents and submit a temporary traffic management design (together with proposed working period) to the relevant Authorities (i.e. DLRCC and An Garda Siochána) for approval.

Potential Impact for the Kilgobbin Site

To minimize the traffic impact to public, all construction related traffic will be outside the AM and PM peak hours and will not have significant impact to the operation of the adjoining junctions. Additionally, the total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours. Moreover, to further minimise the traffic impact to public, temporary traffic management at Kilgobbin Road will be implemented during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities. In view of the above analysis, the traffic and transportation impacts arising from the Kilgobbin Site during the construction phase will be considered as “temporary” and “slight effects”.

3. Glenamuck Road North

As the proposed works at Glenamuck Road North are located adjacent to the carriageway of Ballyogan Grove and Castle View and the footpath / cycle track of Glenamuck Road North Roundabout, and within the greenfield areas, it is anticipated that some work areas will occupy some carriageway, footpath and cycle track to facilitate the works. Temporary traffic management for the captioned works associated with its potential impact is discussed as follows.

Temporary Traffic Management for Glenamuck Road North

To facilitate the replacement / upgrading of existing walls adjacent to Ballyogan Grove (refer to Area A as shown in Figure 11.26), temporary traffic management will be required along this route for the duration of this work. As the road pavement width of Ballyogan Grove is approximately 3m only, one of the feasible arrangements is to fully close the Ballyogan Grove, which only serves a few premises, to facilitate the captioned works. The appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

To facilitate the replacement / upgrading of existing walls adjacent to Castle View (refer to Area B as shown in Figure 11.26), where is at the junction of Castle View / Glenamuck Road North, temporary traffic management will be required along this route for the duration of this work. This measure will include temporary closure of westbound lane of Castle View. It is anticipated that either a temporary traffic signals or a STOP/GO traffic management system (with 3-arm control) will be provided at Castle View and Glenamuck Road North to maintain two-way traffic flow on Castle View for the duration of the works. To minimise the traffic impact to public, the works will be carried out during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities (i.e. DLRCC and An Garda Siochána). The temporary closure of traffic lane at Castle View will re-open for public use outside the working hours.

To facilitate the construction of new flood walls adjacent to Glenamuck Road North (refer to Area C as shown in Figure 11.27), temporary traffic management will be required along this route for the duration of this work. These measures will include temporary closure of footpath and portion of cycle track at Glenamuck Road North. Additionally, the remaining portion of cycle track / verge at Glenamuck Road North will be converted to temporary footway with a minimum width of 1.8m to maintain pedestrian movement for the duration of works. Cyclists will dismount and use the temporary footway to pass through the site. Moreover, some loading / unloading activities may be required at Glenamuck Road North to facilitate the captioned works, and it should be carried out during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities (i.e. DLRCC and An Garda Siochána) in order to minimize the traffic impact to public.

The new flood walls (refer to Area D as shown in Figure 11.27) is located on private lands / greenfield areas. To facilitate the captioned works, the appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works. Additionally, small section of footpath at Glenamuck Road North will be closed temporarily to enable the tie in between the existing and proposed wall.

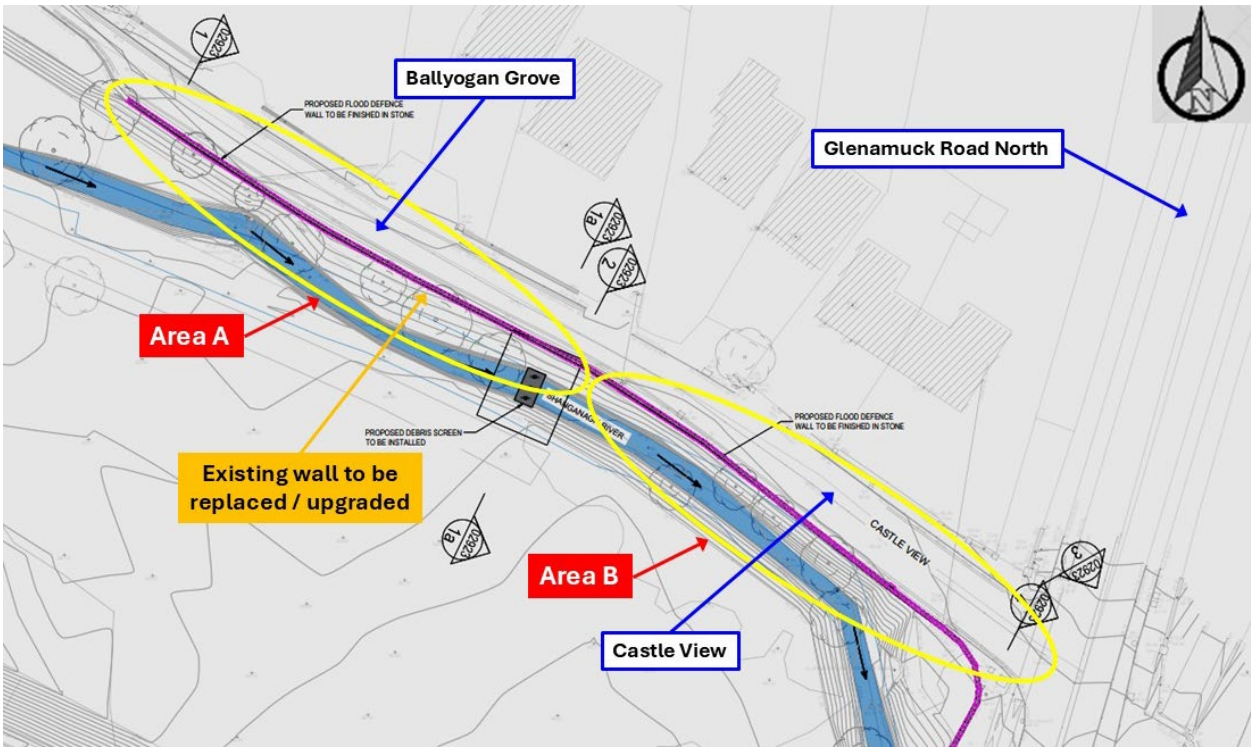


Figure 11.26: Section of Proposed Works at Glenamuck Road North (Part 1 of 2)

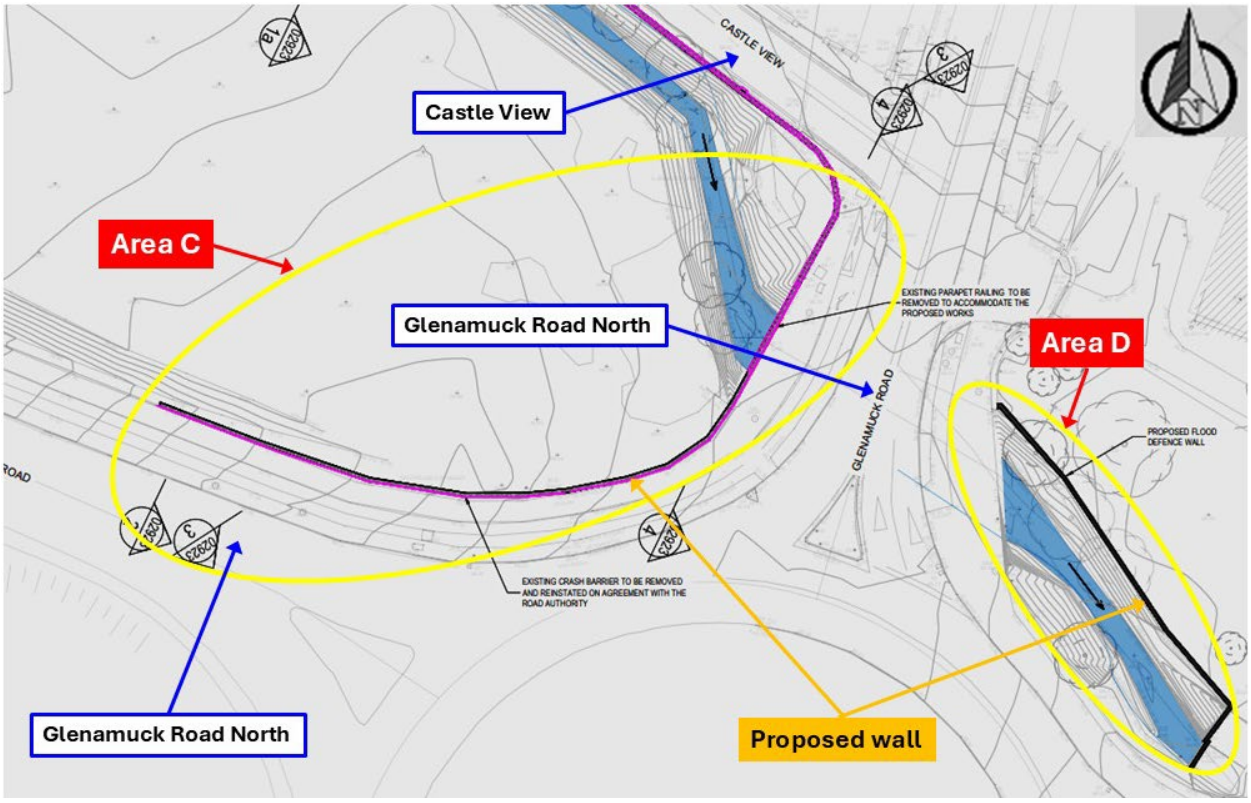


Figure 11.27: Section of Proposed Works at Glenamuck Road North (Part 2 of 2)

Vehicular and pedestrian access must always be made available to all premises during the works, except the works at Ballyogan Grove. Additionally, a minimum lane width of 3m for HGVs and buses must be provided at Glenamuck Road North while a minimum lane width of 2.5m for cars and light vehicles must be provided at Castle View and Ballyogan Grove. Prior to the commencement of works, the appointed Contractor shall liaise with the relevant stakeholders / local residents and submit a temporary traffic management design (together with proposed working period) to the relevant Authorities for approval.

Potential Impact for the Glenamuck Road North

To minimize the traffic impact to public, all construction related traffic will be outside the AM and PM peak hours and will not have significant impact to the operation of the adjoining junctions. Additionally, the total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours. Moreover, to further minimise the traffic impact to public, temporary traffic management at Castle View and loading / unloading activities at Glenamuck Road North will be implemented during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities. In view of the above analysis, the traffic and transportation impacts arising from the Glenamuck Road North works during the construction phase will be considered as "temporary" and "slight effects".

4. N11 Overflow Culvert

As the proposed works at N11 Crossing Site are located at greenfield areas and the footpath / cycle track / carriageway of N11 and Bray Road, it is anticipated that some works areas must be required at the carriageway and footpath to facilitate the works. It should be also noted that trench excavation is required to facilitate the pipe laying works across N11 and Bray Road. Temporary traffic management for the captioned works associated with its potential impact is discussed as follows.

Temporary Traffic Management for the N11 Overflow Culvert

The proposed key works at N11 Crossing Site includes laying 2.4m diameter pipe across N11 and Bray Road. The appointed Contractor shall design a temporary traffic management based on their construction sequence, methodology and equipment / plant used in order to minimize disturbance to public. Additionally, temporary traffic management design shall be submitted to the relevant Authorities (i.e. DLRCC and An Garda Siochána) for approval prior to the commencement of works. To facilitate the captioned works, one of feasible arrangements is to divide the pipe laying works into 9 stages as shown in Figure 11.28.

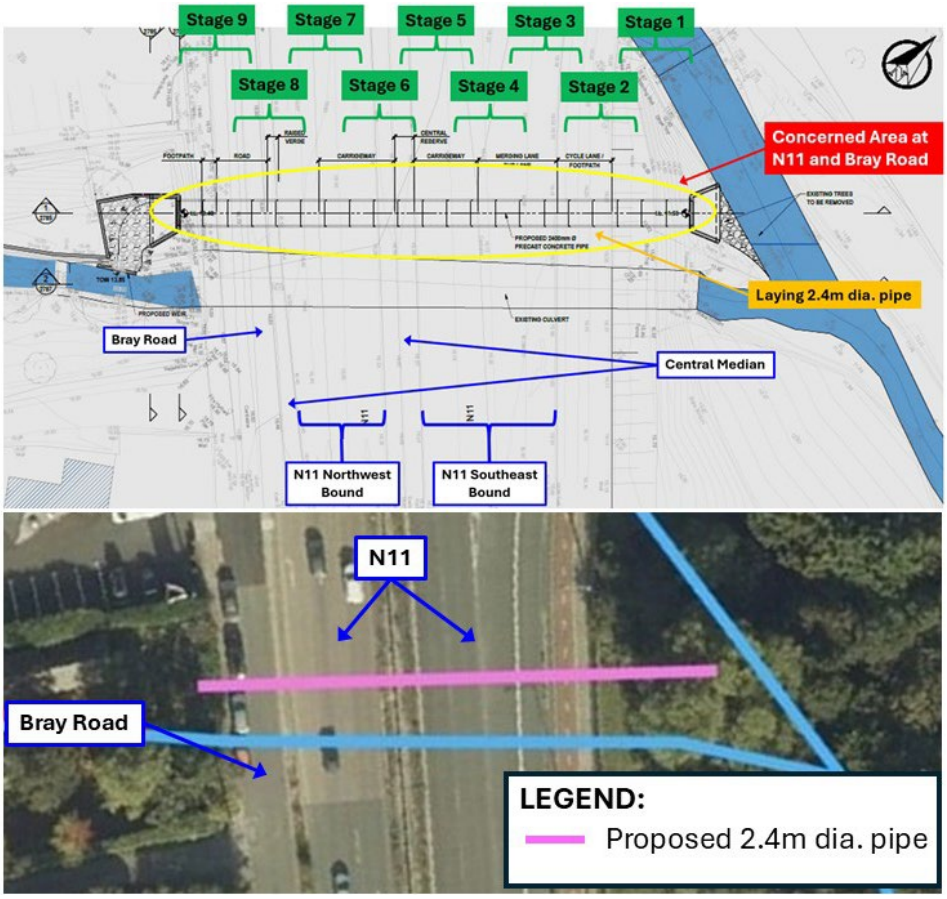


Figure 11.28: Proposed Works at N11 Crossing Site

As the proposed pipe size is very large, it is anticipated that large work areas (i.e. width of approximately 15.7m and length of approximately 19m) is required to facilitate the works for each stage. Temporary traffic management will be required along this route for the duration of this work. These measures will include temporary closure of lanes / footpaths / cycle tracks at N11 and Bray Road, re-configure traffic lanes at N11 and Bray Road, and provide temporary footway with a minimum width of 1.8m to maintain pedestrian / cyclist movements. Cyclists will dismount and use the temporary footway to pass through the site. For each stage, at least one live traffic lane shall be provided in each direction of N11 during construction. To achieve this target, traffic lanes will be temporarily re-configured for the duration of the works at each stage. It should be also noted that additional stages are required to demolish section of central medians (i.e. between N11 southeast bound and N11 northwest bound, and between N11 northwest bound and Bray Road) and convert them to temporary carriageway.

N11 is currently used by national and regional bus services, buses in the Dublin Area service network, cyclists and pedestrians, as well as by emergency vehicles and general vehicular traffic. Additionally, N11 is a busy main road with high volumes of traffic (i.e., 06:00-20:00). Therefore, reduction of any traffic lane at N11 in daytime will cause significant traffic impact to public. To minimise the traffic impact to public during construction, it is advised that the appointed Contractor undertakes the works during nighttime hours. The temporary closure of traffic lanes at N11 and Bray Road will re-open for public use outside the working hours. Exact working time at N11 Crossing Site shall be reviewed / proposed by the appointed Contractor and agreed by the relevant Authorities (i.e. DLRCC and An Garda Siochána) in order to minimise the traffic impact to public. However, if the appointed Contractor opt to work at N11 and Bray Road during daytime hours, they must be cognizant of the permissible working times and the consequent impact on the project's completion rate. Considering the high traffic volume on the N11, the potential allowable working hours for the captioned works at daytime are between 10:00 and 16:00 subject to the approval from the relevant Authorities. If daytime working was to be undertaken on the N11, a full traffic assessment would need to be undertaken to assess the impact and agree with DLRCC.

For the works area falling within Bray Road at some stages, it is necessary to fully close Bray Road to facilitate the works. Prior to the commencement of the captioned works, section of central medians between N11 southeast bound and N11 northwest bound, and between N11 northwest bound and Bray Road shall be demolished and converted to temporary carriageway so that traffic movement at Bray Road northwest bound can be maintained by using N11 as temporary bypass route for the duration of these works. However, traffic movement at Bray Road southeast bound from Cherrywood Road to few premises will be prohibited. Therefore, traffic diversion will be required. Affected southeast bound traffic at Bray Road will be diverted via N11 northwest bound, R118 northeast bound, N11 southeast bound, N11 northwest bound and Bray Road northwest bound as shown in Figure 11.29. As only few premises at Bray Road will be affected by the proposed traffic diversion, so it is anticipated that the proposed traffic diversion will not cause significant traffic impact to public. To facilitate the captioned works, the appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

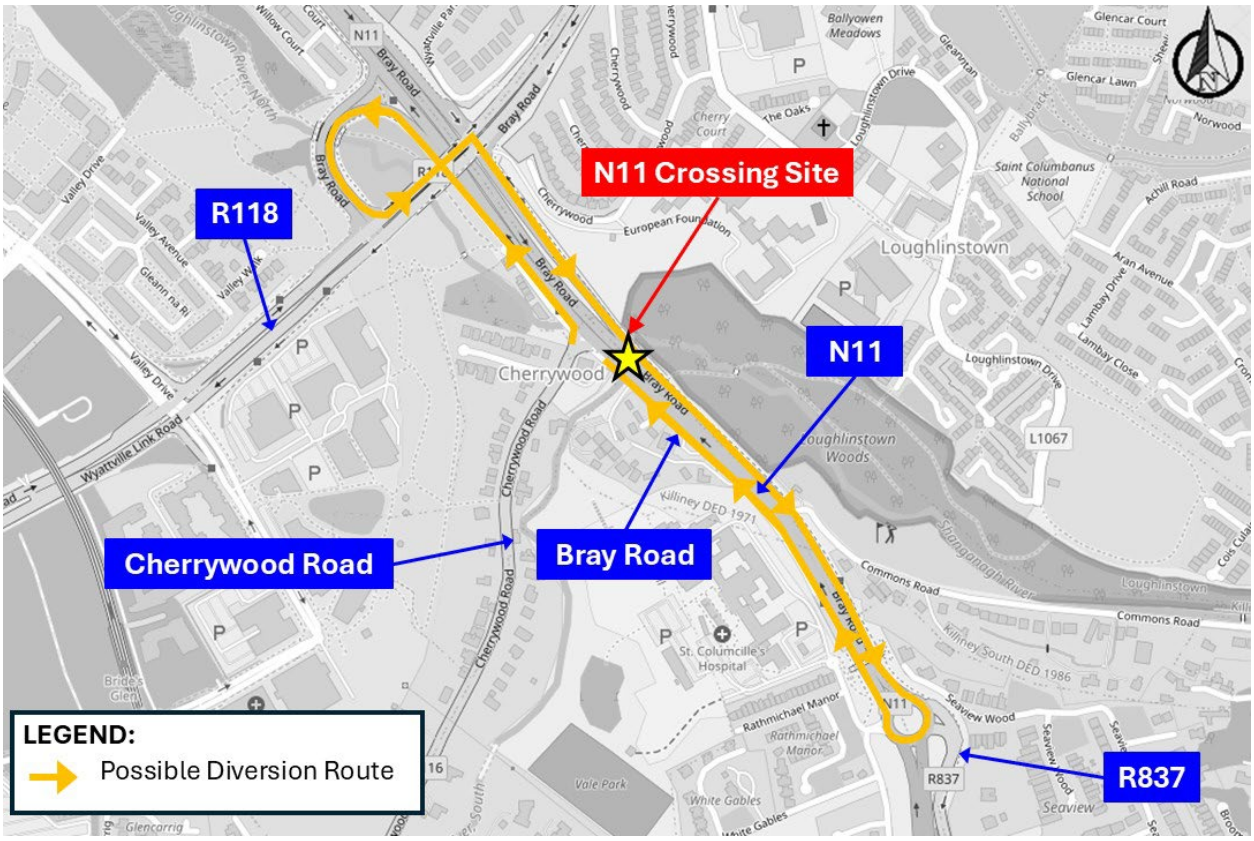


Figure 11.29: Possible Diversion Route during Conversion of Bray Road from Two-way Road to One-way Road
(*Source: OpenStreetMap, annotation by EGIS*)

Vehicular and pedestrian access must always be made available to all premises during the works. Additionally, a minimum lane width of 3m for HGVs and buses / 2.5m for cars and light vehicles must be provided at N11 and Bray Road. Prior to the commencement of works, the appointed Contractor shall liaise with the relevant stakeholders / local residents and submit a temporary traffic management design (together with proposed working period) to the relevant Authorities (i.e. DLRCC and An Garda Siochána) for approval. If the appointed Contractor intends to carry out any minor works, which will not cause any reduction of traffic lane, at the daytime, they shall submit their temporary traffic management design to the relevant Authorities for approval.

Potential Impact for the N11 Overflow Culvert

To minimize the traffic impact to public, all construction related traffic will be outside the AM and PM peak hours and will not have significant impact to the operation of the adjoining junctions. Additionally, the total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours. Moreover, it is advised that the appointed Contractor undertakes the works during nighttime hours to minimize disruption to traffic flow on a heavily trafficked national road. In view of the above analysis, the traffic and transportation impacts arising from the N11 Crossing Site during the construction phase will be considered as “temporary” and “slight effects”. However, if the appointed Contractor opt to work during daytime hours, they must be cognizant of the permissible working times and the consequent impact on the project's completion rate. Considering the high traffic volume on the N11, the potential allowable working hours for the captioned works at daytime are between 10:00 and 16:00 subject to the approval from the relevant Authorities.

5. Commons Road

As the proposed works at Commons Road Site are located adjacent to Commons Road, Shanganagh Road (Bridge Section), River Lane, and within the greenfield areas, residential properties and private lands, it is anticipated that some work areas will occupy some carriageway and footpath to facilitate the works. Temporary traffic management for the captioned works associated with its potential impact is discussed as follows.

Temporary Traffic Management for the Commons Road

To facilitate the construction of new flood walls and upgrading works of existing walls adjacent to Commons Road (refer to Area A as shown in Figure 11.30 and Figure 11.31), temporary traffic management will be required along this route for the duration of this work. These measures will include temporary closure of footpath along northern side of Commons Road and eastbound lane of Commons Road. It is anticipated that either a temporary traffic signals or a STOP/GO traffic management system (with at least 2-arm control) will be utilised to maintain two-way traffic flow on Commons Road and access to residential premises to for the duration of these works. To minimize the traffic impact to public, the works will be divided into several sub-stages and carried out during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities (i.e., DLRCC and An Garda Siochána). The temporary closure of traffic lane at Commons Road will re-open for public use outside the working hours.

To facilitate the upgrading works of existing walls adjacent to Commons Road (refer to Area B as shown in Figure 11.31), temporary traffic management will be required along this route for the duration of this work. One of feasible arrangements is to implement either a temporary traffic signals or a STOP/GO traffic management system with 4-arm control at Commons Road / Shanganagh Road / River Lane Junction in order to maintain two-way traffic flow on Commons Road. However, to further minimise the traffic impact to public, it is proposed to change Commons Road from two-way road to one-way road in order to maintain the eastbound movement so that traffic movement at Commons Road westbound from Shanganagh Road / River Lane to some premises will be prohibited for the duration of these works. Therefore, traffic diversion will be required. Affected westbound traffic at Commons Road will be diverted via Shanganagh Road northbound, Wyattville Road westbound, Wyattville Road southwest bound, N11 southeast bound and Commons Road eastbound as shown in Figure 11.32. To further minimize the traffic impact to public, the works will be carried out during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities (i.e., DLRCC and An Garda Siochána). The temporary closure of traffic lane at Commons Roads will re-open for public use outside the working hours.

To facilitate the upgrading works of existing walls adjacent to the bridge section of Shanganagh Road (refer to Area C as shown in Figure 11.31), temporary traffic management will be required along this route for the duration of this work. This measure will include temporary closure of northbound lane of Shanganagh Road (Bridge Section). It is anticipated that either a temporary traffic signals or a STOP/GO traffic management system (with 4-arm control) will be utilised to maintain two-way traffic flow on Shanganagh Road for the duration of these works. To minimize the traffic impact to public, the works will be carried out during the off-peak hour (i.e., 10:00-16:00) subject to the agreement with the relevant Authorities (i.e., DLRCC and An Garda Siochána). If the appointed Contractor intends to fully close Shanganagh Road (Bridge Section) to facilitate the works, the proposed works shall only be implemented at night-time and outside the bus operating period as shown in Table 11.6. Additionally, traffic diversion routes shall be proposed by the appointed Contractor and submitted it to the relevant Authorities for approval. The temporary closure of traffic lane at Shanganagh Road will re-open for public use outside the working hours.

To facilitate the upgrading works of existing walls at the existing access bridge (refer to Area D as shown in Figure 11.31), temporary traffic management will be required for the duration of these works. As the road pavement width of this access bridge is approximately 3m only, it is necessary to fully close this access bridge, which only serves one premise, to facilitate the captioned works. The appointed Contractor shall liaise with the local resident to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

The upgrading works of existing walls located at the northern side of Shanganagh River (refer to Area E as shown in Figure 11.31) is on private lands and greenfield areas. To facilitate the aforementioned works, the appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

To facilitate the upgrading works of existing walls at River Lane (refer to Area F as shown in Figure 11.31), temporary traffic management will be required for the duration of these works. These measures will include temporary closure of footpath along northern side of River Lane and westbound lane of River Lane. It is anticipated that either a temporary traffic signals or a STOP/GO traffic management system (with at least 2-arm control) will be utilised to maintain two-way traffic flow on River Lane and access to residential premises to for the duration of these works. To minimize the traffic impact to public, the works will be divided into several sub-stages and carried out during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities (i.e., DLRCC and An Garda Siochána). The temporary closure of traffic lane at River Lane will re-open for public use outside the working hours.

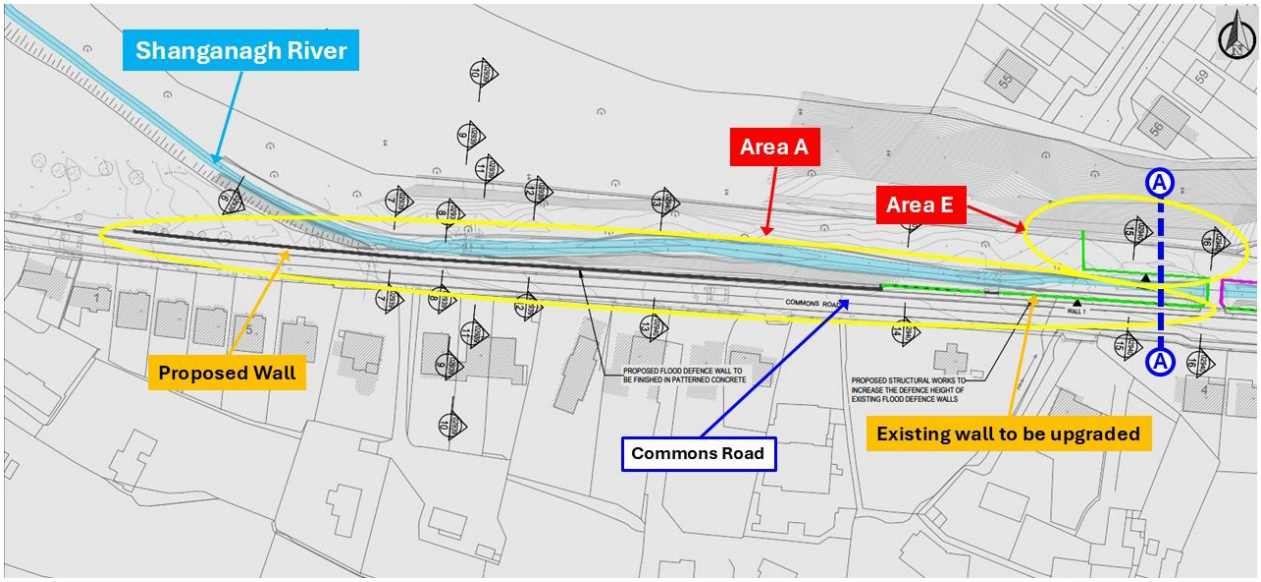


Figure 11.30: Section of Proposed Works at Commons Road Site (Part 1 of 2)

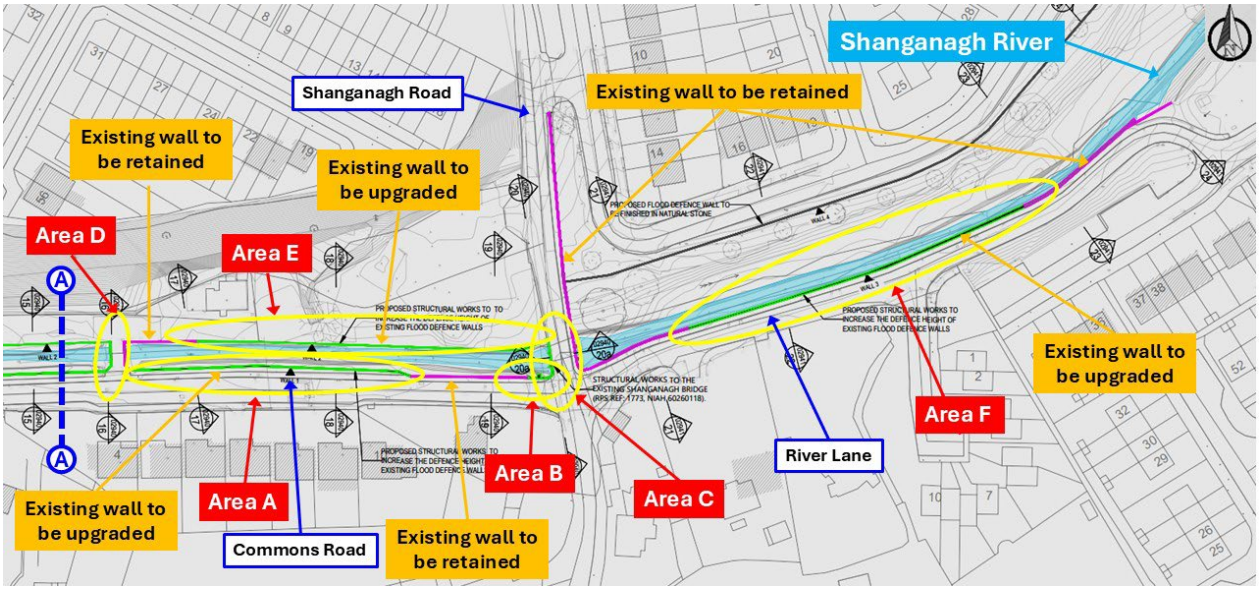


Figure 11.31: Section of Proposed Works at Commons Road Site (Part 2 of 2)

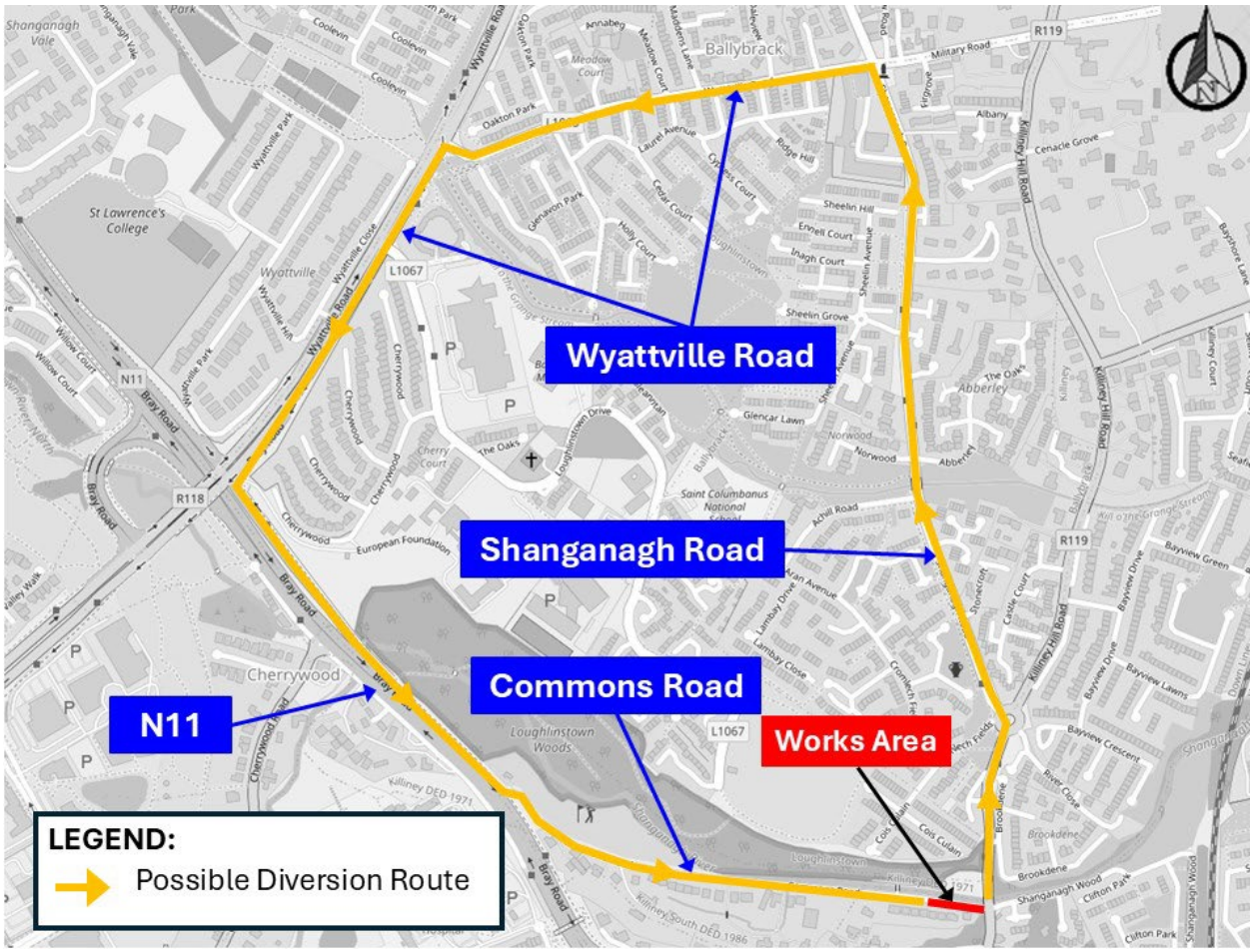


Figure 11.32: Possible Diversion Route during Conversion of Commons Road from Two-way Road to One-way Road
(*Source: OpenStreetMap, annotation by EGIS*)

Vehicular and pedestrian access must always be made available to all premises during the works, except the works at the aforementioned access bridge. Additionally, a minimum lane width of 3m for HGVs and buses must be provided at Commons Road, Shanganagh Road and River Lane. Prior to the commencement of works, the appointed Contractor shall liaise with the relevant stakeholders / local residents and submit a temporary traffic management design (together with proposed working period) to the relevant Authorities for approval.

Potential Impact for the Commons Road

To minimize the traffic impact to public, all construction related traffic will be outside the AM and PM peak hours and will not have significant impact to the operation of the adjoining junctions. Additionally, the total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours. Moreover, to further minimise the traffic impact to public, temporary traffic management at Commons Road, Shanganagh Road and River Lane will be implemented during the off-peak hour (i.e. 10:00-16:00) subject to the agreement with the relevant Authorities. In view of the above analysis, the traffic and transportation impacts arising from the Commons Road Site during the construction phase will be considered as “temporary” and “slight effects”.

11.4.2 Operational Phase for Proposed Scheme

In view of nature of proposed Scheme, it is anticipated that the proposed Scheme will not result in any trip generation in the operational phase. Additionally, it is intended to reinstate roads impacted by the works to their pre-construction condition with no changes to the road network or permitted direction of travel. Therefore, it can be concluded that the proposed Scheme will have no impacts during the operational phase.

11.5 Mitigation Measures

11.5.1 Construction Phase for Proposed Scheme

A Preliminary Traffic Management Plan will be prepared by the Project Supervisor Design Process for the works in full consultation with DLRCC, An Garda Síochána, the Fire Service and the Ambulance service prior to the issuing of tender documents. When the works are awarded to the appointed Contractor, the Preliminary Traffic Management Plan will be developed by the Project Supervisor Construction Stage into a Detailed Traffic Management Plan in full consultation with the above-mentioned stakeholders. All traffic management plans, including working times, will be agreed with and approved by DLRCC Transportation Department in advance of implementation.

Prior to the commencement of works, a full and detailed construction management plan will be submitted to and agreed in writing with the DLRCC, which shall include, inter alia, a construction programme for the works, hours of operation, a traffic management plan, noise and dust mitigation measures and details of construction lighting. A Construction Manager should be appointed to liaise directly with the various sections of DLRCC.

The construction traffic management plan will take into account construction vehicle routing and timing to mitigate any issues with vehicles on public roads, focusing on the areas of impact, as summarised in Table *11.8*. The table shows the specific mitigation measures for the aforementioned sites that are to be provided to minimise impacts to the public road network during the construction phase.

Table 11.8: Specific Mitigation Measures

Site	Specific Mitigation Measures	
Clon Brugh	-	None proposed
Kilgobbin	-	Either a temporary traffic signals or a STOP/GO traffic management system will be utilised to maintain two-way traffic flow on the Kilgobbin Road.
	-	Temporary traffic management is required to construct the overflow pipe at Kilgobbin Road. These works will only be implemented during off-peak hours subject to agreement with the local authority. The road will be fully re-opened for public use outside of the working hours.
	-	Full closure of the adjoining private access road to Kilgobbin Road will be required to facilitate the works. The appointed Contractor shall liaise with the relevant stakeholders and local residents to agree the construction arrangement (i.e. duration, working hours and access arrangements, etc.) prior to the commencement of works. The road will be fully re-opened to relevant stakeholders and local residents outside of the working hours.
Glenamuck Road North	-	Either temporary traffic signals or a STOP/GO traffic management system will be utilised to maintain a two-way traffic flow on Castle View.
	-	Temporary traffic management, required to construct the works, at Castle View will only be implemented during the off-peak hours subject to agreement with the local authority. The road will be fully re-opened for public use outside the working hours.
	-	Full closure of private access road for Ballyogan Grove will be required to facilitate the works. The appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works. The road will be fully re-opened to relevant stakeholders and local residents outside of the working hours.
N11 Overflow Culvert	-	It is advised that the appointed Contractor undertakes the works for the N11 culvert overflow during nighttime hours only to minimize disruption to traffic flow on a heavily trafficked national road. Additionally, full closure of Bray Road at night-time will be required to facilitate the works and the required traffic

Site	Specific Mitigation Measures	
		management measures. For the duration of these construction works, traffic movement from Bray Road that is northwest bound will be maintained using N11 dual carriageway as a temporary bypass route however a traffic diversion will be required for southeast bound traffic from a few premises on Bray Road and Cherrywood Road. The N11 dual carriageway and Bray Road will be re-opened for public use outside the working hours. If the appointed Contractor opts to work during daytime hours, they must be cognizant of the permissible working times and the consequent impact on the project's completion rate. Considering the high traffic volume on the N11, the potential allowable working hours for the captioned works at daytime will be subject to the approval from the relevant Authorities. If daytime working was to be undertaken on the N11, a full traffic assessment would need to be undertaken to assess the impact and agree with DLRCC.
Commons Road	-	Either a temporary traffic signals or a STOP/GO traffic management system will be utilised to maintain two-way traffic flow on Commons Road, Shanganagh Road and River Lane.
	-	Temporary traffic management at Commons Road, Shanganagh Road and River Lane will be implemented during the off-peak hours subject to agreement with the local authority. The roads will be fully re-opened for public use outside the working hours.
	-	Full closure of the existing private access bridge will be required to facilitate the works. The appointed Contractor shall liaise with the relevant stakeholders / local residents to agree the construction arrangement (i.e. duration, working period and access arrangements, etc.) prior to the commencement of works.

The following general mitigation measures, subject to agreement with DLRCC prior to construction, shall be provided for all sites to minimise the impacts to the public road network during the construction phase.

- All construction related traffic will operate outside the morning and evening peak hours to minimise impacts to the operation of the adjoining junctions.
- The construction programme and sequence for the proposed scheme shall be co-ordinated and planned to mitigate the risks of cumulative impacts to the public arising from concurrent works sites.
- Good construction management practices will be employed such as fencing the sites off from the public and neighbouring sites, adequate external/internal signage, secure internal site offices, dedicated construction access points all to ensure the safety construction staff and the public.
- Appropriate levels of staff parking and site compounds will be provided to ensure no potential overflow or haphazard parking in the area. The site compounds will be able to accommodate employee and visitor parking. Contractor's, subcontractor's or supplier's vehicles or staff vehicles, or any vehicles associated with the works are not permitted to park, idle or queue on the public road network.
- Construction traffic routes to/from the sites will be agreed with DLRCC prior to the commencement of constructions activities. The time of day permittable for such routes will also be agreed upon and outside of the AM and PM peak hours.
- Tracked excavators will be moved to/from the site on low-loaders and will not be permitted to drive on the street pavements.
- Wheel washers / judder bars will be placed at all site access points to minimise the migration of detritus onto the public roads. The roads will be inspected and cleaned on a regular basis.
- Haul vehicles will be covered after loading to ensure there is no risk of construction material falling; and
- Where possible, abnormal load movements will be restricted to evening or night-time to minimise disruption to local traffic and traffic on strategic routes.

11.5.2 Operational Phase for Proposed Scheme

It is envisaged that the proposed Scheme will not result in any trip generation in operational phase. Therefore, no mitigation measures will be required for the operational phase of the proposed Scheme.

11.6 Residual Effects

11.6.1 Construction Phase for Proposed Scheme

In view of above analysis, the proposed Scheme will result in a **slight, adverse, temporary** and **not significant** impact during the construction phase.

11.6.2 Operational Phase for Proposed Scheme

In view of above analysis, the proposed Scheme will result in **no long-term impacts** during the operational phase.

11.7 Interactions

11.7.1 Air Quality and Noise & Vibration

The most significant interactions are between air quality and traffic. Emissions increase with increased traffic movements. Additionally, significant interactions may occur between traffic and noise & vibration. Noise & vibration increase with increased traffic movements.

In view of the nature of proposed Scheme, the proposed Scheme will not result in any trip generation in operational phase so it is anticipated that the annual average daily traffic on roads will remain unchanged. Therefore, there is no interaction between traffic and air quality / noise & vibration during the operational phase.

During the construction phase, there is a slightly increase in annual average daily traffic on roads close to the sites. However, as construction traffic generated during the construction phase will be outside the AM and PM peak hours, so the total traffic volumes (i.e. off-peak background traffic volume plus construction traffic generated by the proposed Scheme) will not be higher than the traffic volumes in AM and PM peak hours. Therefore, it is anticipated that the proposed Scheme will not have any significant interaction between traffic and air quality / noise & vibration during the construction phase.

11.7.2 Population & Human Health

All haulage of plants and materials to/from the construction sites will be made along dedicated construction vehicle routes.

As a results of negligible increase in traffic volumes on the surrounding road network, it is not anticipated that the proposed Scheme will have any significant impact on the capacity of the local road network and have any significant interaction with Population and Human Health.

11.8 Cumulative Effects

The cumulative impact assessment for Traffic was informed by the scoping exercise undertaken in the development of this EIAR. For the construction phase, construction vehicles for the proposed Scheme will be generally outside the AM and PM peak hours. Additionally, temporary traffic management at some roads (i.e., Kilgobbin Road, Glenamuck Road North, Commons Road, Shanganagh Road, etc.) will be implemented during the off-peak hour (i.e. 10:00-16:00), and temporary traffic management at N11 and Bray Road will be only implemented at night-time subject to the agreement with the relevant Authorities. To further minimise the traffic impacts to public, a Traffic Management Plan would be prepared in consultation and agreement with the relevant project developers to minimize peak construction traffic flows. Additionally, the Contractor shall carry out co-ordination meetings with relevant project developers to resolve the interface issues related to the temporary traffic management. Therefore, the cumulative impact is considered to be slight adverse temporary impact during the construction phase.

After completion of the proposed Scheme, the roads impacted by the works will be reinstated to their pre-construction condition with no changes to the road network or permitted direction of travel. Therefore, no cumulative effects were identified during the operational phase.

11.9 Monitoring

No monitoring is proposed for the operational phase of the proposed Scheme.

11.10 Reference

In preparing this assessment, reference has been made to the following documents:

- TII Traffic and Transport Assessment Guidelines (2014) as published by the former National Roads Authority (NRA) now TII;
- Traffic Signs Manual (2019) (Chapter 8 – Temporary Traffic Measures and Signs for Roadworks) as published by the Department of Transport, Tourism and Sport;
- Temporary Traffic Management Design Guidance (2019) as published by the Department of Transport, Tourism and Sport; and
- Temporary Traffic Management Operations Guidance 2019) as published by the Department of Transport, Tourism and Sport.

12 Material Assets – Utilities and Waste

12.1 Assessment Methodology

Material assets, as described in the EPA Guidelines (2022) covers three separate aspects: roads, traffic, and transport, built services or utilities, and waste management. Traffic and Transport have been assessed in the previous chapter. This chapter will deal with utilities and waste.

The assessment of utilities included a desk-based exercise to identify utilities (i.e., underground utilities, electrical infrastructure) that could be affected by the proposed scheme, and consultation of utilities mapping from various utility companies. Prior to construction, test trenching will be carried out on site by the utility companies to accurately locate services in proximity to proposed construction excavation sites.

The assessment of waste included a calculation of quantities of waste likely to be produced during the construction phase. Details of likely truck movements in relation to waste are also included in the chapter.

12.2 Receiving Environment

12.2.1 Site Compound Locations

Due to the proposed works areas being spread over a large area, several site compounds will be needed during construction. These are shown in Figures 12.1 to 12.3.

At Clon Brugh (Figure 12.1), a small compound will be situated in green open space adjacent to the works area, immediately north of resident car parking. This compound will serve the works area at Clon Brugh only.

At Belarmine Park (Figure 12.1), a compound will be situated immediately south of the works, in green open space just north of the Belarmine Vale road. This compound will serve the works at Belarmine Park only.

At Kilgobbin Road (Figure 12.1), a compound will be situated in the green field south of Kilgobbin House, immediately adjacent to the southern bank of the river. Access is from Kilgobbin Road, and the compound will serve the works at Kilgobbin Road only.

At Glenamuck Road North (Figure 12.2), the compound will be situated approx. 300m northwest of the works area, off the Leopardstown Racecourse Road. Plant and machinery will travel from the compound to the works site along the Glenamuck Road.

At Bray Road (Figure 12.3), a compound will be situated in the green open space on the west bank of the river, immediately north of houses at Cherrywood Park. This will be accessed from an existing bridge over the river from Bray Road. This compound will serve the works at Bray Road, Cherrywood Road, and Lower Brides Glen.

At Commons Road (Figure 12.3), a compound will be situated in a DLRCC-owned greenfield area on the left (north) bank of the Shanganagh River, immediately upstream of the Shanganagh Road Bridge and accessed from Shanganagh Road. This compound will serve works on Commons Road, Brookdene, and Bayview.

It is likely that several smaller temporary storage areas will be utilised during the works in addition to those named above. These will be within the areas of works and will be properly marked and fenced.

Following construction, all compound areas will be fully reinstated to their pre-construction state.

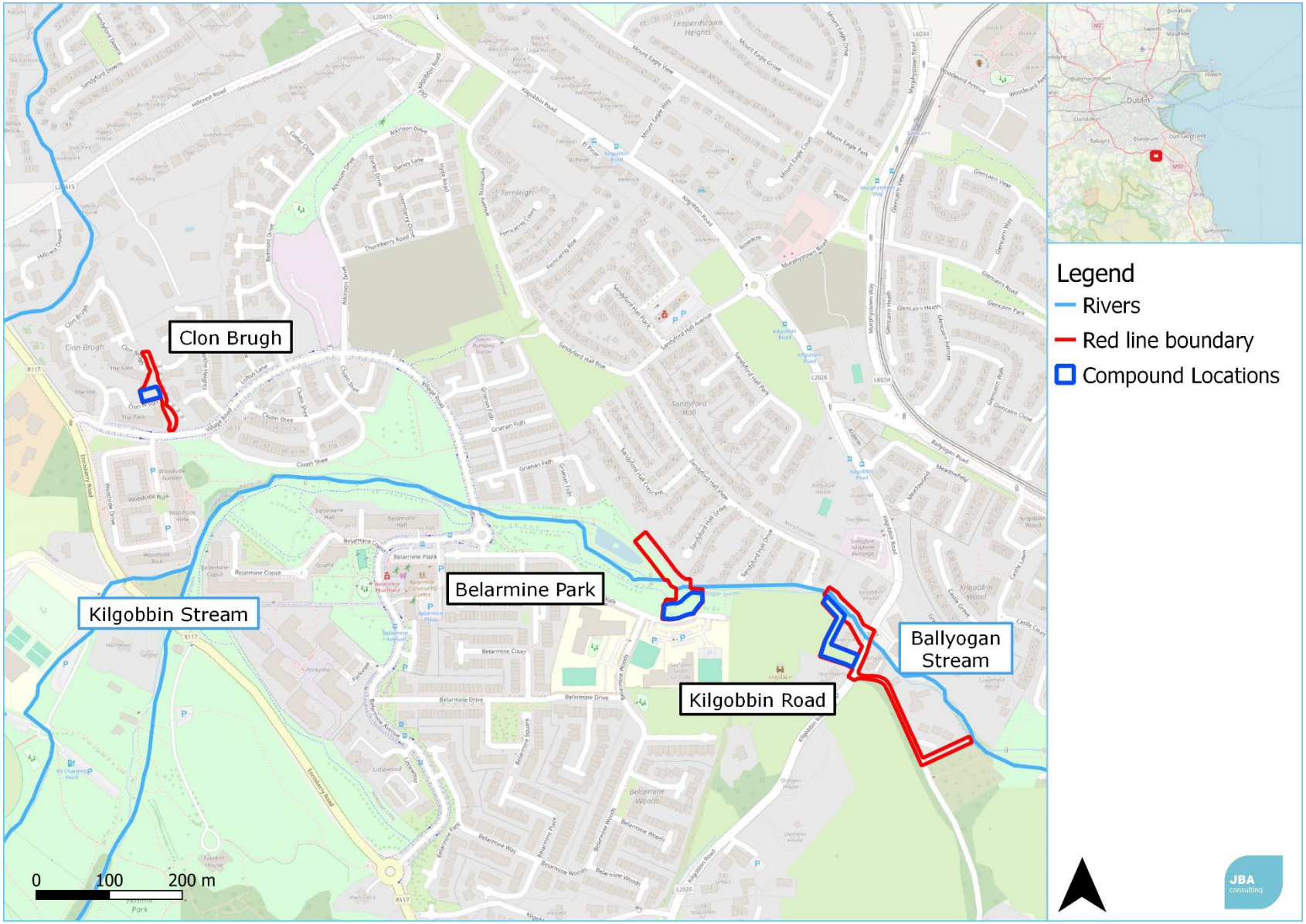


Figure 12.1: Compound locations, sheet 1 of 3

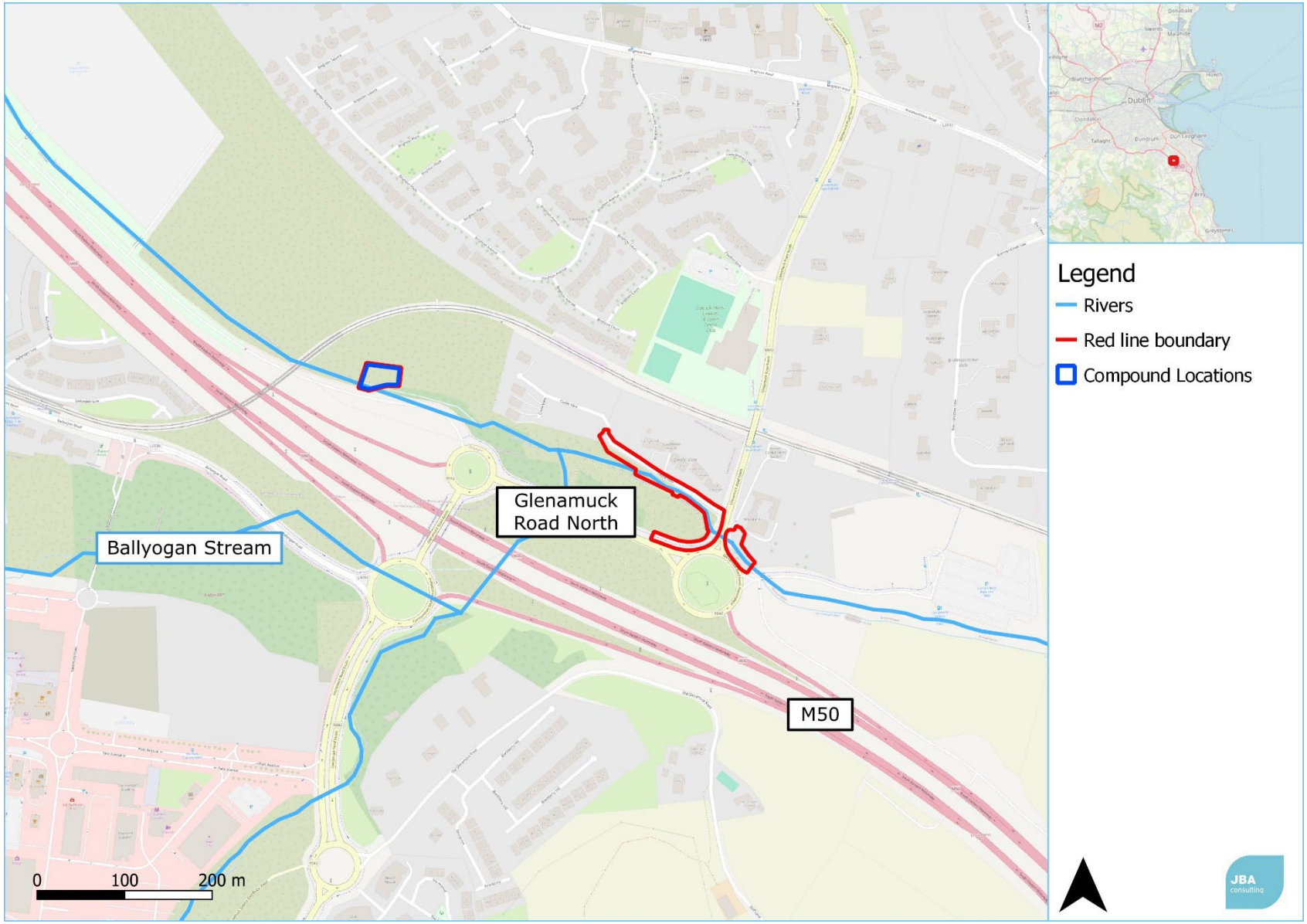


Figure 12.2: Compound locations, sheet 2 of 3

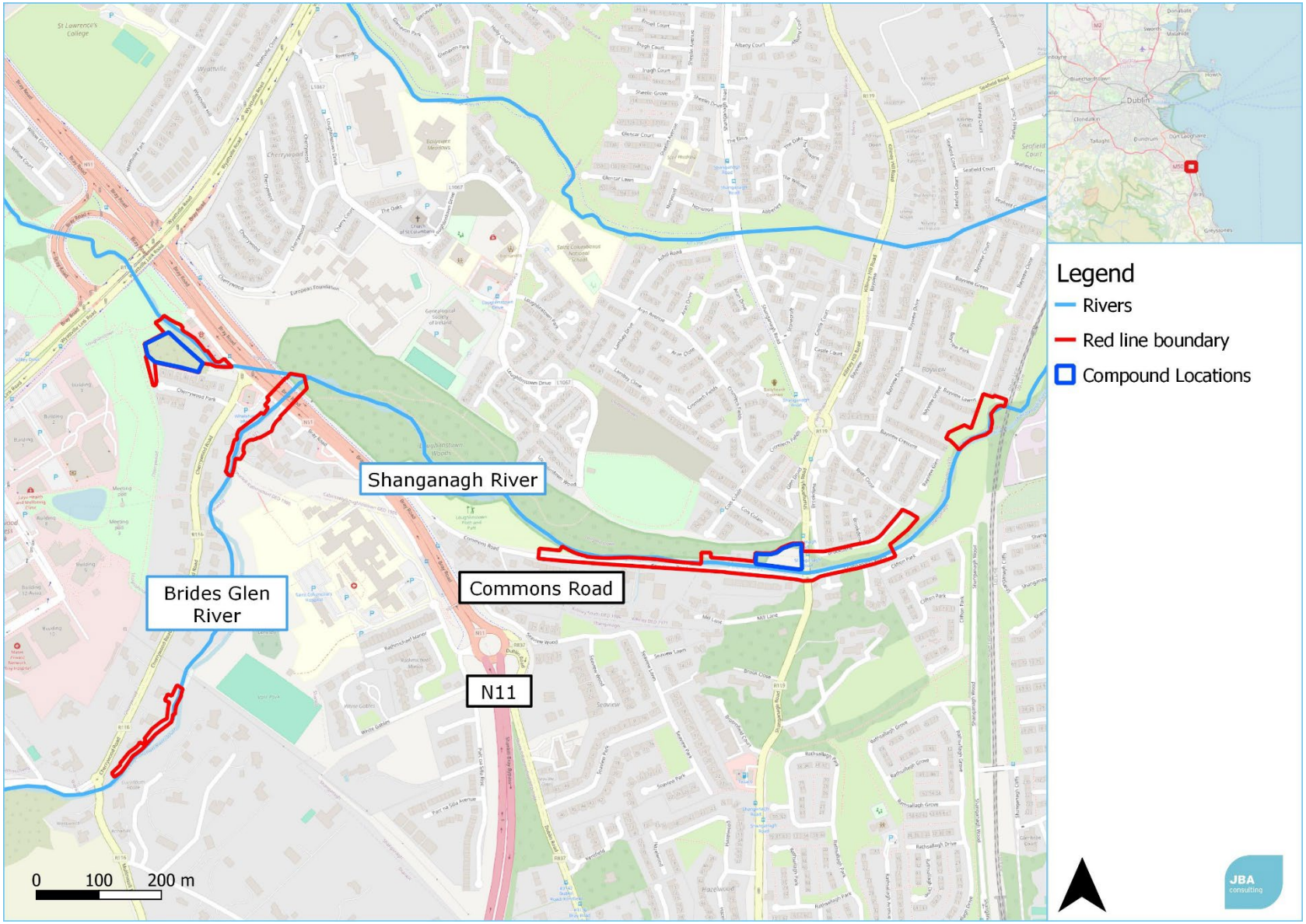


Figure 12.3: Compound locations, sheet 3 of 3

12.2.2 Utilities

Utilities in the Carrickmines-Shanganagh River FRS area

Underground utilities are present in multiple locations around the sites. While deep excavations are generally not required for the proposed development, interactions with utilities are possible during construction.

- **Surface water** drainage is close to, along and underneath the line of the proposed flood defence walls at; Clon Brugh, Ballyogan Stream, Belarmine Vale, Brookdene, Bayview, Glenamuck Road North, Commons Road and Kilgobbin Bridge where the proposed culvert runs over drainage pipes.
- **Foul Sewers** cross the proposed flood defence walls at Clon Brugh, the private access road off Kilgobbin Road at the proposed culvert, Whelehan's Wines Cherrywood Road, Bayview, Brookdene and cross the path of the proposed culvert at the N11.
- **Watermains** are in close proximity to the proposed walls at Cherrywood Road on the northern end and underneath the upgraded wall off Ballyogan Grove/Castle View. Two watermains are along Kilgobbin Road in the footprint of the proposed outfall and a further two watermains traverse the proposed culvert pipeline both located in the footpaths serving Bray Road and the N11 dual carriageway.
- **ESB overhead and underground lines** run parallel to the existing boundary walls to be replaced with a new reinforced concrete flood defence wall, located to the south of Sandyford Hall estate on the Belarmine Park section of works.
- **ESB overhead Low Voltage lines** traverse the proposed walls at Ballyogan Grove/Castle View located off Glenamuck Road North, also at Heron's Ghyll off Cherrywood Road and downstream of Waterfall Cottage at the Lower Brides Glen section of works. An overhead line traverses the proposed wall at Kilgobbin Road, crossing the road to the private access road were the overflow pipe runs along. The upstream end of the new wall on the right bank located off Commons Road and upstream parapet of the Shanganagh Road Bridge, have overhead lines.
- **ESB medium voltage underground lines** traverse the greenfield area at Brookdene, are present at the proposed N11 overflow culvert within the existing footpath at Bray Road and also at the upstream section of the of the culvert. Lines run underground parallel to the existing boundary walls of Sandyford Hall estate located at the Belarmine Park section of works.
- **Gas Networks Ireland (GNI) gas mains** traverse under the proposed walls at Brookdene, Commons Road at several locations, and two locations at Glenamuck Road North. A gas line runs under the Bray Road footpath
- **Public lighting** is present at Clon Brugh, Belarmine Park, Kilgobbin, Glenamuck Roar North, Bray Road, Lower Brides Glen and the N11 Overflow Culvert.
- **Telecommunications infrastructure** and ducts are located along Kilgobbin Road and a private access road to the south. Comms lines are in proximity of the works at Glenamuck Road North and nearby at Ballyogan Grove/Castle View.
- **Eircom lines** traverse underneath the footpath of Bray Road.

In addition to these, the proposed Dublin Array Offshore Wind Farm will likely make landfall at Shanganagh, close to the mouth of the Carrickmines-Shanganagh River. The cable route will travel west from this point to a proposed substation at Ballyogan. DLRCC are liaising closely with the Dublin Array project team.

ESB Infrastructure

The Carrickmines 220kV substation is in the centre of the scheme area, at Ballyogan. This substation plays a significant role in the national electricity transmission network and - along with Poolbeg, Finglas and Inchicore - forms part of a 'ring' of substations to the east, north, west, and south of Dublin that provide for the 'step down' from long distance 220kV networks to more local 110kV distribution networks. Two sets of high-capacity overhead lines connect to the substation from the southeast, across Jamestown, while there are additional underground lines to the southwest through Stepaside East, Kilgobbin East and Jamestown, which then continue as overhead lines to the south of Enniskerry Road. A third alignment of high-capacity

lines extends by way of overhead lines north of the substation, across Ballyogan North and the eastern corner of Mimosa-Levmoss before crossing the M50 corridor by way of underground lines[43].

The Kilgobbin section of works is approximately 728m to the west of the Carrickmines 220kv substation and Glenamuck Road North section of works is 1.4km to the east. As mentioned, the overhead powerlines head southwest and will not directly affect the FRS sites. Inchicore and Finglas 220kv substations are approximately 10.8 km and 16.7km away respectively in a north-westerly direction from Clon Brugh at its closest point. Poolbeg is 8.5 km away from Clon Brugh in a north easterly direction at its closest point.

Water Services Infrastructure

The following reservoirs and treatment plants are in the general area of the Carrickmines-Shanganagh River catchment, but not in close proximity to the proposed development:

- Kiltiernan reservoir, approx. 3.1km southwest from the Glenamuck Road North site.
- Stillorgan Reservoir, approx. 2km northeast from the Clon Brugh site.
- Ballyboden Water Treatment Plant, approx. 5km west from Clon Brugh.
- Dun Gaoithe reservoir, Clon Brugh, approx. 1.5km south from Kilgobbin site.

Wastewater Treatment Plants

Foul Drainage Network Wastewater disposal is focused on the Ballyogan Sewer – laid in 1996 – which passes through the area from northwest to southeast, this sewer flows to the Shanganagh Wastewater Treatment Plant. The capacity of the existing foul drainage network is generally adequate to satisfy current and future growth; however additional local network infrastructure would be required to build out undeveloped zoned lands[43].

12.2.3 Waste

Waste management in the Dun Laoghaire-Rathdown area complies with the Waste Management Act 1996. Municipal waste from the county is normally collected by private waste contractors with waste collection permits. According to the Local Authority Waste Facility Register, there are 2 no. waste facilities that are registered in Dún Laoghaire-Rathdown[43].

12.3 Potential Impact of the Proposed Development

12.3.1 Site Compounds

Due to the nature of the scheme, with construction works taking place in or adjacent to areas prone to flooding, the construction site compounds are close to or within the flood zones in several cases.

The Commons Road compound sits wholly within the 1% AEP extent, along with large portions of the Kilgobbin Road and Bray Road compounds. The Belarmine Park compound has a small portion within the 1% AEP flood extent (Figure 12.44 to 12.6). During construction, there is potential for a flood event to occur which would result in flooding of these compound areas. As potential pollutants are likely to be stored in the compounds, this could lead to indirect adverse impacts on water, biodiversity, and human health. With no mitigation measures in place, this would result in **a temporary moderate adverse effect** which is **not significant.**

[43] Dún Laoghaire - Rathdown County Council (2019) Draft Ballyogan and Environs Local Area Plan 2019-2025. Dún Laoghaire: Available from: draft_ballyogan_and_environs_lap.pdf (dlrcoco.ie) [Accessed 21/05/2024]

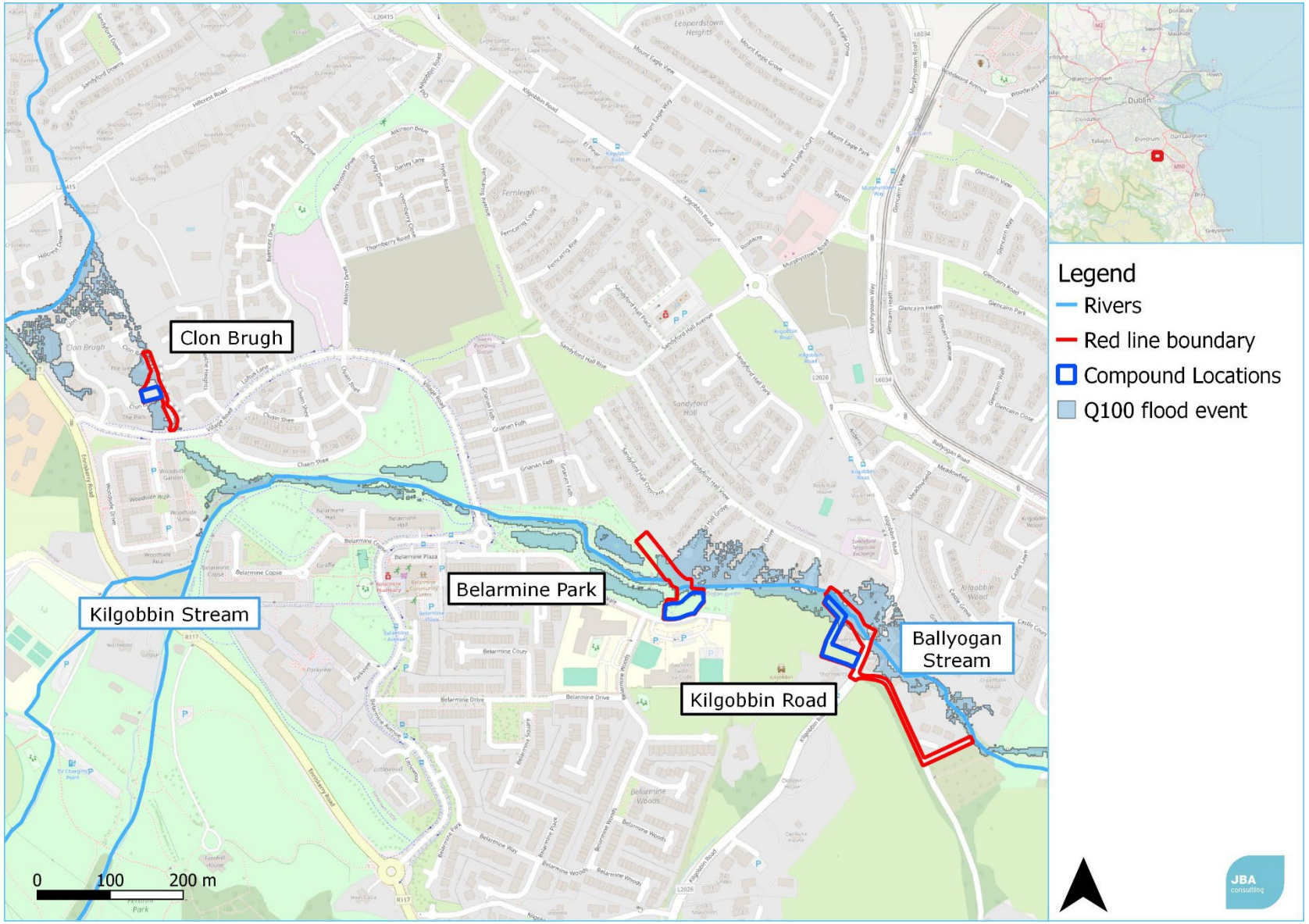


Figure 12.4: Construction compound flood risk at Clon Brugh, Belarmine Park, and Kilgobbin Road

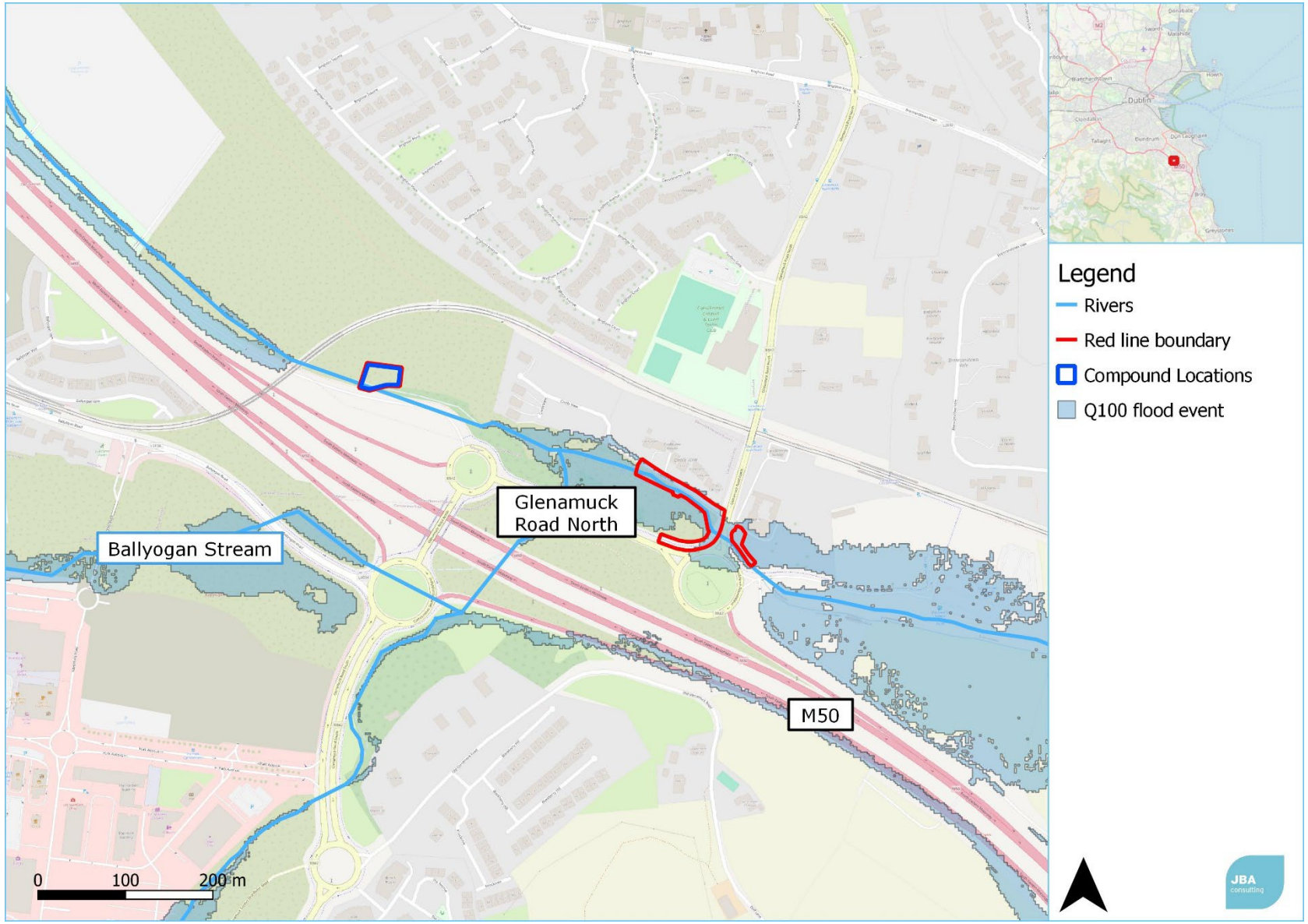


Figure 12.5: Construction compound flood risk at Glenamuck Road North

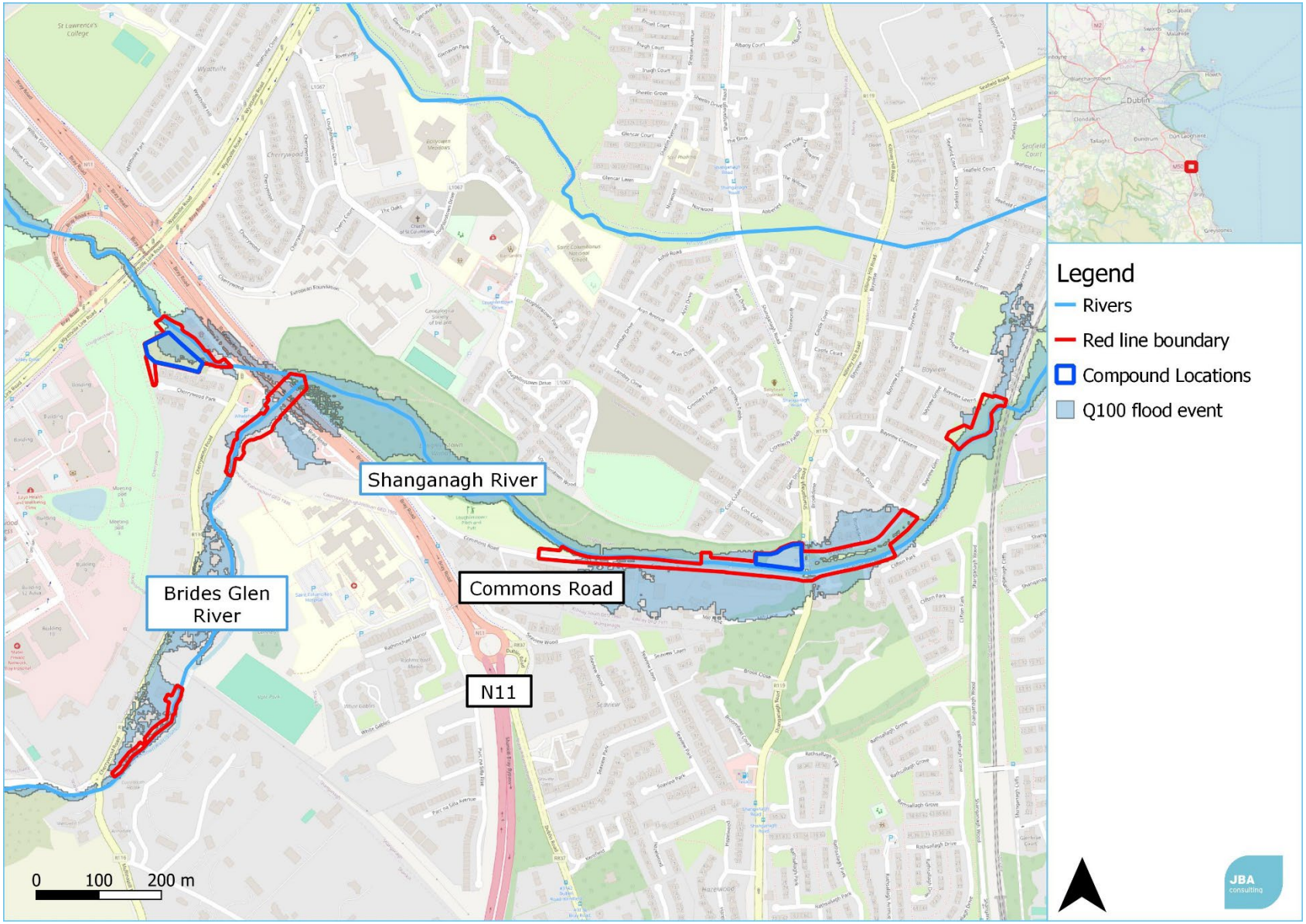


Figure 12.6: Construction compound flood risk at Bray Road and Commons Road

12.3.2 Utilities

Construction Phase

Utilities

Utilities e.g., sewer networks and electricity networks will require identification on the ground by the appointed contractor prior to work proceeding on the scheme. There will be temporary disruption to utilities during the construction stage from diversions and upgrades that will be required, which will result in **temporary slight adverse** effects. All utilities will be reinstated or relocated resulting in no long-term impacts.

The existing utilities traversing the works area will be diverted or protected in advance of the proposed works in the following areas.

- Clon Brugh
- Belarmine Park
- Kilgobbin
- Glenamuck Road North
- Cherrywood Road
- Bray Road
- Lower Brides Glen
- Commons Road
- Bayview

At the N11 Overflow Culvert section, it is envisaged that most services will need to be diverted on a permanent basis to avoid outages, accommodate the overflow installation and expediate the main construction works. The following services are identified;

- Two water mains traverse the pipeline in the footpaths serving Bray Road and the N11 dual carriageway. These services will be diverted in advance of the works for that particular phase of pipeline installation.
- A foul sewer follows the route of the N11 under the northern lane at a depth below the invert of the proposed overflow culvert. It is not envisaged that this pipe will be impacted by the works however protection measures may be installed to avoid damage to this critical infrastructure.
- Several gas mains traverse the works area, located within the footpaths serving Bray Road and the N11 dual carriageway. These services will have to be either protected or diverted, as agreed with Bord Gais.
- An ESB medium voltage line within the existing footpath, south of the N11 crossing will need to be permanently diverted in advance of the works.
- There are public lights adjoining Bray Road and the N11 dual carriageway. No records are currently available for these services however it is expected the associated cabling and ducting for this public lighting, traverse the works area and will be impacted by the works.

The Dublin Array onshore elements may be at construction stage at the same time as the proposed development. Temporary disruptions related to construction of the two schemes may occur, but are not likely to be significant.

Any disruptions to services will be agreed with the relevant service providers and the property owners. If any of the temporary protections envisaged above cannot be agreed, temporary diversions may be required. Effects on utilities during construction will be **temporary, slight adverse** to **negligible**, and **not significant.**

ESB Infrastructure

Direct impacts are **not expected to occur** on the Carrickmines 220kV substation, due to the distance from the site at 740m at the closest and the nature of the proposed works. The two sets of high-capacity overhead lines connecting to the substation from the southeast, across Jamestown do not pass overhead and traverse in a direction away from the proposed works. Indirect impacts are also **not expected** on the substation.

Water Infrastructure

Direct impacts are not expected to occur on any other utilities, such as Stillorgan Reservoir and associated infrastructure or the Ballyboden Water Treatment plant due to their distance from the site. The Shanganagh Wastewater Treatment Plant is closer to the Bayview site; however no direct impacts are expected to occur.

Indirect impacts could occur downstream at facilities due to an accidental spill or leak on site during construction, or due to increased sedimentation of surface water leaving the site. Due to the distance downstream and volume of water passing, the indirect effect on them with no mitigation measures in place would be **temporary, slight, adverse**, and **not significant.**

Operational Phase

Once the proposed development is operational, no impacts to utilities are expected to occur. The operational effect on utilities will therefore be **neutral**.

12.3.3 Waste

Construction Phase

Demolition of walls is required at the following locations:

- Clon Brugh
- Belarmine Park
- Kilgobbin House
- Glenamuck Road North
- Lower Brides Glen
- Commons Road
- Bayview Lawns

This will result in approx. 596m^3 of demolition material. The majority of this will be disposed of as waste and will be removed to an approved waste recovery facility. A portion of the demolition volume will be reused for the flood defence wall at 20 Bayview Lawns if deemed suitable.

Approximately 117m^3 of concrete waste will be generated, as will 7079m^3 of waste during paving and road works.

Most waste will be generated due to excavation and spoil material. Approximately 12,438m^3 of excavation waste and spoil material will be generated. This material could be reused on another site as a by-product while adhering to Article 27 of the EC (Waste Directive) Regulations (2011). This would further reduce the volume of waste generated during excavation. If this is not possible, the excavated material will be removed from the site as waste to an appropriate licenced soil recovery facility. Approximately 6822.00m^3 of backfilled material will be imported and 1456.50 m^3 material will be imported for roadworks.

Small volumes of general construction waste will be generated, typical of construction activities. This will be collected, segregated, and disposed of by licensed waste contractors.

The construction phase effect on waste will be **temporary slight adverse**, and **not significant**.

Operational Phase

Once the proposed development is operational, no waste will be generated. The operational effect on waste will therefore be **neutral**.

12.4 Mitigation Measures

12.4.1 Site Compounds

The following mitigation measures will be put in place in relation to flood risk at site compounds:

- Lubricants, oils, fuels, cement or other chemicals will be stored in sealed containers in a bunded area. This storage area will be located at the southern section of the Kilgobbin Road and Glenamuck Road North compounds, outside the flood extent shown in Figure 12.4-12.6.
- The Glenamuck Road North compound is located further away from the Q100 flood extent and can be used for temporary storage of either excavated and imported materials for the construction of walls or oils and lubricants.
- The contractor will only store a manageable quantity of materials in the secondary compounds at any one time. The contractor will also import and export soil continuously, to limit the quantity of soil stored on site at one time.
- The feasibility of raising the ground levels temporarily at the Commons Road compound is being investigated. If practical, this will allow ground levels to sit above the flood level at this point during the construction phase.

12.4.2 Utilities

Construction Phase

Any disruptions to services will be agreed with the relevant service providers and will be communicated in advance to the relevant property owners. Further mitigation measures for utilities are not required.

Close liaison between DLRCC and the Dublin Array project team will ensure that disruptions to either project during construction are negligible.

Mitigation measures outlined in Chapter 10 for the protection of surface and groundwater such as indirect consequences from surface water pollution, will further reduce potential for impacts on Shanganagh Wastewater Treatment Plant located downstream of the works. With these mitigation measures in place the potential impact on these utilities during construction will be negligible.

Operational Phase

As no impacts on utilities are expected once operational, no mitigation measures are proposed for the operational phase.

12.4.3 Waste

Construction Phase

All construction waste will be segregated and removed to an approved location. A Waste Management Plan (WMP) will be produced by the appointed contractor to help manage, reduce, and dispose of waste arising during the construction phase. The contractor shall consider the relevant waste management acts, regulations, and litter pollution acts:

- Waste Management Act 1996 (as amended)
- Protection of the Environment Act 2003
- Litter Pollution Act 1997
- The Waste Framework Directive (2008/98/EC) transposed into Irish Law as the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011)

In developing the WMP, the contractor shall also consider the reuse of materials where practicable, where permitted under the relevant waste legislation, and where the material meets the engineering requirements. The strategy shall follow the Waste Management Hierarchy:

- Prevention

- Minimisation
- Reuse
- Recycling
- Disposal

This hierarchy outlines that waste prevention and minimisation are the first priority in managing wastes, followed by waste reuse and recycling. Disposal of waste shall only be considered as a last resort. The management of all hazardous waste materials, if they occur, will be coordinated in liaison with Health and Safety Management.

A key waste reduction strategy will be reuse of material where feasible. Over one third of excavated soil will be reused as backfill on site. Stone material from existing stone walls will be reused as cladding material for new reinforced concrete flood walls where feasible. This will reduce waste while also reducing potential impacts on Cultural Heritage, as outlined in Chapter 13.

The contractor will also explore other reuse options off-site, such as reuse as a by-product under Article 27. These strategies will reduce the amount of material being exported off-site as a waste.

When all other options have been explored, the contractor will dispose of unused materials as waste. All waste material will be sorted and segregated into the relevant waste stream. Dedicated waste receptacles or storage areas will be established in site compounds and will be properly labelled. All workers on-site will be trained on waste segregation and management as part of site induction talks.

Construction Waste Management

The contractor shall establish a procedure to identify and classify all waste arising at the site in accordance with the List of Waste (LoW) Code. Waste materials generated during construction works on site will be segregated into hazardous and non-hazardous labelled storage containers at designated points within temporary site compounds. All waste generated will be handled by an approved waste contractor holding a current waste collection permit.

For each waste stream identified by the contractor, and for each additional waste stream that may arise during the course of the works, the contractor shall identify the following:

- The appropriate LoW Code.
- A suitable Waste Collection Contractor in possession of a valid Waste Collection Permit for the collection of the particular waste within DLRCC.
- The waste recovery or disposal site, including the transfer station where the waste may be transferred to upon leaving the site in possession of a valid Waste Facility Permit or Waste License, as appropriate.
- The recovery or disposal method for the waste.

Only contractors in possession of a valid Waste Collection Permit shall collect wastes from the site. The contractor responsible for the waste shall ensure that the Waste Collection Contractor:

- Is permitted to collect the particular waste.
- Is permitted to collect waste within DLR.
- Uses a waste collection vehicle identified on the Waste Collection Permit.
- Transfers the waste to a licenced waste facility identified on the Waste Collection Permit.

The contractor shall ensure the following information is provided and available upon request:

- Transfer notes for controlled waste and consignment notes for hazardous waste must include an accurate description of the type, quantity and containment of waste; Standard Industrial Classification; the LoW Code; and details of the waste carrier, who must be licensed.
- Sufficient information will be provided to ensure that the waste disposal operator is aware of the potential hazards of the substance.

- The contractor should also ensure that returns for consignment notes are collected and retained.
- All documentation will be retained for a minimum of two years for transfer notes and three years for consignment notes and be available for inspection.

The contractor shall advise the consenting authority or its representatives in advance if it proposes to act as the Waste Collection Contractor, subject to agreement. In the event that the contractor acts as the Waste Collection Contractor, it shall ensure that it has the relevant Waste Collection Permit(s) in place prior to commencement of the Proposed Development.

With the above mitigation measures in place, the impact on waste during the construction phase will be **temporary, slight, adverse.**

Operational Phase

As no impacts on waste are expected once operational, no mitigation measures are proposed for the operational phase.

12.5 Residual Effects

12.5.1 Site Compounds

With the proposed mitigation measures outlined in Section 12.4.1 in place, flooding is not expected to negatively impact the site compounds. The residual effect to site compounds will be **temporary, imperceptible, adverse** and **not significant.**

12.5.2 Utilities

Mitigation measures discussed in previous sections will reduce the environmental impact of the proposed development however, there are some impacts that cannot be avoided in the short term, such as short-term disruptions to watermains, foul sewer, ESB or gas stoppages for several hours during the connection of services. Residents will receive notices if stoppages are foreseen. There are no additional impacts expected once services are introduced. The overall residual effect during the construction phase from the relocation of services has been assessed as **temporary, imperceptible, adverse** and **not significant.**

12.5.3 Waste

Mitigation measures such as the reuse of materials where feasible and the production of a RWMP will be put in place. The overall residual effect on waste has been assessed as **temporary, imperceptible, adverse** and **not significant.**

12.6 Interactions

Impacts to material assets have the potential to interact with the following environmental factors:

Land and soils, discussed in Chapter 9: The excavation of material will directly interact with the soil and geology environment at the site. Impacts such as soil compaction, removal of soil from site, and import of new material will affect soil quality and quantity. Mitigation measures such as the safe sourcing of imported material, and reuse of material on site, will ensure that interactions between these effects are not significant.

Population and Human Health, discussed in Chapter 7: During construction, there will be short disruptions to utilities which will inconvenience a small number of people close to construction sites. These will be communicated to residents in advance and will be kept to the shortest time possible. The overall impact of these disruptions, with mitigation measures in place as outlined in Chapter 12, will be temporary and imperceptible.

Water, discussed in Chapter 10: Impacts arising from construction vehicle movements, interactions with utilities on-site, and waste generation are all likely to interact with the surface water and groundwater

environments. There is also the potential for a flood event to occur during construction. Mitigation measures outlined in this chapter and in Chapter 10 will ensure that the interaction of these impacts is not significant.

12.7 Cumulative Effects

The list of projects outlined in Table 16-1 has been consulted; no significant adverse impacts on Utilities and Waste are expected.

If construction of the Dublin Array happens at the same time as the construction phase for the proposed development, there could be disruptions due to the proximity of the schemes. DLRCC and the Dublin Array project team are liaising closely, which will ensure that programming and potential interactions are managed closely. No significant cumulative impacts are expected.

13 Cultural Heritage

13.1 Methodology

13.1.1 Introduction

This chapter describes the proposed flood alleviation measures for the Carrickmines-Shanganagh River Flood Relief Scheme (FRS) and assesses the potential impact on archaeological, architectural heritage and cultural heritage assets. The methodology has been designed so a full understanding of the potential effects on the character of the historic landscape can be assessed. A detailed archaeological and historical background has been included which describes the character of the immediate and wider historic landscape, as well as the individual designated and undesignated heritage assets, and highlights the potential to reveal subsurface archaeological features. The methodology used is based on the Environmental Protection Agency (EPA) Guidelines (EPA 2022[44]), and both direct physical effects, as well as impacts to the setting of individual heritage assets, have been assessed. The assessment of the proposed scheme includes a comprehensive consideration of the potential direct, indirect, residual and cumulative impacts and includes, where applicable, an assessment of visual impacts on cultural heritage constraints.

13.1.2 Defining Cultural Heritage

The EPA (2022[45]) includes under the heading of Cultural Heritage;

Archaeology
- Known archaeological monuments;
- Areas of archaeological potential (including unknown archaeology);
- Underwater archaeology;

Architectural heritage
- Designated architectural heritage;
- Other significant architectural heritage;

Folklore and history
- Designations or sensitivities

Cultural heritage as set out in the EPA Guidelines[46] includes archaeology, architectural heritage, folklore and history. It is a broad term that includes a wide range of tangible and intangible cultural considerations. Cultural heritage can relate to settlements, former designed landscapes, buildings and structures, folklore, townland and placenames, and historical events, as well as traditions (e.g., mass paths and pilgrim ways) and traditional practices (e.g., saints' pattern days).

Cultural heritage is part of our cultural identity and contributes to defining a sense of place. The value of a strong sense of place is likely to become more important as the world grows increasingly homogenised. Recognising the unique sense of place in our towns and villages, whilst also respecting the individual heritage assets, is critical.

Cultural heritage assets are valued for the important contribution they make to the understanding of the history of a place, an event or people. Sites of cultural heritage interest are often afforded protection either as national monuments, recorded archaeological monuments (on the Record of Monuments and Places

[44] EPA (Environmental Protection Agency) (2022) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports'. EPA.

[45] EPA (Environmental Protection Agency) (2022) op. cit.

[46] EPA (Environmental Protection Agency) (2022) op. cit.

(RMP)/Sites and Monuments Record (SMR)) or as protected structures (on the Record of Protected Structures (RPS) in the relevant City or County Development Plan), or as structures within the National Inventory of Architectural Heritage (NIAH) (the various designations[47] are defined in Appendix 13.3 in Table 13.3).

Each of these provides a unique cultural record and acts as a carrier of memory, meaning and cultural value. When considered in its wider context, they can form an essential component in the mechanism for analysing the broader cultural character and context of an area. Together, these can assist in mapping the changes that have led to the development of the modern environment. Such analysis provides insight into the communication, trade, transport, growth and associations of past societies.

As part of the reporting process, the chapter assessed and collated information from archaeological and conservation assessments and investigations conducted to inform this scheme, these are summarised in the text below and are provided in Volume 3 Appendices which contain the following:

- Appendix 13.1 Legislation, Standards and Guidelines
- Appendix 13.2 Local Authority Policies in Relation to Cultural Heritage
- Appendix 13.3 Glossary of Impacts and Assessment Methodology
- Appendix 13.4 Inventory of Cultural Heritage Sites Within 100m of the Proposed FRS
- Appendix 13.5 Underwater Archaeological Impact Assessment
- Appendix 13.6 Geophysical Survey Report
- Appendix 13.7 Archaeological Monitoring of Site Investigation Works
- Appendix 13.8 Method Statement and Specification – Structural Conservation

13.1.3 Study Area

The Flood Relief Scheme (FRS) study area is centred on the Carrickmines-Shanganagh River where it passes through the suburban areas of Sandyford, Leopardstown, Loughlinstown, and Shankill before eventually discharging into the Irish Sea at Killiney Bay. The constraints study and options study (O' Brien 2022[48]; Deery 2023[49]) for the FRS scheme examined the designated cultural heritage sites within this area and beyond as the assessment developed (Figure 13.1). Using data from initial stages of the FRS, this Environmental Impact Assessment Report (EIAR) considers sites and their settings within 100 meters of the proposed flood measures; these sites are discussed in the context of the cultural heritage environment to understand and characterise the character, context and significance of the archaeological, architectural and cultural heritage environment that falls within and surrounding the proposed FRS. To ascertain the likely and significant effects of the proposed development on Archaeology, and, Architectural Heritage and Cultural Heritage sites, the study area for the assessment included all sites in the immediate vicinity of each of the flood measures.

This methodology has ensured that a robust assessment has taken place on all recorded cultural heritage assets within and in proximity to the proposed development and that the likely and significant impacts are considered.

[47] World Heritage Properties, National Monuments, Recorded Monuments, Protected Structures, Architectural Conservation Areas, NIAH and Undesignated Sites

[48] O' Brien, Y. (2022) 'Cultural Heritage Constraints Study, Shanganagh–Carrickmines Flood Relief Scheme, Dublin'. Unpublished report: Courtney Deery Heritage Consultancy Ltd. For JBA Consulting on behalf of Dún Laoghaire Rathdown County Council.

[49] Deery, S. (2023) 'Cultural Heritage Options Assessment Report. Shanganagh–Carrickmines Flood Relief Scheme, Dublin'. Unpublished report: Courtney Deery Heritage Consultancy Ltd. For JBA Consulting on behalf of Dún Laoghaire Rathdown County Council.

The proposed scheme will not result in any changes to flooding outside of the protected areas and it was consequently not necessary to expand the study area to include areas of redirected floodwater.

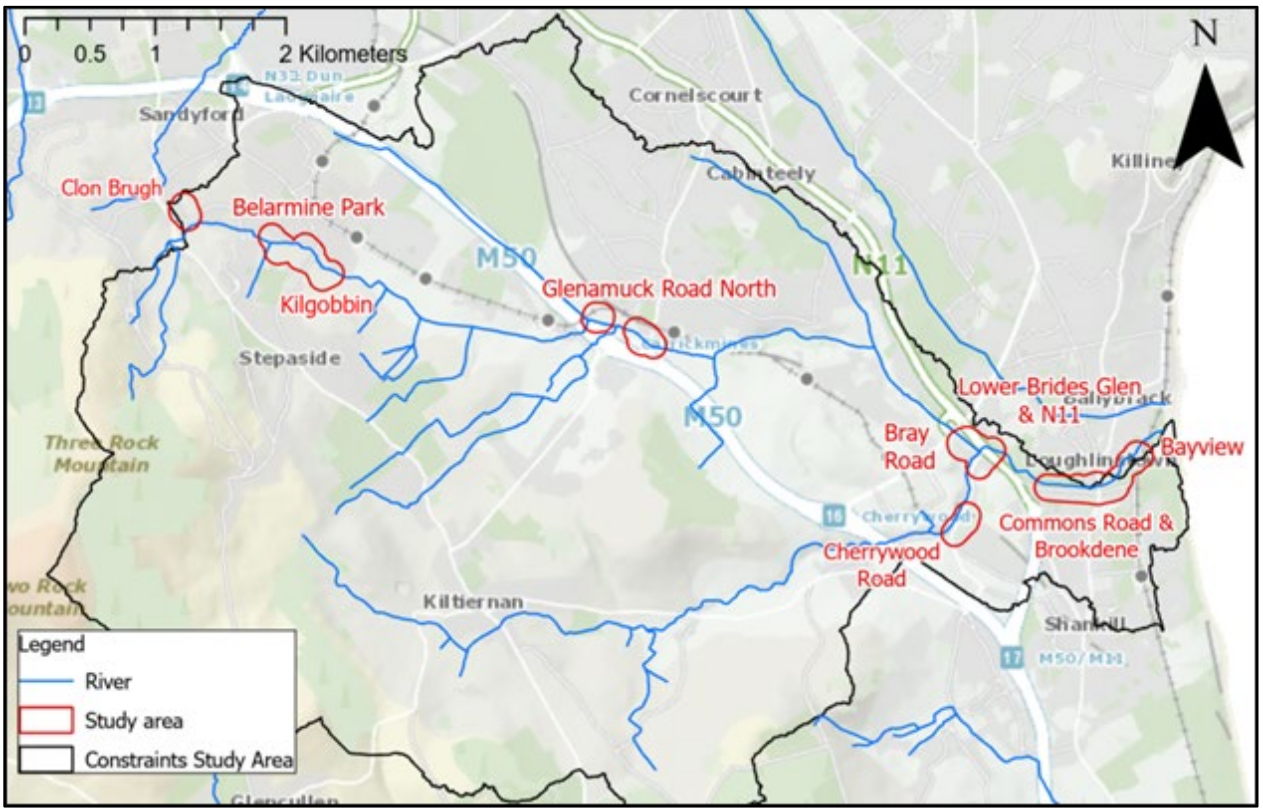


Figure 13.1: Assessment Study Area and Proposed Flood Relief Measures

13.1.4 Relevant Guidelines, Policy and Legislation

This EIAR chapter will be guided by the methodologies and recommendations outlined in 'Archaeology and Flood Relief Schemes: Guidelines' (NMS 2023[50]). These guidelines have been prepared by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH) to provide a framework for the integration of archaeology in Flood Relief Schemes (FRS).

A full list of legislation, standards and guidelines that were consulted to inform the assessment are contained in Appendix 13.1 in Volume 3 of this EIAR along with excerpts from the principal legislation governing archaeology, the National Monuments Acts 1930-2014. The Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 was enacted in October 2023 and this Act is now law. The Minister for Housing, Local Government and Heritage commenced certain provisions in May 2024 (S.I. No. 252/2024); however, until the Act is fully commenced, the National Monuments Acts have therefore not yet been repealed and remain in force.

The Dún Laoghaire Rathdown County Development Plan (CDP) (2022-2028[51]) outline specific policies and objectives for the archaeological heritage in the county, these are summarised in Appendix 13.2 in Volume 3 of this EIAR.

[50] NMS (National Monuments Service) 2023. 'Archaeology and Flood Relief Schemes: Guidelines'. Department of Housing, Local Government and Heritage.

[51] Dún Laoghaire Rathdown County Council (2022) 'Dún Laoghaire Rathdown County Development Plan 2022-2028'

13.1.5 Desk Study

The desk study availed of the following sources:

- UNESCO World Heritage Sites (WHS) and Tentative World Heritage Sites and those monuments on the tentative list;
- National Monuments in State care, as listed by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH);
- Sites with Preservation Orders;
- Sites listed in the Register of Historic Monuments;
- Record of Monuments and Places (RMP) and the Sites and Monuments Record (SMR) from the Archaeological Survey of Ireland; The statutory RMP records known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on vertical aerial photographs. Archaeological sites identified since 1994 have been added to the non-statutory SMR database of the Archaeological Survey of Ireland (National Monuments Service, DHLGH), which is available online at www.archaeology.ie and includes both RMP and SMR sites. Archaeological sites identified since 1994 are placed on the SMR and are scheduled for inclusion on the next revision of the RMP;
- Record of Protected Structures (RPS) listed in the Dún Laoghaire Rathdown County Development Plan (2022-2028);
- County Council Architectural Conservation Areas (ACAs) and their statements of character;
- National Inventory of Architectural Heritage (NIAH) Building Survey (NIAH ratings are international, national, regional, local and record, and those of regional and above are recommended for inclusion in the RPS);
- National Inventory of Architectural Heritage (NIAH) Garden Survey (paper survey only);
- A review of artefactual material held in the National Museum of Ireland;
- Cartographical Sources, OSi Historic Mapping Archive, including early editions of the Ordnance Survey including historical mapping (such as Down Survey 1656 Map);
- The Irish archaeological excavations catalogue i.e., Excavations bulletin and Excavations Database;
- Place names; Townland names and toponomy (loganim.ie);
- National Folklore Collection (Duchas.ie);
- Dún Laoghaire Rathdown (2022-2028): A Summary of relevant Dún Laoghaire Rathdown County Council Policies in relation to Cultural Heritage is provided in Appendix 13.2.1 in Volume 3 of this EIAR;
- A review and interpretation of aerial imagery (OSI Aerial Imagery 1995, 2000, 2005, Aerial Premium 2013-2018, Digital Globe 2011-2013, Google Earth 2001–2023, Bing 2023) to be used in combination with historic mapping to map potential cultural heritage assets;
- Collation of information from similar or other infrastructure projects in proximity to the proposed scheme, for example EISs, SEAs, conservation plans, archaeological test assessments and excavations.
- A review of existing guidelines and best practice approaches.

A bibliography of sources used is provided in the References section.

13.1.6 Field Survey and Archaeological Investigation

The study area was visited on a number of occasions, a field walkover survey was undertaken on 17th October 2023, 29th and 30th April 2024 by Siobhán Deery of Courtney Deery Heritage Consultancy. The aim was to assess the character and setting of the recorded cultural heritage features and identify undesignated cultural heritage features to assess the potential impact from the proposed FRS.

The monitoring of geotechnical investigations (GI) works was carried out by Yvonne Whitty, in November 2022. It was carried out under licence to the National Monuments Service (NMS) DHLGH reference number 22E0794 and detection device reference number 22R0382.

An underwater archaeological impact assessment (UAIA), which included wade (visual inspection) and metal detection survey within the Kilgobbin Stream, Ballyogan Stream, Carrickmines River and Shanganagh River, was carried out by ADCO in April 2024. The survey focused on four in-water areas that will be directly

impacted by the construction of flood relief defences. It was carried out under licence to the NMS DHLGH under Dive Licence Ref. No. 24D0214, and metal detection licence Ref. No. 24R0337.

A geophysical survey of a large greenfield area proposed for a compound in the vicinity of the Bray Road North measure in Cherrywood was carried out on the 28th of August 2024 by J.M. Leigh Surveys Ltd. under Detection Device Consent Licence No. 24R0431, issued by the NMS.

The surveys were carried out to inform the decision-making process and provide greater certainty as to the below-ground and instream archaeological potential throughout the scheme. The underwater, geophysical survey and SI monitoring reports are summarised in this chapter, and the full reports are provided in Appendices 13.5, 13.6 and 13.7, respectively. The fieldwork is included in the inventory of cultural heritage sites can be found in Appendix 13.4.

13.1.7 Data Analysis and Mapping

Previous phases of the proposed FRS involved the compilation and mapping of available cultural heritage data sets (O' Brien 2022[52]; Deery 2023[53]). The outputs of the project included GIS layers and the creation of a database for archaeology, architectural heritage and as far as possible, cultural heritage, as well as associated mapping. This formed a permanent renewable database that can be utilised by multiple specialist users to provide information for the project design and the EIA process. This phase of the project has updated the GIS and mapping for the project with the latest data from statutory authorities and the design team, as well as additional features identified through further desk-based study and fieldwork.

The locations for all archaeological and cultural heritage assets identified in the course of the assessment have been mapped and are shown on map figures throughout this chapter. The coordinates for each asset are provided in Irish Transverse Mercator (ITM) in the inventory of archaeological and cultural heritage sites in Appendix 13.4 in Volume 3 of this EIAR. All measurements are taken from the Centrepoint of the cultural heritage feature or from the Zone of Notification of a recorded archaeological monument.

13.1.8 Appraisal Method for the Assessment of Impacts

Archaeological and cultural heritage sites are considered to be a non-renewable resource and cultural heritage material assets are generally considered to be location sensitive. In this context, any change to their environment, such as construction activity, ground disturbance works and changes to setting, could adversely affect these sites. Similarly, architectural heritage is a unique and irreplaceable material asset which is given value by its design, setting, quality of workmanship and use of materials. In this context, any change to the architectural heritage fabric, structure and setting, resulting from construction and operation activity, may adversely affect these sites.

The likely significance of all effects is determined in consideration of the magnitude of the impact and the baseline rating upon which the impact has an effect (i.e., the sensitivity or value of the cultural heritage asset). Having assessed the potential magnitude of effect with respect to the sensitivity/value of the asset, the overall significance of the effect is then classified as not significant, imperceptible, slight, moderate, significant, very significant, or profound as per the EPA guidance (2022).

[52] O' Brien, Y. (2022) 'Cultural Heritage Constraints Study, Shanganagh–Carrickmines Flood Relief Scheme, Dublin'. Unpublished report: Courtney Deery Heritage Consultancy Ltd. For JBA Consulting on behalf of Dun Laoghaire Rathdown County Council.

[53] Deery, S. (2023) 'Cultural Heritage Options Assessment Report. Shanganagh–Carrickmines Flood Relief Scheme, Dublin'. Unpublished report: Courtney Deery Heritage Consultancy Ltd. For JBA Consulting on behalf of Dun Laoghaire Rathdown County Council.

A glossary of impact assessment terms, including the criteria for the assessment of effect significance, is contained in Appendix 13.3 in Volume 3 of this EIAR.

13.1.9 Consultation

Consultation has been undertaken with the wider Project Team, including designers and landscape/visual specialists to ensure that cultural heritage considerations have been duly considered in the design and assessment phases.

An online introductory presentation of the scheme was given to the Underwater Archaeological Unit of the National Monuments Service (NMS) and the National Built Heritage Unit (NBHS), from the Department of Housing, Local Government and Heritage (DHLGH) on the 9th of February 2024. This was followed by an onsite meeting on the 30th of April 2024, where each flood measure location was visited and reviewed. The subject of these meetings is outlined in detail in Chapter 5 of the EIAR. The main recommendation from the NBHS was that a conservation engineer review and develop the best practice conservation-focused design details for the flood measures on built heritage structures or areas of historic character impacted by the project (for example at Kilgobbin and at Commons Road); consequently, design mitigation measures have been made in relation to the built heritage which have been developed in consultation with the projects conservation engineers Southgate Associates, which also includes construction method statements and specifications (Appendix 13.8). In addition, further archaeological assessment comprising an underwater wade and metal detection survey, and a geophysical survey was undertaken where possible as recommended by the NMS.

13.1.10 Limitations or difficulties encountered

Archaeological testing was considered at the Glenamuck Rd North Roundabout FRS Measure in the vicinity of Carrickmines Castle's Zone of Notification, however due to the live services in this area in close proximity to the flood relief measure it was not possible to carry this out. No other limitations were noted during the compilation of this chapter.

13.2 Receiving Environment

13.2.1 Archaeological and Historical Background

Introduction

The following provides a chronological account of the development of the study area spanning from the prehistoric to modern period. It illustrates the archaeological, architectural and cultural heritage character, as well as context and archaeological potential, of the study area. Additional detailed historical and cartographic background and descriptions for specific archaeological sites and historic properties in proximity to the FRS measures are provided in Appendix 13.4 (Inventory of Cultural Heritage sites within 100m of the Flood Relief Measure).

The Geological Survey Ireland (GSI) indicates that the underlying bedrock from Cherrywood to Commons Road is granite with (muscovite phenocrysts and moving towards the coast microcline phenocrysts) from Commons Road it is dark blue-grey slate, phyllite & schist. The soils are till derived from granite and Irish Sea Till derived from limestones, with alluvium either side of the rivers and streams.

Prehistoric Period (c. 7000 BC - AD 400)

Mesolithic Period

The Mesolithic as yet is not well defined in south county Dublin, although there is a possible settlement on Dalkey Island dating from the late fourth millennium BC (Liversage 1968[54]). A small number of Bann flakes have also been recovered in Dún Laoghaire, Rathfarnham and Loughlinstown, indicating early settlement along rivers, streams and the coast (NMI Ref. 1967:137; Corlett 1999[55]). An early Mesolithic microlith was found in the area as part of the M50 excavations (Seaver 2004[56]). Greater evidence for early settlement in south county Dublin comes from burial sites and stray finds dated to the Late Neolithic and Bronze Age.

Neolithic Period

The archaeological evidence in the south County Dublin hinterland suggest that the local landscape was settled from the Neolithic period onwards (4000–2500 BC). The most visible traces of Neolithic activity consist of substantial megalithic burial monuments, which include the Early Neolithic portal tombs at Kiltiernan, Taylorsgrange, Kiltiernan Domain and Brennanstown (e.g. Ó Nualláin 1983[57]; Kytmannow 2008[58]), and the Middle Neolithic passage tombs atop Two Rock Mountain and Glencullen Mountain (e.g. Herity 1974[59]).

Early Neolithic activity was identified in 2004 in Kilgobbin townland. Two ditches, although mostly containing medieval pottery, also contained sherds of early Neolithic carinated bowls, representing the remains of at least three vessels from 4000–3600 BC (Dennehy 2004b[60], Licence No. 04E0566). The sherds were fragmentary and abraded and although in a secondary position it probably represents outlying activity within the wider domestic landscape of Kilgobbin. Also in Kilgobbin, on the southern side of the Ballyogan Stream further settlement and burial activity (some of which dated to the late Neolithic/Beaker period) was uncovered (Licence No. 02E1173ext). In the neighbouring townland of Newtown Little, archaeological investigations produced evidence for settlement activity in the early, middle and late Neolithic period, and revealed two possible Beaker structures and a number of sherds of Beaker pottery (Licence No. 05E0655). This points to settlement and activity in the wider landscape that continued from the early Neolithic period to the early Bronze Age.

The Neolithic settlement evidence includes an Early Neolithic rectangular structure, which was sited in Belarmine, Kilgobbin (Hagen 2004[61] and 2013[62]). The townland also produced evidence for Early Neolithic pits and spreads, while Middle Neolithic pits were investigated in the adjoining townland of Newtown Little.

[54] Liversage, G.D. 1968. Excavations at Dalkey Island, Co. Dublin, 1956-1959. PRIA, vol. 66C, pp. 53-233.

[55] Corlett, C. 1999. Antiquities of Old Rathdown. Wordwell: Wicklow.

[56] Seaver, M. 2004. From mountain to sea: excavations at Laughanstown. Glebe in Archaeology Ireland (Spring 2004): 8-12.

[57] Ó Nualláin, S. 1983. Irish portal tombs: topography, siting and distribution. Journal of the Royal Society of Antiquaries of Ireland 113, 75–105.

[58] Kytmannow, T. 2008. Portal Tombs in the Landscape: the chronology, morphology and landscape setting of the portal tombs of Ireland, Wales and Cornwall. BAR British Series 455: Oxford.

[59] Herity, M. 1974. Irish Passage Graves. Irish University Press: Dublin.

[60] Dennehy, E. 2004b. 'Archaeological Assessment: Glenamuck Road, Carrickmines Great, Dublin 18'. Licence no.: 04E0114. Unpublished report: Margaret Gowen & Co. Ltd.

[61] Hagen, I. 2004. Archaeological Excavations. Interim Report. Phase 3 Development, Kilgobbin, County Dublin (03E0306). Unpublished report for Margaret Gowen and Co. Ltd.

[62] Hagen, I. 2013. Prehistoric excavations in Kilgobbin. In C. Corlett (ed.), Unearthing the Archaeology of Dún Laoghaire-Rathdown, 9–15. Dún Laoghaire-Rathdown County Council and the Heritage Council: Dublin.

Stray finds in the area include a polished stone axe apparently made from a local andesite or dolomite (NMI Ref. 1979:73) which was recovered in Murphystown townland. A second was found in Kiltiernan (NMI Ref. 1984:19). These artefacts of highly finished, fine-grained stone are typical of the Neolithic period, when they were used for cutting wood. Two objects from Kingston, near Ballyogan, described in the NMI files only as 'stone artefacts' (NMI Refs. 1935:398, 399) may also be polished stone axes. Neolithic artefacts were recovered during excavations associated with the M50 motorway, including evidence for Beaker occupation (2460-2200 BC). To the east of the Glenamuck Road a prehistoric rock art site comprising three small boulders featuring cupmarks (Licence No. 01E0364) was identified during the motorway works.

Bronze Age Period

The settlement and burial evidence indicate that the local area continued to support communities throughout the Bronze Age (2500–800 BC). Standing Early Bronze Age monuments include the wedge tombs at Kilmashogue and Ballyedmonduff (Waddell 2000), while other Bronze Age burial monuments consist of ring barrows from Woodside and Kilgobbin (Wallace 2004 and 2013; McGlade 2018), as well as cists,[63] urn burials[64] and cremations from Kilgobbin and Stepaside (e.g. Lewis 1837; Waddell 1990; Corlett 1999; Ward 2005 and 2013; Hagen 2013; McGlade 2018). Middle Bronze Age roundhouses have been investigated in Kilgobbin, and the surrounding townlands of Stepaside and Woodside (Kelleher 1999; McCabe 2004; Hagen 2004; Wallace 2004; McGlade 2018), while Bronze Age cooking and manufacturing sites, known as *fulacht fiadh*, or burnt mounds, have been excavated in Kilgobbin and Stepaside (Cryerhall 2004; Larsson 2005).

Iron Age

There is only limited evidence for Iron Age activity in the locale (800 BC–AD 400). An extended inhumation in a stone-lined cist was recorded in Loughlinstown (NMI ref. 1957:350), which probably dated to the Iron Age or early historic period. Excavations at Cherrywood revealed a Late Bronze Age / Early Iron Age burial enclosure (Ó Néill 2000[65]; Licence no: 99E0523). Cremated human bone was recovered from the ditch, with one intact cremation found in the centre of the site. Blue glass beads, a fragment of bronze, a bone pin and an iron pin suggest an important Iron Age site. The site was later reused with some disturbance.

A La Tène Iron Age site (c.200 cal. BC) was excavated during in advance of the construction of the South Eastern Motorway in Carrickmines Great. It appears to have been an open undefended settlement, comprising a round house (the first Iron Age example in County Dublin), an iron-smelting furnace and associated domestic structures, while analysis of plant remains from the site indicates cereal growing (Ó Drisceoil 2005[66]; Licence no. 02E0272). A pit-cremation of the 4th-6th century cal. AD post-dates the earlier Iron Age settlement and is only one of two Irish cremations that have been dated after c. 400 AD (the other being at Furness, Co. Kildare). These cremations occurred at a time when other, contemporary burials appear quite Christian in character, though the associated beliefs are uncertain.

[63] DU025–017003

[64] DU026–123

[65] Ó Néill, J. 2000. 'Preliminary Excavation Report. Cherrywood, Co. Dublin, Area C.' Licence no. 99E0523. Unpublished report: Margaret Gowen & Co. Ltd.

[66] Ó Drisceoil, C. 2005. 'Draft Final Report. Archaeological Excavation, Carrickmines Great (Sites 59-62), South Eastern Motorway, Co. Dublin'. Licence no.: 02E0171. Unpublished report: Valerie J. Keeley Ltd.

Other remains of Iron Age date include possible structures from Kilgobbin and Carrickmines Great (Hagen 2004[67]) in addition to an enclosure from Stepaside (Reid 1998a[68]), and a grain-drying kiln in Kilgobbin (McGlade 2018[69]).

Radiocarbon determinations that date to the Iron Age have also been obtained from the environs of the Early Neolithic portal tomb at Taylorsgrange (Lynch 2000[70]), as well as the Early Bronze Age wedge tomb at Kilmashogue (Brindley and Lanting 1991/92[71]; Hedges *et al*. 1993[72]), which suggests these monuments continued to be venerated during the latter stages of prehistory.

Early Medieval/ Early Christian Period (c. AD 500 to 1100)

The principal settlement type during the early medieval period was the ringfort or rath, though upstanding examples are very rare in Dublin, where intensive agriculture and the expanding city have removed much of their physical presence and their immediate and wider setting within the landscape. Of the two recorded sites previously thought to be ringforts in the surrounding area, neither proved to be of early medieval origin. The designed landscape feature recorded in Woodside townland was formerly recorded as a ringfort (DU022-069), though subsequent archaeological testing and a topographical survey undertaken in 1998 indicated that it is more likely to have been a tree ring or landscaping feature (Reid 1998a[73]; Licence No. 98E0074). Similarly, an enclosure recorded in Jamestown (DU026-001), when investigated was found to be non-archaeological in origin and associated with the modern dump at Ballyogan (Reid 1998b[74]; Licence No. 98E0119).

There are several pre-Norman ecclesiastical settlements in the wider landscape. The ruined church of Kilgobbin is a building erected just less than 300 years ago. However, it occupies the site of a church (DU026-004) that stood at Kilgobbin at the time of the Anglo-Norman invasion. The church is said to owe its foundation to *St Gobban*, whose festival falls on April 1. His name appears in the Martyrology of Tallaght as well as the Martyrology of Donegal. Near it stands a fine typical example of a plain high cross and the site of a holy well.

There is also an early church and graveyard sites in Tully and Rathmichael. A cross base, which is probably early medieval in date, is recorded in the townland of Carrickmines Great (DU026-018) and it is thought that a cross at this location may have marked a route or a boundary between Tully to the east and Jamestown

[67] Hagen, I. 2004. 'Archaeological Excavations. Interim Report. Phase 3 Development, Kilgobbin, County Dublin (03E0306)'. Unpublished report for Margaret Gowen and Co. Ltd.

[68] Reid, M. 1998a. 'Archaeological Excavation. Stepaside, County Dublin (97E0467)'. Unpublished report for Valerie J. Keeley Ltd.

[69] McGlade, S. 2018. 'Final Excavation Report. Landsdown Old Wesley Grounds, Kilgobbin, County Dublin'. Unpublished report for Archaeology Plan.

[70] Lynch, R. 2000. 'The Brehon's Chair', Taylors Grange. In I. Bennett (ed.), Excavations 1998: summary

[71] Brindley, A.L. and Lanting, J.N. 1991/92. Radiocarbon dates from wedge tombs. Journal of Irish Archaeology 6, 19–26.nts of archaeological excavations in Ireland, 69–70. Wordwell: Bray.

[72] Hedges, R.E.M., Housley, R.A., Ramsey, C.B. and van Klinken, G.J. 1993. Radiocarbon dates from the Oxford AMS system: Archaeometry datelist 17. Archaeometry 35, 305–26.

[73] Reid, M. 1998a. 'Archaeological Report on Pre-Development Testing at Woodside, Sandyford, Co. Dublin'. Licence no. 98E0074. Unpublished report.

[74] Reid, M. 1998b. 'Preliminary Report. Archaeological Excavation, The Pale Ditch, Ballyogan, Co. Dublin'. Licence no.: 98E0119. Unpublished report: Valerie J. Keeley Ltd.

to the west (Corlett 1999[75]). According to the Schools Survey, organised by the Irish Folklore Commission in 1937, there was a tradition that the cross was buried somewhere in the vicinity. The cross-base stands within a farmhouse garden and the trackway beside the house is known as the 'Old Packhorse Road' (RMP File). Archaeological testing at the site of the cross base did not reveal any features and may indicate that the cross did indeed mark an early routeway (Dennehy 2004b[76]; Licence No. 04E0114ext).

In the early historic era, the area of south County Dublin, in which the proposed development is situated, was part of the territory of the Dál Messin Corb, the first of the Leinster dynasties (MacShamhráin 1996[77]). The Dál Messin Corb were eventually displaced from the Liffey plain and gradually pushed further into Wicklow under pressure from other dynasties that were themselves being displaced by Scandinavian settlements being established from the 9th century onwards. It is possible that the area later became part of the domain of the Ui Briúin Chualann, who dominated the southern parts of County Dublin and the coastal strip towards Wicklow.

Early medieval activity has been revealed at Brennanstown where a series of ditches were dated to the 7th/8th century due to the retrieval of a copper alloy pseudo penannular ring-brooch from one of the ditch fills. These inter-cutting boundaries indicate changing patterns of land division at the time. A cereal drying kiln dating to the 10th century demonstrates the cultivation of cereals in the area (Duffy 2021[78]; Licence No. 16E0468).

Medieval Period

During the late 13th and 14th centuries, the Irish living in the Wicklow and Dublin Mountains began to launch raids on the Anglo-Irish settlements of south County Dublin. This activity, combined with the devastation of the Bruce invasion, reduced the territory controlled by the administration of Dublin to the area of the Pale, which developed in the 15th century. The Pale delineated the hinterland around the centre of the English Lordship during the late Middle Ages. The 'Pale' is derived from the Latin term *pālus*, meaning stake. Consequently, the 'Pale' had the original connotation of a stake or fence and, by extension, came to mean a fenced-off area that was under a particular jurisdiction (Cosgrave 1981[79]; Goodbody 1993[80]). The earliest known use of the term in Ireland occurred in 1446–7, when the Gaelic-Irish leader Hugh Roe McMahon undertook 'to carry northing out of the English Pale' (Shirley 1845[81]). However, the territory of the Pale at this time was not as strictly defined as it would become in the late fifteenth and early sixteenth centuries.

An Act of Parliament from 1488–9 decreed that landowners should raise a defensive rampart along the borders of the Pale, which incorporated parts of Dublin, Kildare, Meath and Dublin. The Pale boundary has changed in form and line over time, and in 1492 was fortified after an Act of Parliament ordered that the line

[75] Corlett, C. 1999. Antiquities of Old Rathdown. Wordwell: Wicklow.

[76] Dennehy, E. 2004b. 'Archaeological Assessment: Glenamuck Road, Carrickmines Great, Dublin 18'. Licence no.: 04E0114. Unpublished report: Margaret Gowen & Co. Ltd.

[77] MacShamhráin 1996.Church and Polity in Pre-Norman Ireland, Maynooth

[78] Duffy, P. 2021. 'Excavation Report for Druid's Glen Link Road N11, Loughlinstown, Dublin 18'. Licence no.: 16E0468. Unpublished report: Irish Archaeological Consultancy Ltd.

[79] Cosgrove, A. 1981. Late Medieval Ireland, 1370–1541. Helicon: Dublin.

80 Goodbody, R. 1993a. On the Borders of the Pale: a history of the Kilgobbin, Stepaside and Sandyford areas. Pale Publishing: Dublin.

[81] Shirley, E.P. 1845. Some Account of the Territory or Dominion of Farney: in the province and earldom of Ulster. William Pickering: London.

of defence consist of 'a double ditch of six feet high above ground on one side' (the side closest to the Irish). The Pale boundary earthwork defined an area measuring 30 miles long and 20 miles wide that included parts of Counties Dublin, Louth, Meath and Kildare (O'Keeffe 1992[82]). Although this earthwork was never completed, there are some upstanding portions of the Pale boundary at Balally, Kilcross, Kilgobbin and Ballyogan. The lands within the Pale were under English control but under constant attack from the native Irish. Ball and Hamilton (1895[83]) state:

'The Pale began at Dalkey and followed a south-westerly direction towards Kilterian; then turning northwards passed Kilgobbin, where a castle still stands, and crossed the parish of Taney to the south of that part of the lands of Balally now called Moreen, and thence in a westerly direction to Tallaght, and on to Naas in the County of Kildare. In the wall bounding Moreen is still to be seen a small watch-tower and the remains of a guard-house adjoining it. From this point a beacon-fire would raise the alarm as far as Tallaght, where an important castle stood.'

However, the construction of a continuous barrier enclosing the four counties was never attempted, instead, the Pale came to refer to a notional, as opposed to a defensive perimeter, where English culture and law were observed. Thus, the morphology of the Pale boundary varied between different landholdings, and often enclosed an individual's property, rather than following a definite orientation, or predictable structure (e.g. O'Keeffe 1992[84] and 2001[85]; Bolger 2005[86]). Where stretches of the fortified rampart were constructed, it usually took the form of two ditches that were divided by a flat-topped earthen bank as mentioned above. It generally it varies from 2–3m wide at the top and stands 2.5m above the present bottom of the ditches. The ditches vary from 2–3m in width. The bank has hedgerow trees growing along the length of it (mainly on the sides) leaving a clear path along the top. Many of the trees are of considerable age with hawthorns of girth up to 1.3m and clumps of ash, sycamore, and hawthorn as coppice re-growth from now disappeared stumps (Goodbody 1993, ibid). In the militarised medieval marchlands of Kilgobbin, Jamestown, and Carrickmines, the earthen rampart would have impeded against cattle raids and attacks by local Gaelic-Irish families such the O'Toole's and the O'Byrne's (O'Byrne 2003[87]). T

To the west, the Pale is aligned on Kilgobbin Castle. Both Carrickmines and Kilgobbin castles were in the hands of the Walsh family at the time that the Pale ditch was being constructed. On John Rocque's 1760 map of County Dublin, a section of the Pale boundary is shown as a deep ditch and river flowing from Carrickmines towards Kilgobbin Castle, with a small path/trail running alongside it (Figure 13.3). It runs almost parallel to Ballyogan Road and to a small river that runs eastwards towards Carrickmines. The western end disappears under the Ballyogan tiphead and may well have been longer before the opening of this dump. It would appear from subsequent historical maps that this path preceded Ballyogan Road, which is depicted on Taylor's 1816 map the at the 'New Road.'

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[82] O'Keeffe, T. 1992. 'Medieval frontiers and fortification: the Pale and its evolution,' in Dublin city and county: from prehistory to present, ed. F. H. A. Aalen and K. Whelan, Geography Publications, Dublin.

[83] Ball F. E. & Hamilton E. 1795. The Parish of Taney: A history of Dundrum, near Dublin, and its neighbourhood. Dublin: Hodges, Figgis.

[84] O'Keeffe, T. 1992. Medieval frontiers and fortifications: The Pale and its evolution. In F.H.A. Aalen and K. Whelan (eds.), Dublin City and County: from prehistory to present (Studies in Honour of J.H. Andrews), 55–77. Geography Publications: Dublin.

[85] O'Keeffe, T. 2001. Medieval Ireland: an archaeology. Tempus: Stroud.

[86] Bolger, T. 2005. Archaeological Assessment, Carrickmines Great, County Dublin (05E0459). Unpublished report for Margaret Gowen and Co. Ltd.

[87] O'Byrne, E. 2003. A much-disputed land: Carrickmines and the Dublin marches. In S. Duffy (ed.), Medieval Dublin IV, 229–252. Four Courts Press: Dublin.

Sections of the Pale boundary have been archaeologically investigated in Kilgobbin, Ballyogan, Jamestown and Carrickmines Great (Reid 1998b[88]; Brady 2000[89]; Bolger 2000[90] and 2005[91]; O'Carroll and Turrell 2001[92]; Ó Néill 2002[93]), including the probable line of the earthwork to the south of the Clay Farm development (Rice 2018[94]). Two test trenches were opened across the possible bank, but no evidence was uncovered for ditches or other associated defensive features. The investigation demonstrated that the bank was representative of a natural scarp, which was formed by ice sheets during the Pleistocene era. However, this natural topographic feature may have substituted for more formal defences along this section of the Pale, as the scarp provided a naturally occurring bank and slope (Rice 2018).

The medieval period is represented by a wide range of monuments, and the tower houses recorded in the study area (e.g. Murphystown, DU023-025; Kilgobbin, DU025-017001; Balally, DU022-024; Carrickmines, DU026-005) are indicative of the frontier nature of these areas as outposts of the Pale.

The fifteenth-century tower house of Kilgobbin (DU025–017001) was constructed by the Walsh family. The impetus for its construction may have been provided by a subsidy issued under Henry VI in 1429, which granted £10 for the building of a castle within the Pale (Sweetman 1999[95]). The Walshes were important local marcher lords who owned extensive lands in south Dublin, in addition to other castles in Balally, Carrickmines, Brennanstown, Shanganagh, Corke and Old Connaught (Goodbody 1993[96]). The earliest reference to Kilgobbin Castle dates to 1476, when it was sacked by the Gaelic-Irish O'Byrne's (O'Byrne 2002[97]). It was occupied by Morris Walsh in 1482, and subsequently by his son Pierce from 1509. John Walsh resided in the castle in 1578, Edmond Walsh in 1599 and Christopher Walsh in 1615. A court was held in Kilgobbin Castle by order of the Exchequer in 1620, at which time it was held by Patrick Walsh (Ball 1902[98]).The standing castle consists of southern and western walls; the north and east walls collapsed in 1832. The building survives to three storeys, and its granite walls include several arrow slits. A tall doorway

[88] Reid, M. 1998b. Preliminary Report of the Archaeological Excavation of the Pale Ditch at Ballyogan, County Dublin (98E0119). Unpublished report for Valerie J. Keeley Ltd.

[89] Brady, N. 2000. Archaeological Investigations at Ballyogan Waste Management Centre. Jamestown, County Dublin (99E0456). Unpublished report for Valerie J. Keeley Ltd.

[90] Bolger, T. 2000. Archaeological Monitoring and Excavation of the Meadowfield Lodge Pipeline, Kilgobbin, County Dublin (00E0247). Unpublished report for Irish Archaeological Consultancy Ltd.

[91] Bolger, T. 2005. Archaeological Assessment, Carrickmines Great, County Dublin (05E0459). Unpublished report for Margaret Gowen and Co. Ltd.

[92] O'Carroll, E. and Turrell, S. 2001. Final Report on Excavations at Jamestown, County Dublin (01E0413). Unpublished report for Archaeological Development Services Ltd.

[93] Ó Néill, J. 2002. Archaeological Assessment at the Pale Boundary (DU026–1150). Ballyogan Road, Jamestown, County Dublin (02E0535). Unpublished report for Margaret Gowen and Co. Ltd.

[94] Rice, K. 2018. Archaeological Impact Assessment Report. Clay Farm (Phase II), Kilgobbin, County Dublin (17E0585). Unpublished report for Courtney Deery Heritage Consultancy Ltd.

[95] Sweetman, D. 1999. Medieval Castles of Ireland. The Collins Press: Cork.

[96] Goodbody, R. 1993a. On the Borders of the Pale: a history of the Kilgobbin, Stepaside and Sandyford areas. Pale Publishing: Dublin

[97] O'Byrne, E. 2003. A much-disputed land: Carrickmines and the Dublin marches. In S. Duffy (ed.), Medieval Dublin IV, 229–252. Four Courts Press: Dublin.

[98] Ball, F. E. 1902. A History of the County Dublin, Part I, The H.S.P. Library, Dublin.

is sited at the north-end of the west wall, while a square draw-bar hole is located inside of the entrance. The ground floor is spanned by the remains of a high vault, directly above which is a line of square joist holes for timber floor supports. A service tower on its southeast corner originally included a stone spiral staircase, as well as an extant garderobe (Corlett 1999[99]).

Excavation in 2002, in the field to the north of the tower house, produced evidence of a small number of medieval features relating to drainage, land enclosure and agricultural activity in the area (Hagen 2004[100]; Licence Refs 02E0906, 02E1104, 02E1173, 02E1196, 02E1220, 03E0306, 03E0717, 04E0566). The remains of a burial (preserved in situ) were discovered at the edge of the excavation area, though the date of the burial is unknown (Hagen 2003). Archaeological testing in 2005 within the remainder of the proposed development site also revealed a series of ditches of apparent medieval date, that may have been associated with the nearby tower house (Moriarty 2005[101]; Licence Ref. 05E0322), this was confirmed during another phase of testing (Rice, 2018[102]).

Carrickmines castle probably dates to the 13th century and was constructed in order to protect the southern marchlands of the city of Dublin from the Gaelic tribes who occupied the Wicklow Mountains. A branch of the Walsh family, to which the lands of Carrickmines had been given, garrisoned the castle. They were very successful agriculturists and military men (Ball 1902[103]). The earliest known reference to it is in the 14th century, with records indicating it was “in waste” in 1326 and was warded in 1355-6. Historical references show that in 1360, a troop of light horsemen under the leadership of Sir John Bermingham was stationed there. In 1375 a large force under the leadership of John Colton, then Dean of St. Patricks and Treasurer of Ireland (and later Archbishop of Armagh), stayed at Carrickmines on one occasion for 3 days, and on another occasion for a month. In 1388, forty mounted archers were stationed there, for which a contribution was levied from the distant lands of Fingal (Ball 1902, ibid). In 1441 Henry Walsh was allowed ten marks for protecting his liegemen.

The 16th century found the Walshes in occupation either as tenants or owners of a wide extent of country, including Carrickmines and Glenamuck and they had become one of the most important families on the south side of Dublin. However, the lands were subjected to devastating attack from Irish tribes towards the end of that century when the property was in the custody of Peter Barnewall, a guardian of Richard Walsh who was a minor at the time (Ball 1902, ibid).

At the start of the 17th century the Walshes were described as ‘a large and ancient stock and as men of note in the metropolitan county’, which was then ‘rich and plenteous in corn and cattle and inhabited by a people of stately port and garb’ (ref. from 1642 in Ball 1902, ibid). However, before the middle of that century the Walshes’ prosperity was at an end. The part taken by the owner of Carrickmines Castle in the Cromwellian Rebellion of 1641 is not clear, but as a family the Walshes threw themselves behind the Irish side and proved that they had become more Irish than the Irish themselves. Whether with or without the consent of the owner, Carrickmines became the centre for disaffection in the southern part of County Dublin, and the Walshes figure prominently in the depositions made by those who suffered losses during that first winter

[99] Corlett, C. 1999. Antiquities of Old Rathdown: the archaeology of south County Dublin and north County Wicklow. Wordwell: Bray

[100] Hagen, I. 2004. Archaeological Excavations. Interim Report. Phase 3 Development, Kilgobbin, County Dublin (03E0306). Unpublished report for Margaret Gowen and Co. Ltd.

[101] Moriarty, C. 2005. Archaeological Assessment, Riverside Cottage, Kilgobbin Road, Sandyford, Dublin 18 (05E0322). Unpublished report for Margaret Gowen and Co. Ltd.

[102] Rice, K. 2018. Archaeological Impact Assessment Report. Clay Farm (Phase II), Kilgobbin, County Dublin (17E0585). Unpublished report for Courtney Deery Heritage Consultancy Ltd.

[103] Ball, F. E. 1902. A History of the County Dublin, Part I, The H.S.P. Library, Dublin.

(Ball 1902, ibid). The lands of Glenamuck were assigned to Roger Jones, and at this time were inhabited by Gaelic Irish.

During that winter after the rebellion, the county of Dublin, south of the city, was in the hands of the rebels. Their defeat in February 1642 at Deans' Grange meant that they fell back to Carrickmines Castle, preparing to stand a siege. According to Ball (1902, ibid), the rebels put up a brave fight for a day but eventually the castle was breached, and all within it, men, women and children, were put to the sword, and the castle was blown up and levelled to the ground (ref. from 1642 in Ball 1902, ibid). However, Petty's Down Survey map of 1656 shows a substantial Tudor-type house still standing at this time in Carrickmines, as well as a number of smaller buildings, so the level of destruction at the end of rebellion may not have been as great as reported. After the Restoration, the Commissioners of Settlement awarded the lands of Carrickmines to the Earl of Meath.

The castle at Carrickmines formed part of the defences along the Pale boundary. The Pale partially surrounded Dublin during the medieval period and was a defensive structure built by the English settlers to alleviate the constant raiding of their lands by native Irish tribes such as the O'Tooles and the O'Byrnes. The term the 'Pale' is derived from the Latin referring to a method of fencing using vertical wooden stakes or poles (Goodbody 1993[104]). An act of Parliament of 1488-89 required the landowners of the time to construct a defensive boundary along the borders of the Pale. Thus, the construction of the pale earthwork was often undertaken to enclose an individual's property rather than ensuring that the pale boundary followed a definite orientation or predictable structure. According to O'Keeffe (1992[105]) "one might assume from the description that the earthwork ran more or less in a line from one location to the next, but the field evidence indicates otherwise".

The churches, holy wells, and crosses in the area also point to a considerable local population, living in well-defined villages and hamlets, rather than scattered across the landscape. They also appear to reflect a relatively stable medieval population, as the church in Kilgobbin appears to have been rebuilt with stones from an older church (DU026-004), rather than being deserted. Finds from the period include a range of Belarmine ware (NMI Ref. 1971:1126, 1972:16) found in the area around the castle at Kilgobbin and some stoneware sherds (NMI Ref. 1972:17).

Post-Medieval Period

The Walshes remained in the ascendant at the onset of the seventeenth century when they were described as 'a large and ancient stock and as men of note in the metropolitan county' (Ball 1902[106]). However, the Walshes became involved in the Irish Rebellion of 1641, which subsequently developed into the Irish Confederate Wars. Theobald Walsh threw his lot in with the rebel confederacy and conducted raids between 1641–2 on lands in Booterstown, Jamestown, and Deansgrange (Murphy 2012[107]). Carrickmines Castle, which was owned by Theobald Walsh, became a centre of operations for the Catholic forces in late 1641 and early 1642, and a place to which stolen cattle were frequently driven (Ball 1902, ibid).

The war reached Kilgobbin Castle on the 20th of January 1642, when a government cavalry force approached the tower house with the intention of razing it and the surrounding village. The castle had

[104] Goodbody, R. 1993. On the Borders of the Pale: a history of the Kilgobbin, Stepaside and Sandyford areas. Pale Publishing: Dublin.

[105] O'Keeffe, T. 1992. 'Medieval frontiers and fortification: the Pale and its evolution,' in Dublin city and county: from prehistory to present, ed. F. H. A. Aalen and K. Whelan, Geography Publications, Dublin.

[106] Ball, F.E. 1902. A History of the County Dublin, Vol. I. Alex, Thom and Co. Ltd: Dublin.

[107] Murphy, M. 2012. Historical Background. In T. Breen (ed.), Report on the Findings of the Archaeological Excavations at Carrickmines Great, County Dublin (00E0525 and 02E1532), 12–35. Unpublished report for Valerie J. Keeley Ltd.

passed to Sir Adam Loftus of Rathfarnham some years earlier, who had possibly inherited it through marriage. Loftus leased Kilgobbin Castle to Matthew Talbot at the time of the rebellion, who was an officer in the Irish Confederate Army (Ball 1902, ibid). The attacking government cavalry were skirmished by a party of Confederate rebels, who killed two soldiers (Goodbody 1993[108]). However, the castle was subsequently besieged by General Monk, who captured and garrisoned it. The lands now occupied by Sandyford Hall, which border the proposed development site to the north, are locally referred to as 'the battlefield', which presumably derives its name from these seventeenth century events.

The rebel army was defeated in February 1642, by government forces at Deangrange. The rebels then occupied several castles in south Dublin; however, the Dublin administration judged that if they could force the rebels from one castle, then they would probably abandon the remainder. This decision resulted in the dispatch of Sir Simon Harcourt with a company of men and horses to Carrickmines Castle on the 26th March 1642 (Clinton and Shiels 2013[109]). The castle was bombarded with artillery, and the walls were breached. The soldiers massacred all those inside, and portions of the castle walls were reputably levelled (Clinton et al. ibid). Theobald Walsh was outlawed in October 1642, and Carrickmines was granted to Edward Brabazon, the second Earl of Meath (Arnold 1993[110], 181–2).

The site at Carrickmines Castle continued to be occupied in the post-medieval period, with the use of a manor house, associated farmyard complex, and possible milling activity. A military camp (DU026-127) was located in Laughanstown from 1794 to 1799. The camp covered 120 acres and billeted up to 4,000 troops. An earlier camp, dating to 1690, was occupied by the army of King James II and gave its name to Gun and Drum Hill where it was situated north of Tully Church. The later camp was established by the British government to defend Killiney Bay from Napoleonic threats. It was later used as a garrison during the 1798 rebellion. It consisted of two lines of encampment, with one on Gun and Drum Hill and one to the east over the current N11 roadway. Lehaunstown Road is a military road, probably contemporary with the camp. The camp was dismantled in 1799, and the troops dispatched to other garrisons.

13.2.2 Cartographic Sources

The Down Survey map of the Barony of Rathdown (c. 1656)

The Down Survey map of 1656-8 was at the time the most detailed survey on a national scale undertaken anywhere in the world. The map of County Dublin depicts the Ballyogan Stream flowing past Carrickmines Castle and Brennanstown to join the Shanganagh River along the Hackettstown / Shanganagh boundary to meet the Irish Sea (Figure 13.2). It shows castle structures at Carrickmines, Loughlinstown and Shanganagh and also a mill structure on the Shanganagh River. The majority of the study area is depicted within the Barony of Rathdown, but the map shows that the westmost extent of the study area in the vicinity of Ballyedmonduff was historically part of the barony of Newcastle.

[108] Goodbody, R. 1993a. On the Borders of the Pale: a history of the Kilgobbin, Stepaside and Sandyford areas. Pale Publishing: Dublin

[109] Clinton, M. and Shiels, D. 2013. The history of the 1642 Siege of Carrickmines Castle. In C. Corlett (ed.), Unearthing the Archaeology of Dún Laoghaire-Rathdown, 142–6. Dún Laoghaire-Rathdown County Council and the Heritage Council: Dublin.

[110] Arnold, L.J. 1993. The Restoration Land Settlement in County Dublin, 1660–1688: A History of the Administration of the Acts of Settlement and Expansion. Irish Academic Press: Dublin.

Figure 13.2: Down Survey map of County Dublin depicting approximate study area

Archaeological sites of note which appear on this map include Murphystown Castle (DU023-025), Carrickmines Castle (DU026-005001), Laughanstown Castle (DU026-093) and Shanganagh Castle (DU026-031001), and a large house at Leopardstown. The depiction of the watercourses next to these Pale boundary castles demonstrates the importance of the rivers of this area in the defence of the Pale.

The Down Survey map of the Barony of Rathdown (Figure 13.3) also depicts Ballyogan Stream flowing past Carrickmines, Glenamuck and Brennanstown to meet the Shanganagh River. Additionally, Brides Glen River is shown flowing past the townlands of Ballycorus, Shankill and Laughanstown to meet the Shanganagh River. This map similarly depicts castles and large houses adjacent to the watercourses. Additionally, a road labelled 'The Highway from Dublin to Wicklow' is depicted crossing the Shanganagh River at Loughlinstown. This is the Old Bray Road which has now been replaced by the N11.

Figure 13.3: Down Survey map of the Barony of Rathdown depicting approximate study area

John Rocque's 'An Actual Survey of the County of Dublin' 1760

Rocque's map of the County Dublin (Figure 13.4) depicts the study area are predominantly rural in character. The settlements at Kilgobbin, Carrickmines, at Cabinteely, Laughanstown, and Shanganagh are well established with road networks linking them. Cabinteely River, Kilgobbin Stream, Ballyogan Stream, Brides Glen River and Shanganagh River are all depicted among the network of watercourses. Shading along the south side of Ballyogan Stream between Carrickmines and Kilgobbin indicates an embankment. This is believed to have formed part of the Pale Boundary, between Carrickmines Castle and Kilgobbin Castle (DU026-115). Carrickmines Stream is depicted flowing from Leopardstown to join the Ballyogan Stream. The potential line of the pale ditch is shown along the southern side of the Ballyogan Stream connecting Carrickmines to Kilgobbin.

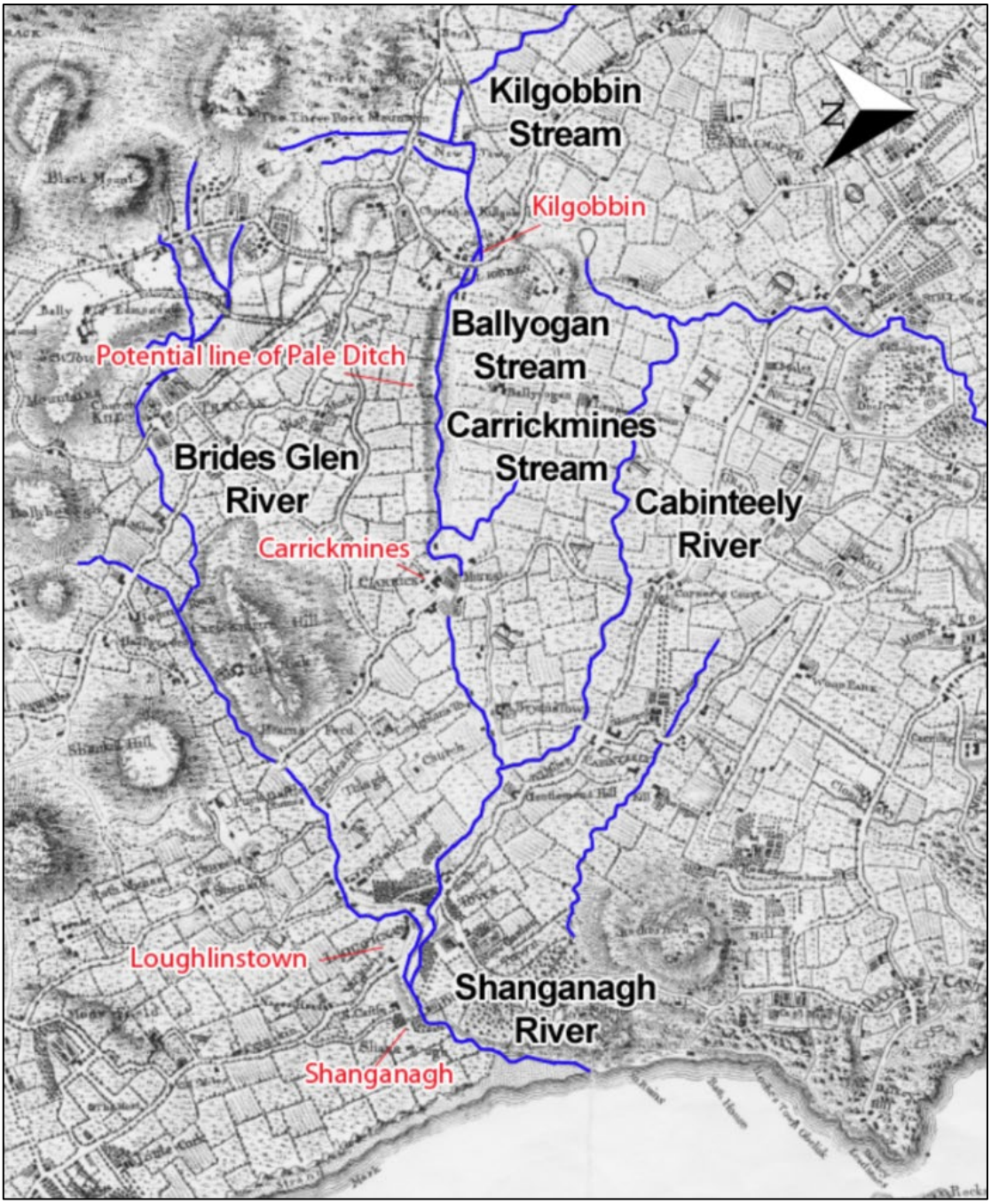

Figure 13.4: Rocque's 'An Actual Survey of the County of Dublin' depicting approximate study area

Taylor's 'Map of the Environs of Dublin' 1816

Taylor's 'Map of the Environs of Dublin' (Figure 13.5) does not show much additional detail. The lands at Kilgobbin and Carrickmines are depicted. The Ballyogan Road is shown connecting Carrickmines to Kilgobbin and may have replaced the Pale Bounday which may have provided access between the two settlements. .

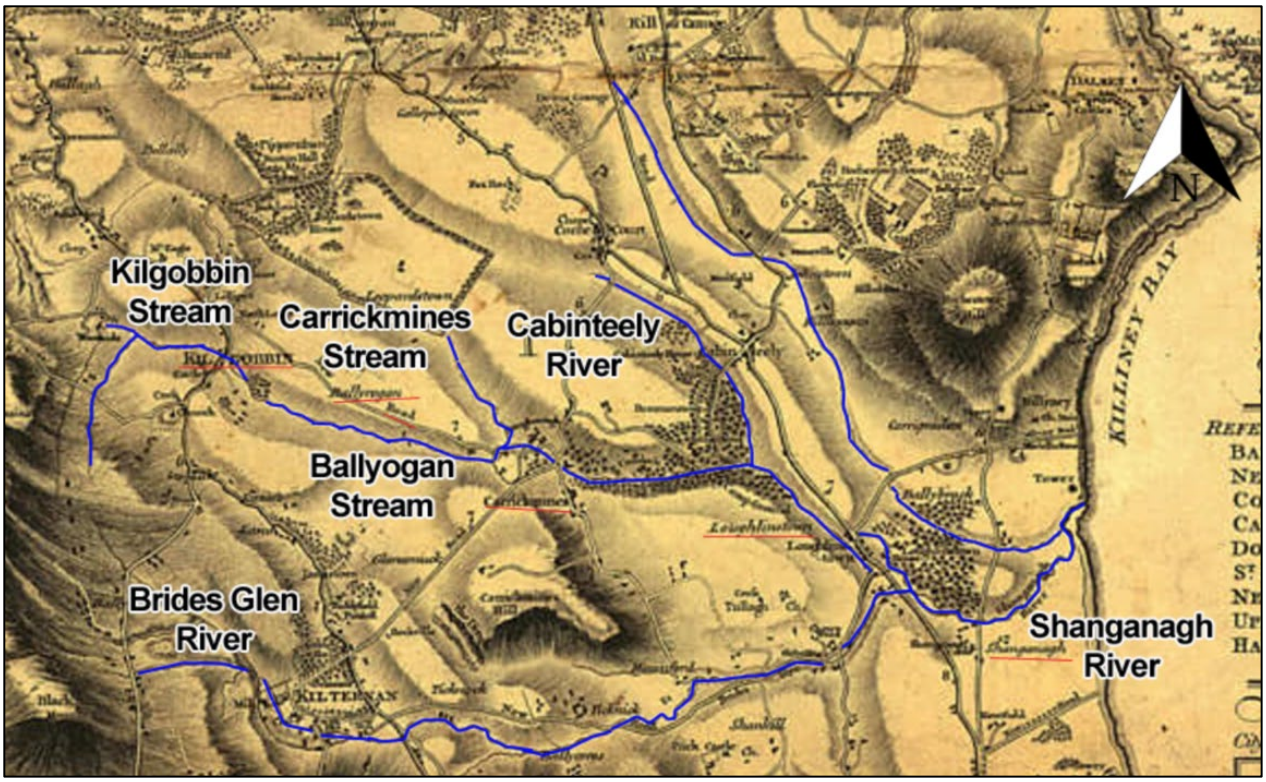

Figure 13.5: Rocque's Taylor's 'Map of the Environs of Dublin' depicting approximate study area

Ordnance Survey Maps

The Ordnance Survey provided detailed mapping in the 19th century of Ireland, including a variety of landscape features, built heritage and archaeological sites (Figure 13.6 and Figure 13.7). The historic maps were examined to identify any unrecorded cultural heritage sites, including industrial heritage features or potential archaeological features, see Section 12.2.7. The Ordnance Survey maps illustrate the 19th century expansion of the suburbs of Dublin facilitated by new transport links, including road and railway networks. The maps also capture the industries along the rivers (such as the rise and decline of the milling industry). A general description of each of the river courses are described as follows.

The Newtown Little Stream meets the Barnacullia Stream at the Newtown Little / Woodside townland boundary to become the Kilgobbin Stream. The Kilgobbin Stream flows east along the north side of Kilgobbin Castle with several culverts depicted along its course. It flows under a bridge on the Kilgobbin Road and there are a number of wells and footbridges depicted in this area. It is known as the Ballyogan River in Jamestown, where it splits for a distance before merging again to flow under the Ballyogan Road in a course which has been altered in modern times. It joins the Carrickmines Stream and continues as the Carrickmines River. An unnamed tributary to Kilgobbin Stream is shown rising at Kilgobbin Schoolhouse and flowing under a roadbridge west of Kilgobbin Castle on a road which no longer exists. Another unnamed tributary rises to the east of Clay Farm in Kilgobbin. Several culverts are depicted along it before it meets the Kilgobbin Stream at Larkfield.

A group of three unnamed tributaries to Ballyogan River are located in the east of the townland of Kilgobbin and along the townland boundary with Jamestown. Its course northwest appears to have been canalised along field boundaries before meeting the Glenamuck North Stream. Several culverts are depicted along its course until it meets the Carrickmines River. The Carrickmines River flows under Carrickmines Bridge, which is now replaced with a modern road at the Glenamuck North Road Roundabout. An irregular,

serpentine watercourse is shown on the First Edition 6-inch OS map of 1843, with the 'Site of an Ancient Mill' (DU026-080002) noted along its course. The river was later straightened and appears with a more direct course in the 25-inch OS map of 1910. This map also depicts a weir at Priorsland and a footbridge on the Carrickmines Great / Brennanstown townland boundary.

The Laughanstown Stream is shown as a straightened watercourse along field boundaries in Carrickmines Great, with a series of culverts before it meets the Carrickmines River. The Loughlinstown River North, also known as the Carrickmines Stream, is shown with a number of culverts along its course before reaching the grounds of Loughlinstown House where four footbridges, three weirs and a pond are depicted as well as Loughlinstown Bridge where the N11 is now located. It meets the Bride's Glen River at Loughlinstown / Loughlinstown Commons to become the Shanganagh River.

Bride's Glen River, also known as Loughlinstown River South or Shanganagh River, is shown rising in Ballyedmonduff. The river flows along the Laughanstown / Rathmichael townland boundary passing Bride's Glen House into Shankill. The 'Site of a Tuck Mill', a recorded monument, is noted at Mullinastill House in Shankill (DU026-086001), with a short length of millrace evident in the First Edition 6-inch OS map. The river continues between Mullinastill House and Cherrywood House, flowing under Cherrywood Bridge at the junction of the Millinastill Road and Cherrywood Road. The river continues northeast and is shown culverted under the Dublin & South Eastern Railway (RPS1783) on the 25-inch map of 1910.

The Bride's Glen River continues past the Rathdown Union Work House, where several buildings were close to the river in the 25-inch OS map and a footbridge is depicted next to the Bray Road, where a road bridge and weir were located before meeting Loughlinstown River North to continue under the moniker of Shanganagh River.

The Shanganagh River flows through Loughlinstown Commons where it is evident from the First Edition 6-inch OS map that the river was straightened from its original curving course in the 19th century when the Commons Road was constructed. It continues on its original course at Shanganagh Bridge (NIAH 60260118) and is culverted under the railway in Hackettsland and the Kingstown and Bray Branch of the Dublin and South Eastern Railway before entering the Irish Sea at Hackettsland and Shanganagh.

Figure 13.6: First Edition Ordnance Survey Map of 1843 showing the proposed flood measures

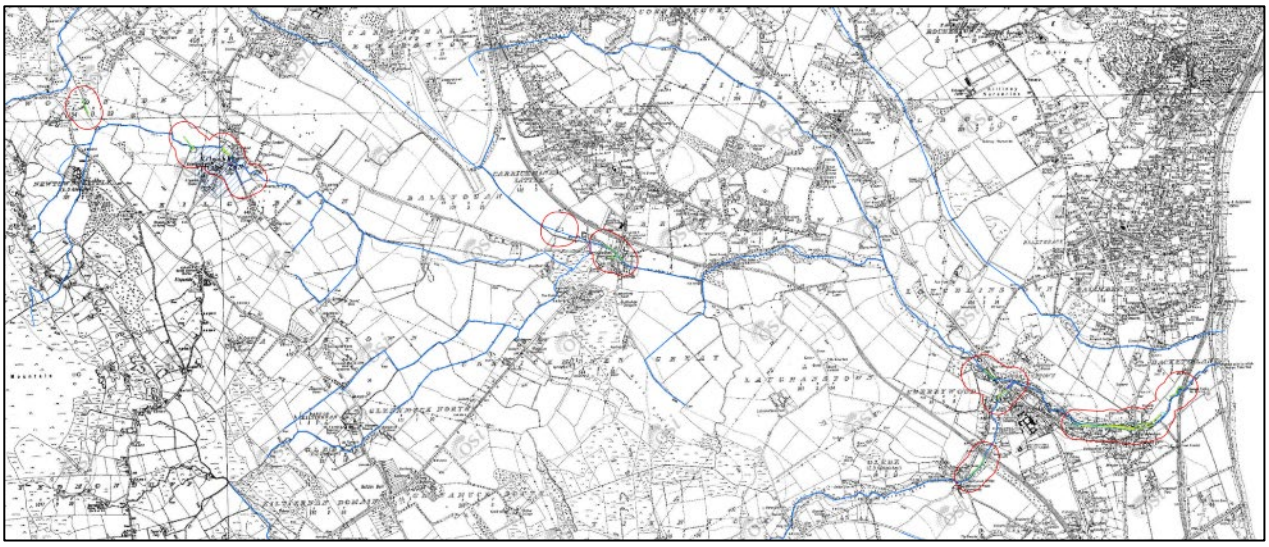

Figure 13.7: Revised Edition Ordnance Survey Map showing the proposed flood measures

13.2.3 Townland Names

Townlands are land divisions that form a unique feature in the Irish landscape; their origins can be of great antiquity, and many are of pre-Norman date. They existed well before the establishment of parishes or counties. Townland boundaries can take the form of natural boundaries or routeways as well as artificially constructed earthen banks and ditch divisions. They are predominantly formed of substantial boundaries which are usually distinguishable from standard field division boundaries.

Within the study area, the watercourses of the Shanganagh-Carrickmines River System make up many of the townland boundaries. In addition to this, the Pale Boundary which delimited the English-dominated regions around Dublin from the Gaelic Irish area in the Dublin and Wicklow mountains followed the Ballyogan River and Kilgobbin Stream for a significant distance.

There are 16 townlands within or partially within the 100m study area (Table 13.1). The townland names are predominantly English names, but with some names an anglicisation of Irish names demonstrating the mixed populations which lived in this area in the medieval period. They refer to family names from the area and the saint's whose names were bestowed on the early churches (e.g. Kilgobbin, Shankill). The landscape is described by these names which refer to features such as stony plains or sandy places.

Table 13.1: Townlands and their meanings within the study area

Townland	Parish	Barony	Origin	Placename origin/meaning (Logainm.ie)
Woodside	Kilgobbin	Rathdown	English	An English name
Kilgobbin	Kilgobbin	Rathdown	Irish	*Cill Ghobáin* - The church of St. Gobban, referring to the early medieval church of Kilgobbin. The reputed nephew of Saint David of Wales (Ó hÉailidhe 1984[111]). A Saint Gobbán is named in the eighth or ninth century 'Martyrology of Tallaght' (Corlett 1999[112]). The earliest historic reference to Kilgobbin Church is from AD 1179 in 'Archbishop's Alen's Register', where it was referred to as Technabretnach, the 'house of the Welshman', which

[111] Ó hÉailidhe, P. 1984. Decorated stones at Kilgobbin, County Dublin. Journal of the Royal Society of Antiquaries of Ireland 114, 142–4.

[112] Corlett, C. 1999. Antiquities of Old Rathdown: the archaeology of south County Dublin and north County Wicklow. Wordwell: Bray.

Townland	Parish	Barony	Origin	Placename origin/meaning (Logainm.ie)
				suggests it may originally have comprised a Welsh foundation (Gwynn and Hadcock 1988[113]).
Murphystown	Tully	Rathdown	English	An English name referring to land owned by the Murphy family.
Carrickmines Great	Tully	Rathdown	Irish	An anglicisation of the Irish *Carraig Mhaighin* meaning the rock of the little plain
Carrickmines Little	Tully	Rathdown	Irish	*Carraig Mhaighin* - Rock of the little plain
Ballyogan	Tully	Rathdown	Irish	*Baile Uí Ógáin* - The homeplace (*Baile*) of the O'Hogan's
Brennanstown	Tully	Rathdown	English	*Baile Uí Bhraonáin* – Brennan's town, a family name
Cherrywood	Killiney	Rathdown	English	An English name referring to the vegetation
Glebe	Rathmichael	Rathdown	English	An English name referring to land owned by the church
Loughlinstown	Killiney	Rathdown	Irish	*Baile Uí Lachnáin* – The homeplace of Laughnan
Loughlinstown Commons	Killiney / Rathmichael	Rathdown	Irish	*Baile Uí Lachnáin* – The homeplace of Laughnan
Hackettsland	Killiney	Rathdown	English	Hackett's land
Ballybrack	Kilgobbin	Rathdown	Irish	*Baile Breac*- meaning the speckled town/land
Shanganagh	Rathmichael	Rathdown	Irish	Possibly from the Irish *Sean Gainneamh* – meaning old sand

Townlands are land divisions that form a unique feature in the Irish landscape, their origins can be of great antiquity, and many are of pre-Norman date. They existed well before the establishment of parishes or counties. Townland boundaries can take the form of natural boundaries or routeways as well as artificially constructed earthen banks and ditch divisions. They are predominantly formed of substantial boundaries which are usually distinguishable from standard field division boundaries. The Glenamuck Road North Roundabout measure includes the section of the Carrickmines River that forms a natural boundary between Carrickmines Little and Carrickmines Great townlands, similarly the Commons Road measure includes the Loughlinstown River which forms the townland boundary between Loughlinstown Commons, Hackettsland and Shanganagh townlands.

13.2.4 Previous Archaeological Investigations

The archaeological and historical background discussed above included the results of archaeological investigations in the general area, providing a context for the development of the landscape. It demonstrates that the surrounding townlands present a rich archaeological landscape containing both standing and subsurface remains that date from prehistory to the post-medieval era. Over the three decades, a substantial number of archaeological investigations have been undertaken in the locale, which have uncovered a diverse range of sites and artefact types. The findings in proximity to the FRS measures provide an indication of the type of remains that are present and offer insights into the archaeological potential of the immediate environs. Archaeological investigations conducted within at least 100m of the relief measures are examined below.

Clon Brugh FRS Measure

Excavations in advance of Atkins Village, Village Road, and Clon Brugh development village were carried out in 2002 and archaeologically monitored (02E1285[114]) (Figure 13.8). Nothing of archaeological significance was noted during this work in the area of the FRS measure. Further to the east, three areas of

[113] Gwynn, A. and Hadcock, R.N. 1988. Medieval Religious Houses: Ireland. Irish Academic Press: Dublin.

[114] McCabe. S (2002) Report on Archaeological Monitoring, Woodside Enniskerry Road, Sandyford, County Dublin. Unpublished Report ArchTech (Area 1). Licence Reference 02E1285(Ext)

archaeological significance were identified and excavated under licence 02E1584. They included an isolated pit containing metal, iron slag and burnt animal bone, a hut structure and domestic settlement activity of post medieval date; these were focused on a natural rise in the landscape.

There is a suggestion[115] that the 15th century Pale Ditch may run along the line of the Ballyogan stream, running from the section in Kilgobbin (DU026-121002) northwards toward Kilcross/Moreen Housing Estate (DU022-064) (now incorporated into a green area). As discussed above, the Pale earthwork was often undertaken to enclose an individual's property rather than following a more regular linear orientation or consistent defensive form. There was no evidence of the Pale during the earthmoving works for Clon Brugh; it is likely that the watercourse would have acted as a natural defensive feature and may have substituted for the construction of formal Pale defences in this area. This finding parallels in Kilgobbin and Carrickmines, where investigations across sections of the Pale boundary indicated a natural scarp in the landscape with no associated archaeological features (as noted above).

Figure 13.8: Licenced Archaeological investigations in the vicinity of the Clon Brugh FRS measure

Belarmine Park FRS Measure

Archaeological investigations carried out in advance of the Belarmine residential development and park in Kilgobbin revealed a significant prehistoric landscape (Figure 13.9). Areas referred to as Areas 4, 5, 6 and Block 7, identified previously unknown archaeological features during the monitoring of the development (Licence no.: 03E0306; Hagen 2004[116]). Area 4 comprised three small pits, thought to have been related to the adjacent prehistoric site at Area 6. Area 5 contained two pits of Beaker period date. Area 6 was the main focus of prehistoric settlement comprising an Early Neolithic rectangular house, a circular structure, two hut sites and refuse pit dating to the Beaker period and two cremation burials. Medieval features included a kiln, furrows, drains and refuse pits.

[115] McCabe. S. 2002. Report on Archaeological Monitoring, Woodside Enniskerry Road, Sandyford, County Dublin. Unpublished Report ArchTech (Area 1). Licence Reference 02E1285(Ext)

[116] Hagen, I. 2004. Archaeological Excavations. Interim Report. Phase 3 Development, Kilgobbin, County Dublin (03E0306). Unpublished report for Margaret Gowen and Co. Ltd.

A burnt mound which was discovered adjacent to the stream was subsequently added to the SMR (SMR DU026-161, 50m west of the FRS measure), while another area adjacent to the watercourse comprised of pits, a posthole, spreads and a hearth (Licence no.: 03E0717; Cryerhall 2004[117]). Testing carried out at the school site to the south of the measure (Licence Ref: 07E0413[118]) and nothing of archaeological significance was identified. No features or finds of an archaeological interest were identified during Phase 2 of the development on what is now Belarmine Drive (02E0906[119]).

The Belarmine area appears to have been comprehensively developed and archaeologically monitored; it is suggested that there are unlikely to be undiscovered archaeological remains in the recently disturbed area of the site. In addition, the UAIA report suggests that the Kilgobbin Stream in Belarmine Park was previously culverted as it flows downstream from an outfall pipe.

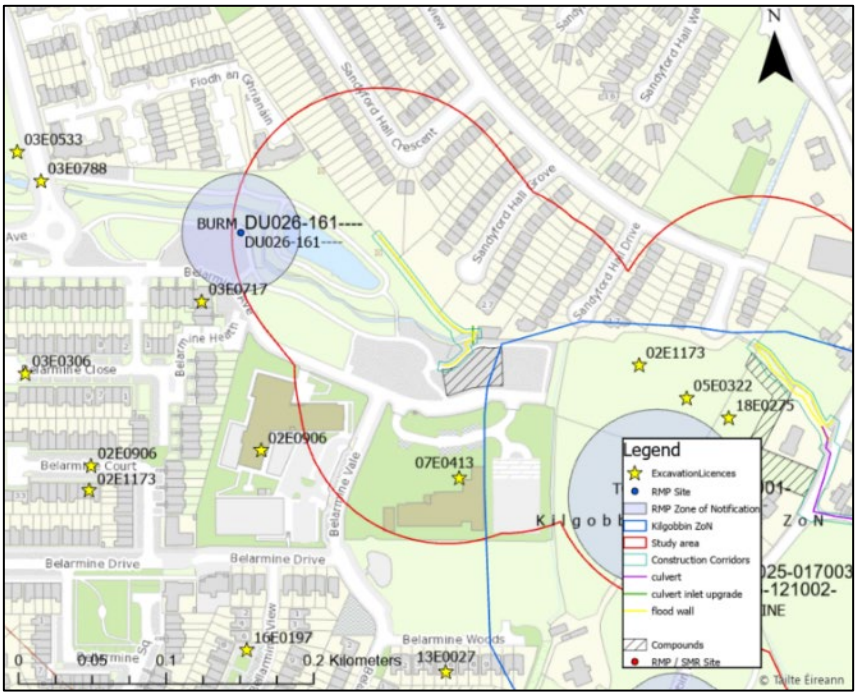

Figure 13.9: Licenced Archaeological investigations in the vicinity of the Belarmine FRS Measure

Kilgobbin Road FRS Measure

The agricultural fields that lies between Kilgobbin Castle and Kilgobbin Stream has been the focus of several archaeological investigations (Figure 13.10, Field 1 and Field 2). These have included a geophysical survey,

[117] Cryerhall, A. 2004. Archaeological Excavation Report. Phase 3 Development, Kilgobbin, County Dublin (03E0717). Unpublished report for Margaret Gowen and Co. Ltd.

[118] Connell, T. 2007 Archaeological Assessment Kilgobbin Stepaside, County Dublin(07E0413). Unpublished Report for ACS.

[119] Hagen, I. 2002 Archaeological Monitoring Phase 2 Development Kilgobbin/Newtown Little County Dublin. Licence Reference 02E0906. Unpublished report for Margaret Gowen and Co. Ltd.

excavation and three separate programmes of archaeological testing (02E1173, Hagen 2002[120]; 05E0322, Moriarty 2005[121]; 18E0275, Rice 2018[122]), and an archaeological excavation between 2002 to 2003.

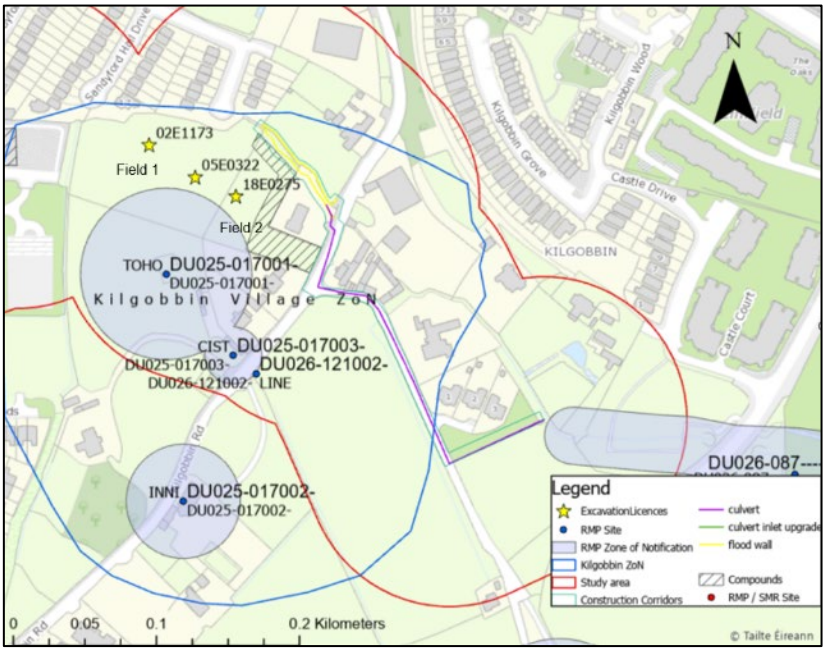

Figure 13.10: Licenced Archaeological investigations in the vicinity of the Kilgobbin FRS Measure

The 2002 testing programme predominantly focused on the northern section of Field 1 but also included long trenches along the southern and eastern edges of the field. A series of possible ditches, drains and pits were identified in six test trenches opened. The subsequent investigation, carried in 2002 and 2003, was undertaken in advance of the construction of service trenches for a foul sewer and an ESB duct in the northern part of the field (Figure 13.11). The excavation produced several medieval features that related to drainage, land enclosure and agricultural activity in the area. The medieval features were severely truncated by post-medieval and early modern activity. The post-medieval features consisted primarily of agricultural furrows, shallow ditches and stone-lined drains. The remains of a human skeleton were uncovered within the southern-end of one of the north-south orientated ditches in Field 1. Only the feet bones of the burial were lifted, as the remainder of the skeleton lay outside the pipeline corridor. The finds from the ditch included medieval and post medieval pottery, and the orientation of the burial appeared to respect the alignment of the ditch.

Two additional phases of archaeological testing were carried out in the two fields (Moriarty 2005, licence ref: 05E0322; Rice 2018, licence ref: 18E0275, Figure 13.11). The first phase uncovered thirty-two possible archaeological features that predominantly consisted of medieval and post-medieval drainage ditches and agricultural features, while assemblages of medieval and post-medieval ceramics were also recovered. The key findings included a post-medieval boundary wall that was orientated north-south; another section of the wall had been investigated in 2002 during the excavation (Hagen 2003). Two medieval enclosure ditches

[120] Hagen. I. 2002, Kilgobbin/Newtown Little, Phase 2, Kilgobbin, County Dublin (02E1173). Unpublished report for Margaret Gowen and Co. Ltd. and Hagen, I. 2003. Preliminary Excavation Report. Phase 2 Development, Kilgobbin, County Dublin (02E1173ext.). Unpublished report for Margaret Gowen and Co. Ltd.

[121] Moriarty, C. 2005. Archaeological Assessment, Riverside Cottage, Kilgobbin Road, Sandyford, Dublin 18 (05E0322). Unpublished report for Margaret Gowen and Co. Ltd.

[122] Rice, K. 2018. Archaeological Impact Assessment Richardson's Lands, Kilgobbin, Dublin 18). Unpublished report for Courtney Deery Heritage Consultancy Ltd.

were also uncovered, which similarly tied in with features to the north that Hagen excavated in 2002 and 2003. These features may represent outer defensive elements associated with Kilgobbin tower house (DU025-017001) to the south.

The second testing phase uncovered a substantial number of archaeological features that predominantly consisted of ditches and drains of medieval and post-medieval dates. These consisted of twenty-one features in Field 1 and twelve in Field 2. Several of these appear to be continuations of features Hagen previously identified by in 2002–3 and Moriarty in 2005. No evidence for any other burials or grave cuts was uncovered, which suggests the skeleton identified in 2002 occurred in isolation. However, human remains were recently identified on the site during SI works for a residential development in Field 1 (Pers Comm Archer Heritage, 2023). The test trenches opened near the river were waterlogged, indicating the potential to find deeply buried archaeological remains in the alluvial soils.

The features identified in the eastern and northern section of the field will be subject to impact by the proposed FRS measure and compound (Figure 13.11). The Kilgobbin flood relief measure and compound are considered to be an area of archaeological potential (AP1).

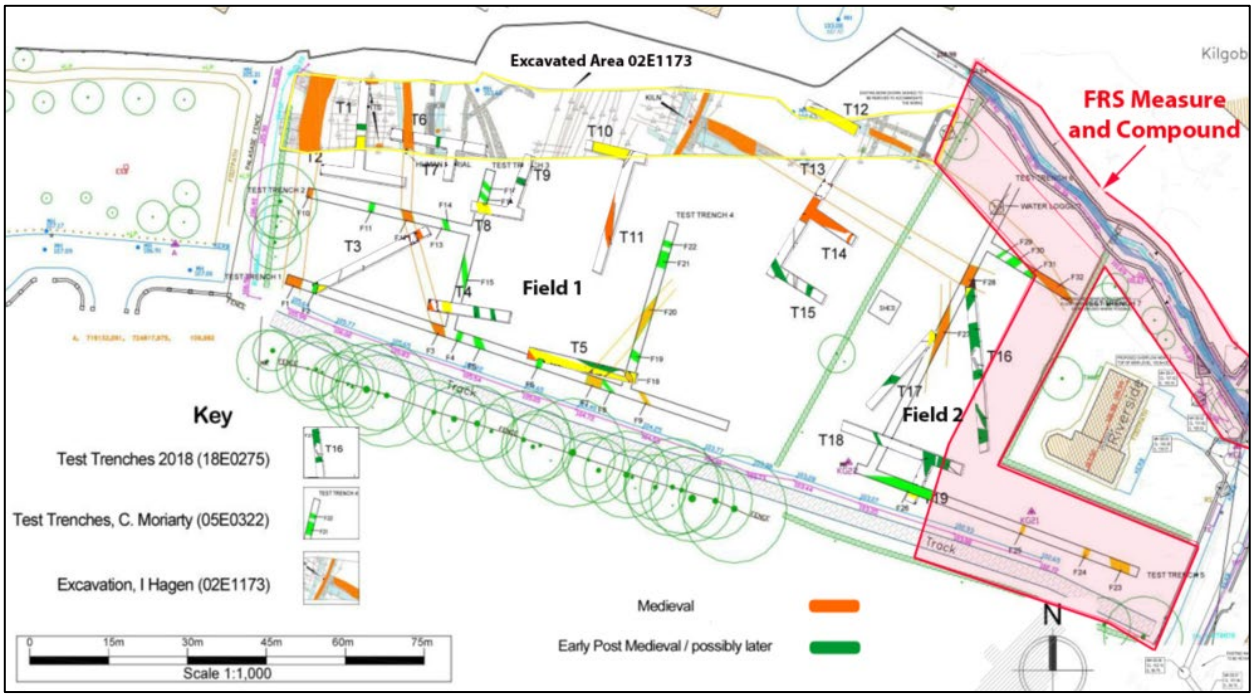

Figure 13.11: Archaeological investigations within the vicinity of the Kilgobbin FRS measure, the measure and the proposed compound are highlighted

Glenamuck Road North Roundabout, Ballyogan Grove, Castle View, and Priorsland

There have been extensive archaeological investigations in the vicinity of the Glenamuck Road North Roundabout measure associated with motorways, light rail and waterworks (Figure 13.12).

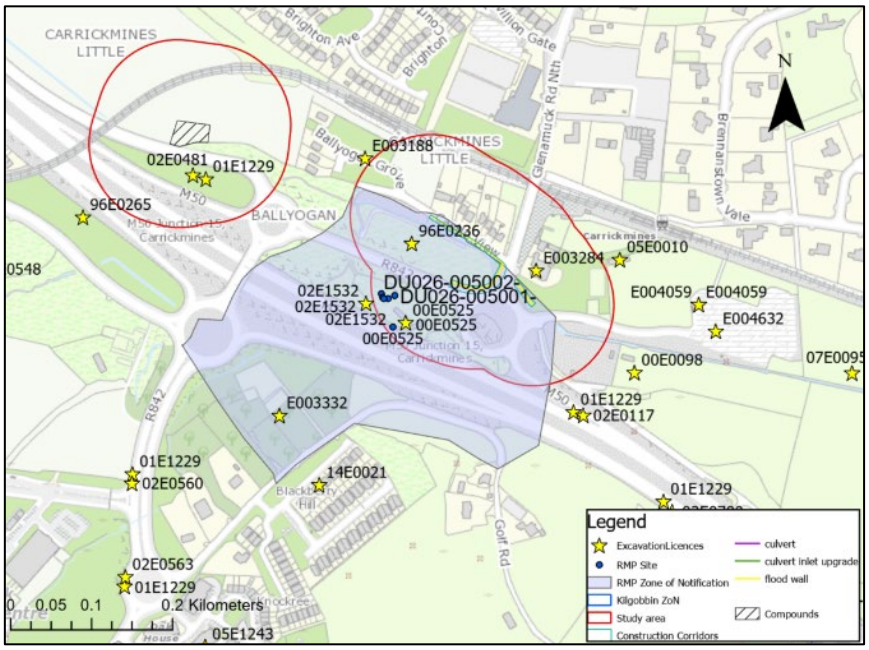

Figure 13.12 Archaeological investigations within 100m of the Glenamuck Road North Roundabout FRS Measure

Excavations at Carrickmines Castle (DU026-005) in advance of the South Eastern Motorway (SEM) revealed a medieval landscape (Licence no.: 00E525, 02E1532, NRA 2018[123]). The excavated remains included a thirteenth century moated site with a substantial stone building, that was defended by a broad ditch. The centre of settlement, which was outside the limit of excavation, was a fortified stone castle. Only the gatehouse and a section of a revetted stone fosse and curtain wall with mural tower remains standing of Carrickmines Castle and bawn (DU026-005002-), it is located between the M50 motorway and Glenamuck Road North. Additional enclosures, causeways and stone structures were added in the late fourteenth century, when Carrickmines formed part of the fortalice system of defences at the edge of the Pale. The investigations uncovered a horizontal water-mill, a pair of corn-drying kilns, house sites, industrial features, the main castle entrance, and a medieval village. A series of ditches including a double fosse / double bank to the northwest of the castle and a stone-revetted fosse to the southeast (RMP DU026-005002, DU026-005003), as well as a millpond associated with a documented mill site (RMP DU026-005004), evidence of a ringwork castle (SMR DU026-005005), a kiln and wells and (00E0525; Excavations ref.: 2000:0216, 2001:335, 2002:0479). Other discoveries included three small boulders containing cup-marks (SMR DU026-145, DU026-146). The archaeological excavations also uncovered two mass graves and associated individual burials, which produced a total of eighteen to nineteen individuals. These skeletal remains probably correspond to the recorded massacre at the castle, on the 27th March 1642.

[123] National Roads Authority. (2018, October 18). Archaeological excavation report, 00E525 and 02E1532 Carrickmines Sites 16 to 20 Vol 1, County Dublin. Digital Repository of Ireland; Transport Infrastructure Ireland (TII). https://doi.org/10.7486/DRI.f762gz55m-1

National Roads Authority. Archaeological excavation report, 00E525 and 02E1532 Carrickmines Sites 16 to 20 Vol 4, County Dublin.. Text [Type]. Digital Repository of Ireland (2018) [Publisher]. Transport Infrastructure Ireland (TII) [Depositor]. https://doi.org/10.7486/DRI.f475g271x (Accessed: 2024/09/29)

Archaeological monitoring of the SEM (Conboy 2001, 01E1129[124]) revealed a burnt spread (02E0481, Breen 2002[125]) south of the proposed FRS compound area.

As only the wayleave area of the SEM was investigated there is a possibility that further material associated with the medieval settlement at Carrickmines may lie beyond it. The final excavation report illustrates the areas that were excavated, unexcavated and preserved in situ (Figure 13.13). The flood measure comprising a flood wall is located northeast of the roundabout, it runs north of the river on castle view and wraps around to the R842.

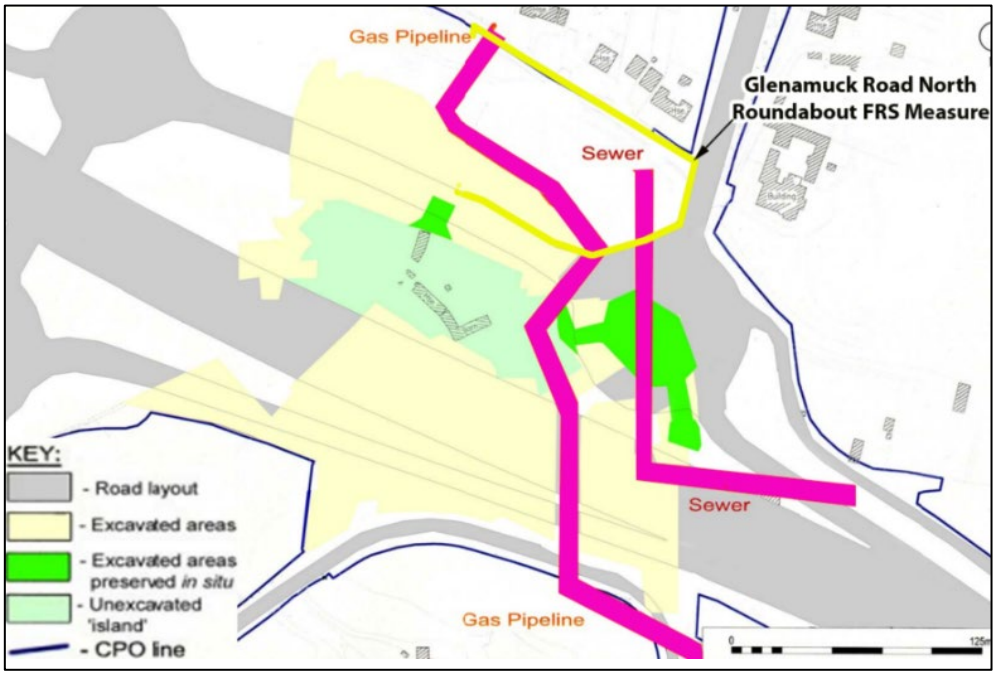

Figure 13.13 Extract from the Carrickmines excavation report showing the areas that were excavated, preserved in-situ and unexcavated (after Conboy 2001). The FRS measure is also indicated.

The unexcavated area overlaid on the proposed FRS measure indicates that this area has yet to be excavated (Figure 13.14), this area was most likely used for the deposition of spoil or soil as the area is very rough underfoot. In addition, the foul sewer extended parallel to Castle view and was also laid to depth of 2.5m (this was not indicated in the above map). Whilst there was a substantial amount of disturbance associated with the motorway, gas pipeline and foul sewer, there is a potential that the localised works required for the FRS measure will impact on previously unknown features associated with the Carrickmines Castle complex, all works in this area are considered to be of archaeological potential.

[124] Conboy, G. 2001. Final Archaeological Monitoring of topsoil Stripping for the South Eastern Motorway, County Dublin. 01E1229. Unpublished report for VJK.

[125] Breen, T.C. 2002. 'Ballyogan, Site 70, South-Eastern Motorway, Dublin'. Unpublished report for VJK

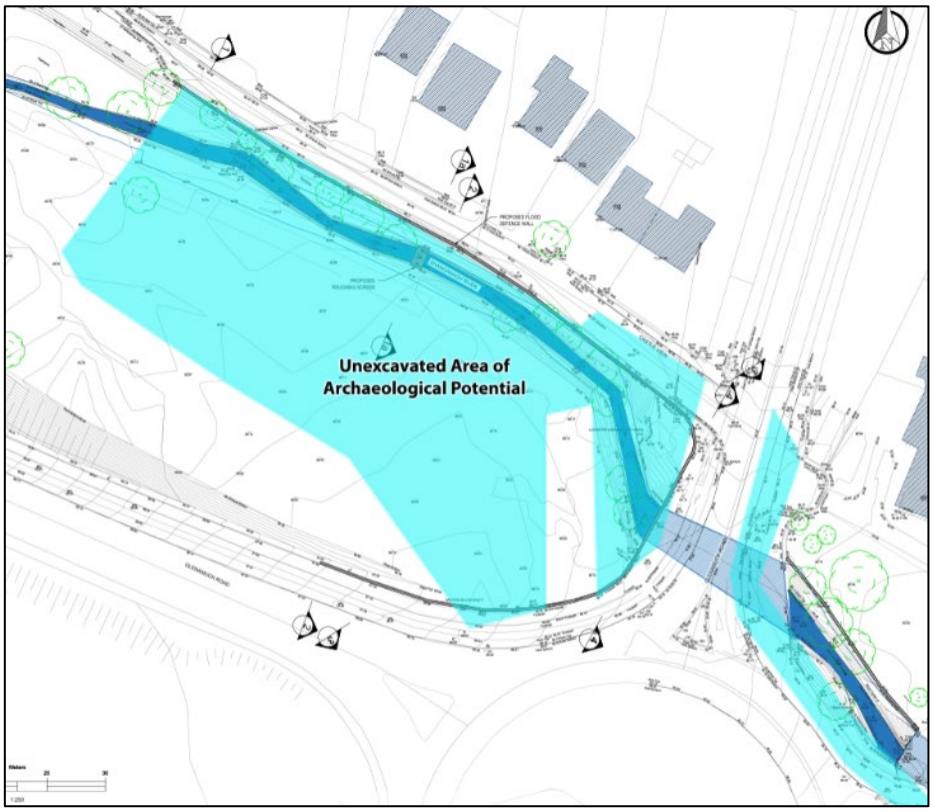

Figure 13.14 Unexcavated areas associated with the Carrickmines Complex that is unexcavated in the vicinity of the FRS Measure

Other investigations at Carrickmines have revealed areas of burning and a stone drain (Licence no.: 96E0236; Connolly 1996[126]) as part of the Carrickmines-Shanganagh Main Drainage Scheme.

Archaeological testing at Priorsland, revealed one posthole and two prehistoric finds (Licence no.: 05E0010; Cryerhall 2005b[127]). Further testing revealed cut features with charcoal inclusions and two possible postholes or stakeholes (Ministerial Consent no.: E004059; Clutterbuck 2010[128]). Of relevance to the FRS scheme is the monitoring of groundworks associated with the temporary diversion of a canalised watercourse (the Carrickmines River) for the Luas was conducted in 2008, this ran along the southern boundary of the Priorsland lands (Frazer & Eriksson 2008[129], Ministerial Consent no.: E003284). No in-situ archaeology was identified, however a gilded copper alloy rococo shoe buckle, probably dating from the mid-18th century was found. In addition, an early medieval (8th/9th Century) pit surrounded by stakeholes possible fire pit, stake holes were identified in advance of the Luas Park and ride While the archaeological monitoring of the diversion of the watercourse at Priorsland revealed no archaeological features, a copper alloy buckle of 17th / 18th century date was found. A final phase of monitoring revealed stone-lined drains

[126] Connolly, A. 1996. 'Archaeological Investigation. Carrickmines-Shanganagh Main Drainage Scheme'. Licence no.: 96E0236. Unpublished report: Valerie J. Keeley Ltd.

[127] Cryerhall, A. (2005) Archaeological Assessment Luas Line B1 'Park & Ride' at Carrickmines, Licence:05E0010. Dublin: Unpublished Report, Margaret Gowen & Co. Ltd.

[128] Clutterbuck, R. (2010) Archaeological Test Excavations at Priorsland, Brenanstown, Co. Dublin. Dublin: Unpublished Report, Cultural Resource Development Services Ltd.

[129] Frazer, W.O. and Eriksson, C. (2008) Archaeological Monitoring, Priorsland, Glenamuck Road, Brenanstown townland, Carrickmines, Dublin 18. Ministerial Consent C196. Dublin: Unpublished Report, Margaret Gowen & Co. Ltd.

and a possible fire pit surrounded by a series of eight stakeholes dating to the early medieval period (Ministerial Consent no.: E004059; Dennehy 2013[130]).

Cherrywood Road FRS Measure

No previous archaeological excavations have been carried out within 100m of the Cherrywood Road flood measure.

Lower Brides Glen, Bray Road North and the N11 Overflow Culvert FRS Measure

Pre-development archaeological monitoring identified several previously unknown sites as part of the archaeological investigations carried out in advance of the Cherrywood Science and Technology Park (Figure 13.15), these comprised prehistoric sites such as a ring barrow (DU0206-133), two fulacht fiadh (DU026-142, DU026-141), a prehistoric house site (DU026-125) and an enclosure (DU026-027). These sites demonstrate the archaeological potential of the river valley since the prehistoric period.

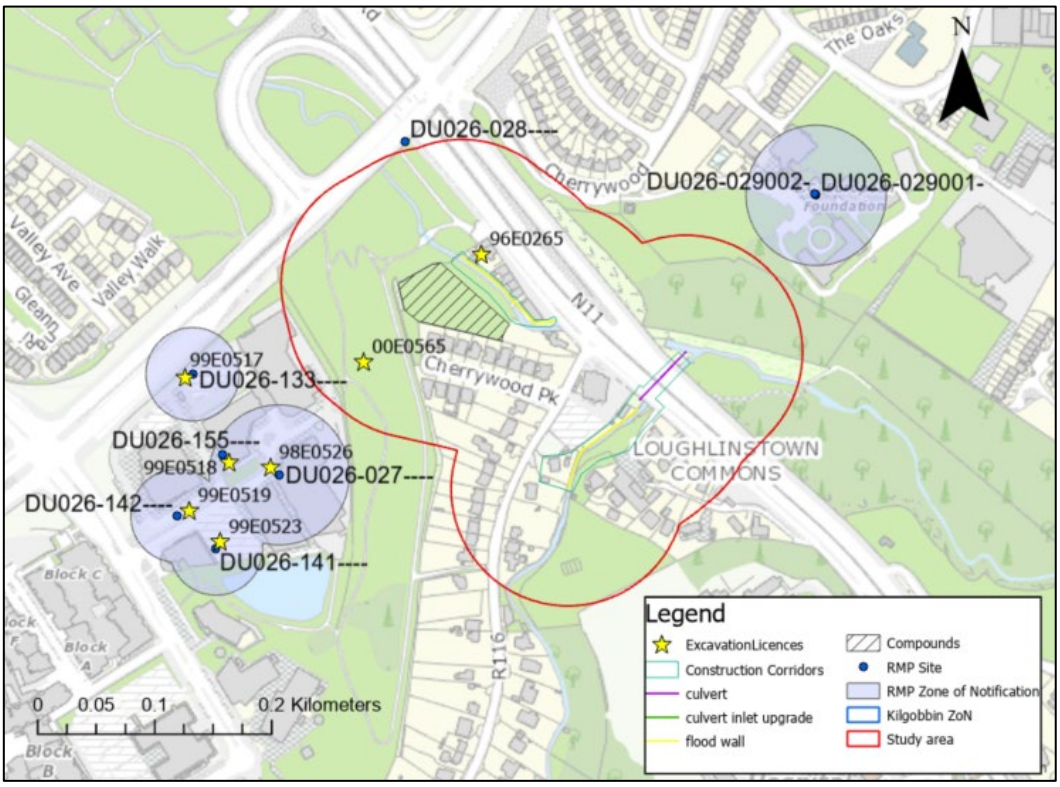

Figure 13.15 Archaeological investigations within 100m of the Lower Brides Glen, Bray Road North and the N11 Overflow Culvert FRS Measure

Archaeological investigations within 100m of the proposed FRS measure included the testing of geophysical anomalies in the parkland area (00E0565, O'Neill[131]) to the east which did not reveal any features of archaeological interest.

[130] Dennehy, E. 2013. 'Archaeological Monitoring and Excavation Report. Priorsland Park & Ride, Brenanstown, Dublin'. Ministerial Consent no.: E004059. Unpublished report: Railway Procurement Agency.

[131] O'Neill, J. 2001. Archaeological Assessment Cherrywood, Park Two, County Dublin. Unpublished Report for Margaret Gowen & Company

As part of the SEM works the subsurface remains of a post-1700 building thought to be an inn site that was converted into a Georgian Style villa was recorded (96E0265, Breen 1996[132]). Given the extensive prehistoric landscape identified in advance of the development of Cherrywood there is a potential that similar features might be identified during earthmoving works associated with the compound and the FRS measure within the river. Based on the findings of the excavations these measures are considered to be in areas of archaeological potential.

Commons Road and Brookdene (Shanganagh Road Bridge) and Bayview FRS Measures

An archaeological assessment was carried out on Mill Lane (07E0033, Lohan 2007[133]) where there is a complex of mill structures, did not reveal any archaeological deposits or features in the test trenches opened.

13.2.5 Archaeological Heritage Sites

There are no national monuments, sites with Preservation Orders or Register of Historic Monuments sites within the study area. The Carrickmines Castle complex (DU026-005001-010, DU026-145 and DU026-146), whilst not designated a national monument, has been treated as such as it is in the ownership of the Local Authority.

There are 16 RMP sites within 100m[134] of the flood relief measures (Table 13.2, Figure 13.16–Figure 13.18); these sites are described in detail in Appendix 13.4, which provides an inventory of the sites. There are no RMP sites within 100m of five of the proposed FRS measures, i.e. the Clon Brugh, the Lower Brides Glen, Bray Road and the N11 Overflow Culvert, and the Bayview measures. There are RMP sites located within 100m of the Belarmine Park, Cherrywood Road, Commons Road and Brookdene flood measures (RMP sites DU026-161, DU026-086001 and DU026-031001 respectively (Table 13.2, Figure 13.16–Figure 13.18, Appendix 13.4). These RMP sites are sufficiently separated from the proposed flood measures by development or by the intervening landscape, and as such, there will be no direct or indirect effects on them. However, the presence of the sites within 100m of the measures indicates the general archaeological potential of the landscape through which the measures run.

The proposed Kilgobbin Road and the Glenamuck Road North Roundabout measures are within the statutory Zone of Notification[135] (ZoN) for settlement complexes associated with Kilgobbin Castle/Village and Carrickmines.

The proposed Kilgobbin Road measure is within the ZoN of the historic settlement of Kilgobbin Village (RMP DU025-017/DU026-121, Figure 13.16), this zone is not shown in the Historic Environment Viewer[136] but is illustrated in the statutory Archaeological Survey of Ireland paper map of Recorded Monuments (and indicated on Figure 13.16) and in the Dun Laoghaire Rathdown Development Plan (2022–2028). The ZoN includes the Kilgobbin Stream. Within the ZoN there are a number of recorded monuments, including Kilgobbin tower house (DU025-017001), a cist site (DU025-017003), a linear earthwork (DU025-121002) and an inn site (DU025-017003). Given their distance to the flood measure none of these individual RMP sites will be subject to direct or indirect effects (Table 13.2). Archaeological investigations within the

[132] Breen, T 1996. Excavation of two sites on the Southeastern Motorway. 96E0265. Unpublished report for VJK.

[133] Lohan, K. 2007. Archaeological Assessment, Mill Lane, Shankill, County Dublin. 07E033. Unpublished report for Margaret Gowen & Co. Ltd.

[134] Measured from the Zone of Notification of the monument.

[135] The zones do not define the exact extent of the monuments but rather are intended to identify them for the purposes of notification under Section 12 of the National Monuments Act (1930-2004): each is referred to as a “zone of notification”.

[136] https://www.archaeology.ie/archaeological-survey-ireland/historic-environment-viewer-application

proposed compound area for the measure however has revealed a substantial medieval and early post-medieval activity associated with the settlement of Kilgobbin (see Section 13.2.4 above).

The linear earthwork, associated with the Pale boundary (RMP DU026-087), is just c.5m from the eastern end of the proposed overflow pipeline for the Kilgobbin flood measure. This section of the boundary may continue along the Kilgobbin Stream, or as suggested by Goodbody cross the field in the vicinity of the pipeline and ran along the line of a private access laneway (to Kilgobbin Cottage) to connect with the linear earthwork at Kilgobbin Castle (DU025-121002). RMP site DU026-121002, is recorded in the Heritage Map Viewer as being located immediately north of the entrance gate of Oldtown House further south of the laneway, it is described in the RMP as follows:

> *Goodbody (1993, 25-32) suggests that the Pale Ditch may have run through Kilgobbin. He indicates that a lane which runs off Kilgobbin road to Kilgobbin cottage was a bank in the early eighteenth century, which followed the line of a Pale ditch which it replaced.*

The RMP location shown does not match the description; the writer confirmed that the site described by Goodbody[137] is located further north at the entrance to Kilgobbin Cottage (Goodbody, Pers. Comm. 2023), which is part of the private laneway through which the proposed overflow pipe will run. Should they survive, the subsurface remains of the pale boundary will interact with the line of the overflow pipeline at some point along the route.

The proposed Glenamuck Road North Roundabout measure is within the ZoN of Carrickmines Castle (Figure 12.15) which also contains numerous recorded archaeological sites (DU026-005001-, DU026-005002-, DU026-005003-, DU026-005004-, DU026-005005-, DU026-145, DU026-146). These individual sites will not be impacted by the flood scheme, they all lie in the area between the M50 and the Glenamuck Road North. The proposed flood measure works will take place within the ZoN, which is an indication that there is a potential that previously unknown subsurface features associated with the Medieval settlement at Carrickmines may be revealed during any earthmoving works for the flood measure. While an extensive amount of excavation has occurred at Carrickmines during the construction of the Southeastern Motorway and for the Glenamuck Road roundabout, there are pockets of areas that have not been excavated, that contain archaeological features preserved in situ or are upstanding sites (see Section 13.2.4 above).

Table 13.2: RMP sites in the study area

RMP / SMR no.	Class	Townland	ITM E	ITM N	FRS Measure
DU026-161----	Burnt mound	Kilgobbin	718936	724926	Approx. 47m to the west of the Belarmine Park measure
ZoN of Kilgobbin Village DU025-017/DU026-121					
DU025-017001-	Castle - tower house	Kilgobbin	719218	724746	The ZoN of the castle site includes the corner of the proposed compound area for the Kilgobbin Road measure. The castle structure is c.50m to the southeast of the measure to the rear of two properties and in a separate field.
DU025-017002-	Inn	Kilgobbin	719230	724587	The inn site is c.140m southwest of the proposed compound for the Kilgobbin Road measure

[137] Goodbody, R. 1993 On the borders of the Pale. A history of Kilgobbin, Stepaside and the Sandyford area. Bray. Pale Publishing

RMP / SMR no.	Class	Townland	ITM E	ITM N	FRS Measure
DU025-017003-	Cist	Kilgobbin	719265	724689	Approx. 52m southeast of the proposed compound for the Kilgobbin Road measure
DU026-087----	Linear earthwork	Kilgobbin	719658	724606	The terminus of the recorded earthwork is c.5 m from the proposed overflow pipeline associated with the Kilgobbin Road measure. There is a potential that the line of the earthwork crosses the proposed overflow pipeline at some point along its length.
DU026-121002-	Linear earthwork	Kilgobbin	719281	724676	The RMP location for this site is 70m from the Kilgobbin Road measure, however it is likely that the site is at the entrance to the private laneway where the proposed overflow pipe will run.
ZoN of Carrickmines Castle					
DU026-005001-	Castle - unclassified	Carrickmines Great	721785	724107	Approx. 70m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-005002-	Bawn	Carrickmines Great	721769	724109	Approx. 84m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-005003-	Fortification	Carrickmines Great	721770	724105	Approx. 83m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-005004-	Mill - unclassified	Carrickmines Great	721772	724103	Approx. 81m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-005005-	Enclosure	Carrickmines Great	721777	724103	Approx. 77m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-145----	Rock art	Carrickmines Great	721783	724068	Approx. 83m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-146----	Rock art	Carrickmines Great	721783	724068	Approx. 83m southwest of the Glenamuck Road North Measure and south of the Glenamuck Road North
DU026-086001-	Mill - fulling	Cherrywood, Shankill	724083	722581	Approx. 30m southwest of the Cherrywood Road Measure. There will be no impact on the site.
DU026-031001-	Castle - tower house	Shanganagh	725226	722846	Approx. 84m south of the Commons Road and Brookdene

RMP / SMR no.	Class	Townland	ITM E	ITM N	FRS Measure
					Measure there will be no impact on this site
DU026-031002-	Water mill - unclassified	Shanganagh	725224	722847	Approx. 84m south of the Commons Road and Brookdene Measure

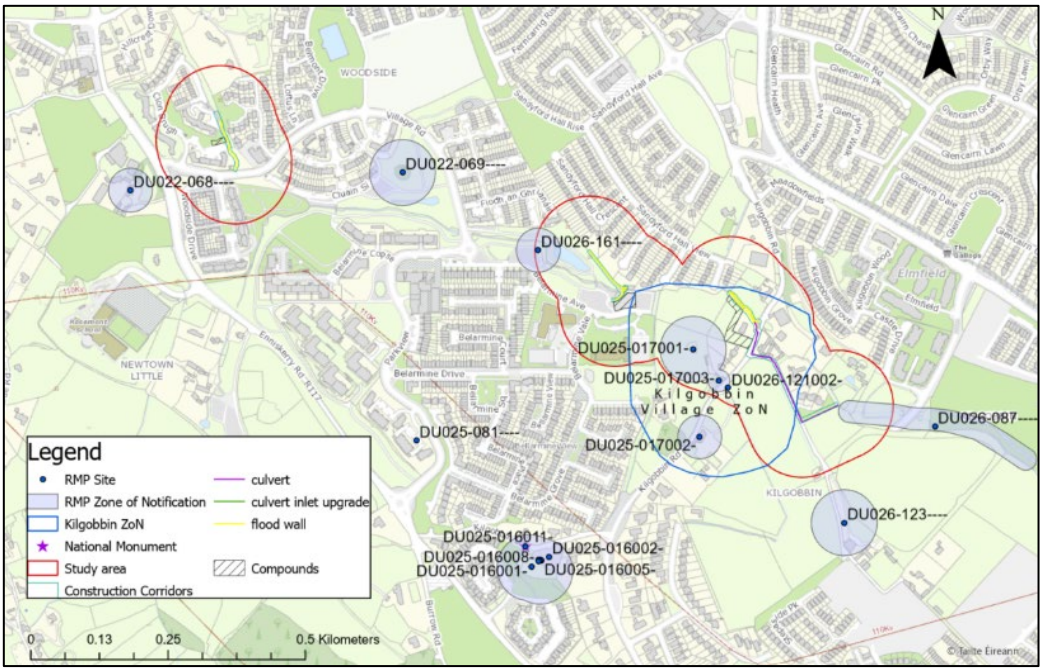

Figure 13.16: RMP sites within 100m of the Study Area (Clon Brugh, Belarmine Park Kilgobbin Road FRS Measures)

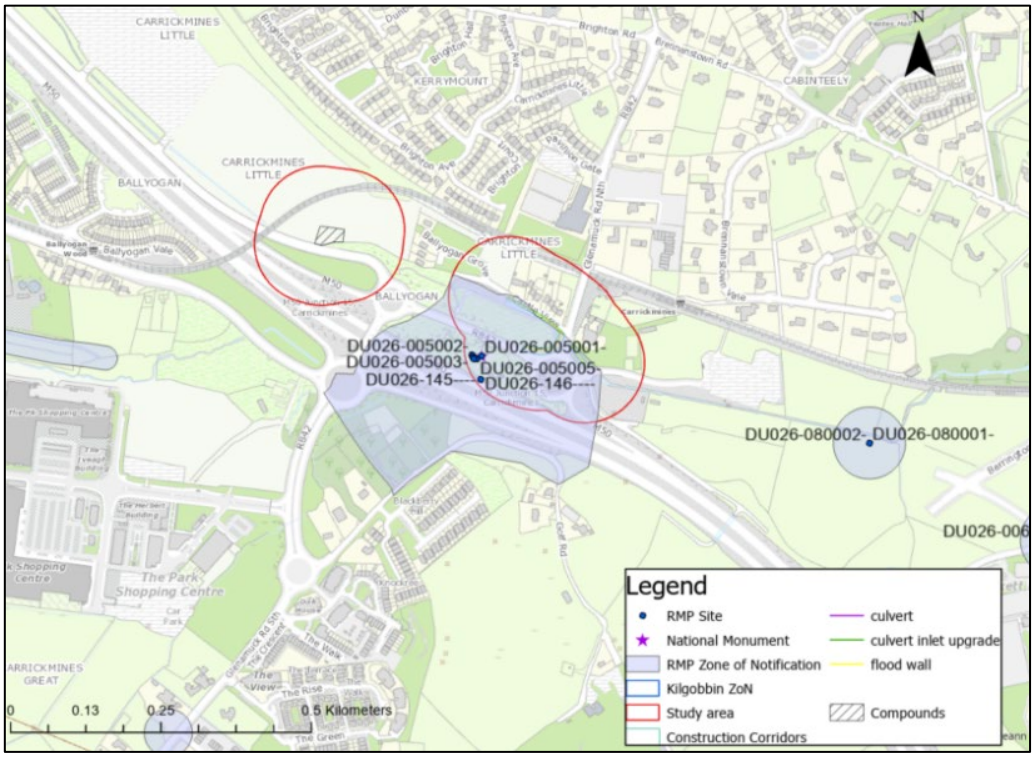

Figure 13.17: RMP sites within 100m of the Study Area (Glenamuck Road North Roundabout, Ballyogan Grove, Castle View, and Priorsland FRS Measure and Compound)

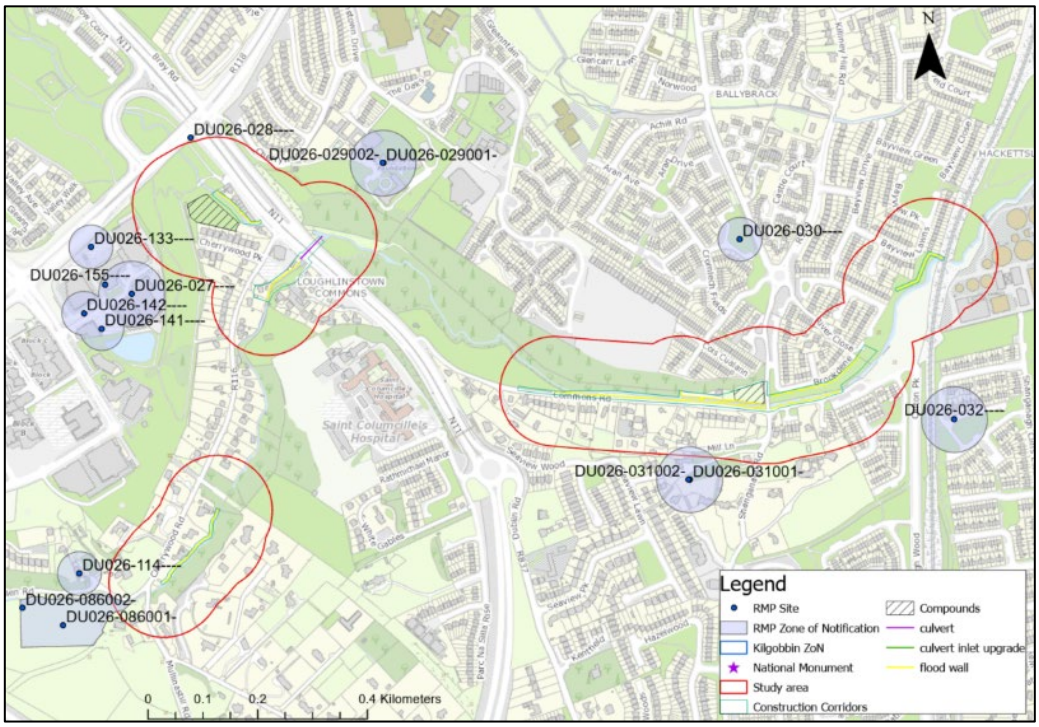

Figure 13.18: RMP sites within 100m of the Study Area (Cherrywood Road, Lower Brides Glen Bray Road – N11 Overflow Culvert, Bray Road North, Commons Road and Brookdene (Shanganagh Road Bridge) and Bayview measures)

There are no wrecks recorded from the study area in the Wreck Viewer hosted by the National Monuments Service at www.archaeology.ie.

13.2.6 Architectural Heritage Sites

Architectural Conservation Area

There are no Architectural Heritage Conservation Areas within the cultural heritage study area.

Record of Protected Structures and NIAH Surveys

No protected structures in the Record of Protected Structures (RPS) are located within 100m of the Clon Brugh, Belarmine Park, Glenamuck North Road Roundabout, N11 Overflow Culvert measures or Bayview Measures. There are 20 RPS sites within 100m of the proposed flood relief measures. All except five of the sites are also recorded in the National Inventory of Architectural Heritage (NIAH). There is also one NIAH site that is not designated a protected structure (Table 13.3). These sites are described in detail in the Architectural Heritage Inventory Appendix 13.4.3.

Of the 20 structures within 100m of the measures, there are five RPS sites/their curtilage that will be subject impacts associated with the flood relief measures; the Kilgobbin Measure will have an effect on the boundary wall associated with Kilgobbin House (RPS 1684), the Glenamuck Road North Roundabout measure is within Priorsland House (RPS1746), the Lower Brides Glen measure will have an effect on the riverside boundary wall associated with Waterfall Cottage (RPS 1770), and the Commons Road Brookdene flood measure will effect Shanganagh Bridge and site of a ford (RPS 1772 and 1773) (Figure 13.19–Figure 13.21).

The remaining sites are located within defined property boundaries with enclosed settings having little interaction with the landscape surrounding them or are well removed from the measures and will not be subject to impact.

Table 13.3: RPS and NIAH structures within 100m of a flood measure

RPS ref.	NIAH ref.	Name	Site type	Address	FRS Measure
1684	60260003	Kilgobbin House	House	719351, 724844	The southwestern boundary wall of Kilgobbin House is part of the Kilgobbin flood measure
-	60260004	Milestone/ milepost	Milestone/ milepost	719375, 724863	Approx. 71m north of the Kilgobbin flood measure
1688	60260008	Kilgobbin Villa	House	719340, 724748	The overflow pipe associated with the Kilgobbin flood measure runs immediately outside the property boundary walls to the east and also south along a private laneway
1689	60260002	Thornberry	House	719292, 724739	The property is located immediately to the south of the Kilgobbin flood measure compound and is c 12m from the proposed overflow waterpipe which runs through the Kilgobbin Road.
1690	60260001	Castle Lodge	House	719270, 724714	Approx. 46m northeast of the Kilgobbin flood measure proposed water overflow pipe on the Kilgobbin Road
2061	60260006	Greenfield House	House	719509, 724723	Approx. 83m northeast of the Kilgobbin flood measure proposed water overflow pipe on the Kilgobbin Road
N/a	60260228	Glenamuck Road	Water pump	721907, 724165	Approx. 5m north of the Glenamuck Road North Roundabout Measure on the opposite of Castle View Road.
1746	60260234	Priorsland	House, Out Offices and Gates	721969, 724152	The southern property of boundary of Priorsland House is part of the Glenamuck Road North Roundabout Measure
1743	60260232	Station House (Former Carrickmines Railway Station)	Railway Station (former) House	721987, 724221	Approx. 98m north of the Glenamuck Road North Roundabout Measure
1783	60260097	Cherrywood Viaduct	Viaduct	724333, 722847	Approx. 57m from the Cherrywood Road flood measure
1788	60260096	Cherrywood House	House	724200, 722676	Approx.58m from the Cherrywood Road flood measure
1791	60260094	Mullinastill House	House	724219, 722592	Approx. 76m from the Cherrywood Road flood measure
1770	N/a	Waterfall Cottage	Thatched Dwelling	724444, 723194	The eastern riverside boundary of the property is part of the Lower Brides Glen flood measure

RPS ref.	NIAH ref.	Name	Site type	Address	FRS Measure
1776	60260127	Mill House	House	725220, 722923	Approx. 66m to the south of the Commons Road and Brookdene flood measure
1780	N/a	Corn Kiln	Corn Kiln	725225, 722895	Approx. 94m south of the Commons Road and Brookdene flood measure
1788	N/a	Mill	1847 Mill	725225, 722895	Approx. 94m south of the Commons Road and Brookdene flood measure
1779	N/a	Mill Pond	Millpond	725225, 722895	Approx. 94m south of the Commons Road and Brookdene flood measure
1978	60260125	Beechlands	Gate Lodge (Exterior Only)	725331, 722885	Approx. 90m south of the Commons Road and Brookdene flood measure
1772	60260118	Shanganagh Bridge (Over River)	Bridge over Loughlinstown River	725369, 722980	Within the Commons Road and Brookdene flood measure
1773	N/a	Ford	Ford (site of) in Shanganagh River	725377, 722980	Within the Commons Road and Brookdene flood measure

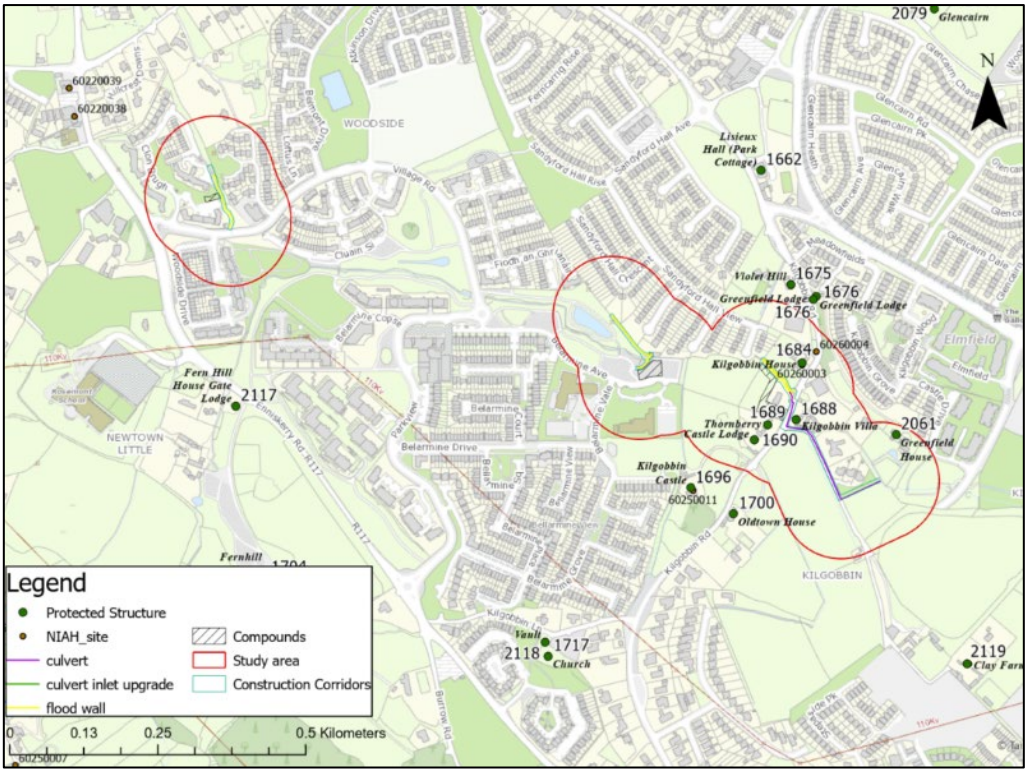

Figure 13.19: Protected Structures within 100m of the Study Area (Clon Brugh, Belarmine Park, Kilgobbin Road Measures)

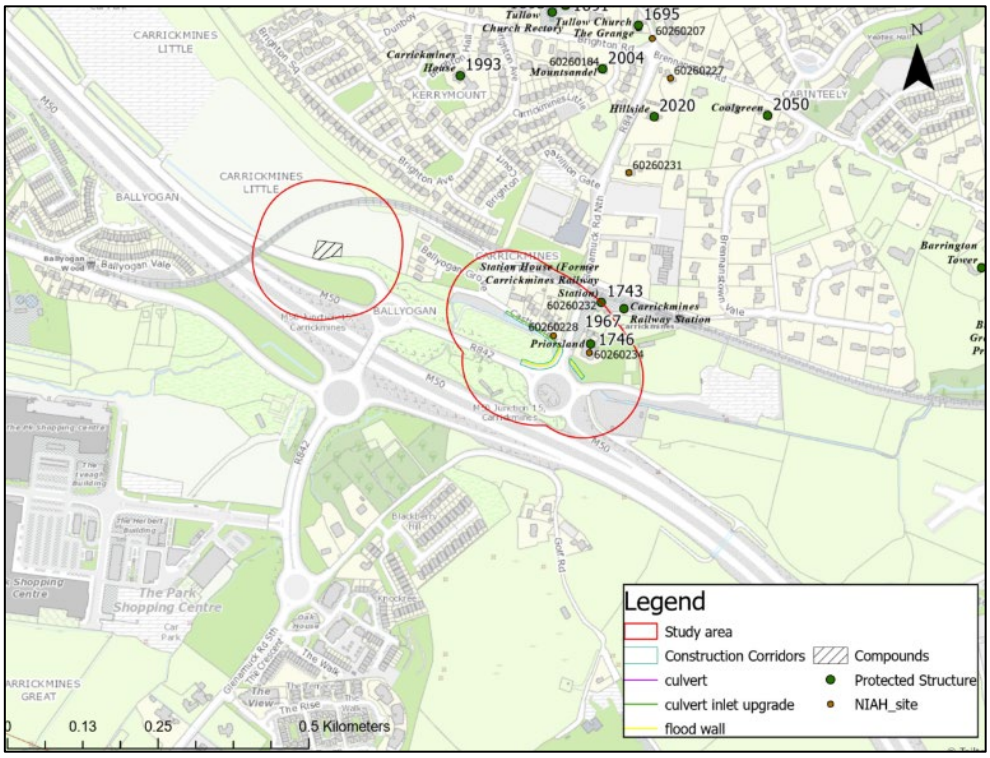

Figure 13.20: Protected Structures within 100m of the Study Area (Glenamuck Road North Roundabout, Ballyogan Grove, Castle View, and Priorsland Measure and Compound)

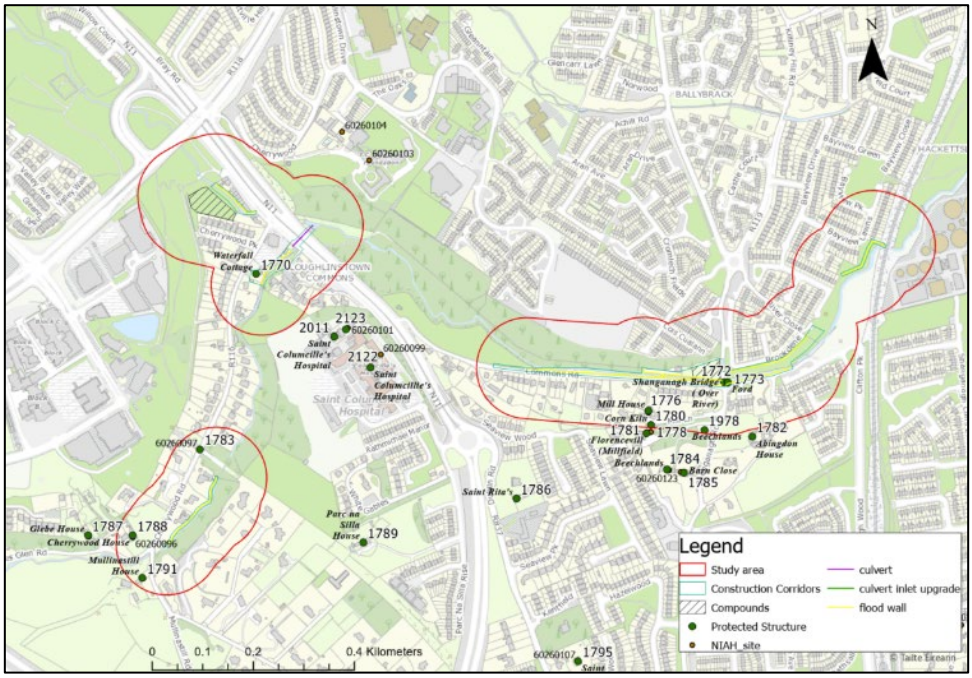

Figure 13.21: Protected Structures within 100m of the Study Area (Cherrywood Road, Lower Brides Glen Bray Road – N11 Overflow Culvert Bray Road North Commons Road and Brookdene (Shanganagh Road Bridge) and Bayview measures

13.2.7 Undesignated Cultural Heritage Sites and Areas of Archaeological Potential

A review of cartographic sources and a field inspection of the FRS measures identified a number of undesignated cultural heritage sites (CH) which lie within or adjacent to the flood relief measures (Table 13.4, Figure 13.22–Figure 13.24). These features mostly comprise rubble stone field and boundary walls, bridges. Several of the CH sites were also captured by the underwater archaeological assessment the UAIA (13.2.8). A full description of each feature is provided in an inventory in Appendix 13.4.4.

No additional CH sites were identified in the Clon Brugh measure and Cherrywood Road the Bayview Measure.

Table 13.4: Undesignated Cultural Heritage Sites

CH ID	Other designations	Type	Location	ITM E, N	FRS Measure
CH1	RPS Ref: 1684	Kilgobbin House Boundary Wall	Kilgobbin Road, Kilgobbin	719331; 724796	The Kilgobbin flood measure incorporates the river side property boundary wall, this wall curves around the property.
CH2	ADCO 10 in the UAIA report	Retaining river wall at Kilgobbin Stream	Kilgobbin Road, Kilgobbin	719337, 724787	The Kilgobbin flood measure incorporates the river wall
CH3	ADCO 10 in the UAIA report	Granite slab spanning Kilgobbin Stream	Kilgobbin Road, Kilgobbin	719331, 724794	The Kilgobbin flood measure incorporates the saddle block
CH4	N/a	Access ramp Kilgobbin Stream	Kilgobbin Road, Kilgobbin	719334, 724793	The Kilgobbin flood measure incorporates the access ramp
CH5	U44 in the UAIA report	Kilgobbin Stream Road Bridge	Kilgobbin Road, Kilgobbin	719336, 724787	The Kilgobbin flood measure incorporates bridge structure
CH6	N/a	Field boundary wall and stile	Kilgobbin Road, Kilgobbin	719320, 224755	The site compound is located in the field
CH7	RPS Ref: 1688	Kilgobbin Villa eastern and southern boundary wall and jostle stone (RPS 1688) defining north side of the private laneway to Kilgobbin Cottage	Kilgobbin Road Kilgobbin	719326, 724737	The Kilgobbin pipeline measure will run in the vicinity of the of the wall but will not impact it
CH8	N/a	Field boundary wall defining the southern boundary of the private laneway to Kilgobbin Cottage	Kilgobbin Road Kilgobbin	719354, 724726	The Kilgobbin pipeline measure will run in the vicinity of the of the wall but will not impact it
CH9	N/a	River wall forming the southern wall on Castle View	Castle View, Carrickmines Little	721878, 724174	The Glenamuck North Roundabout measure incorporates the river wall
CH10	ADCO 6	Arched boundary wall and gate	Beechwood, Loughlinstown	724358, 723372	Part of the Bray Link Road North Measure
CH11	RPS Ref: 1770	Waterfall Cottage river retaining wall	Loughlinstown/ Loughlinstown Commons	724458, 723189	Part of the Lower Brides Glen Measure

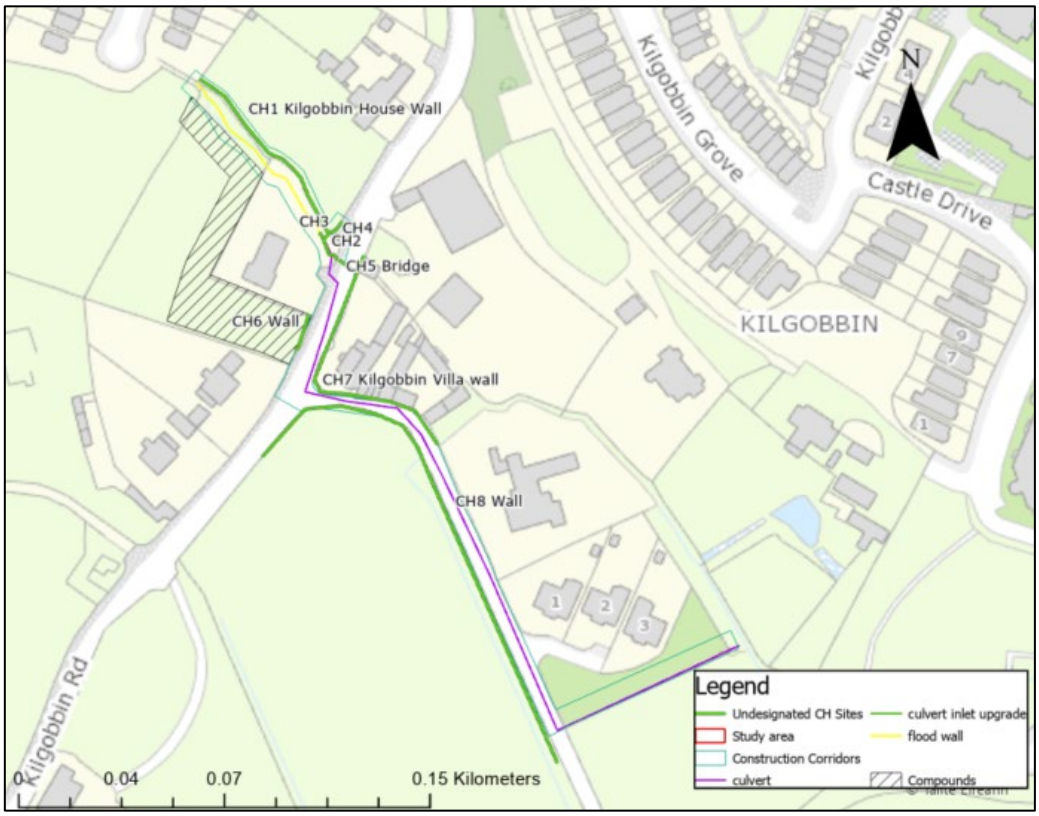

Figure 13.22: Cultural Heritage sites in the vicinity of the Kilgobbin Road Measure (CH1-CH8)

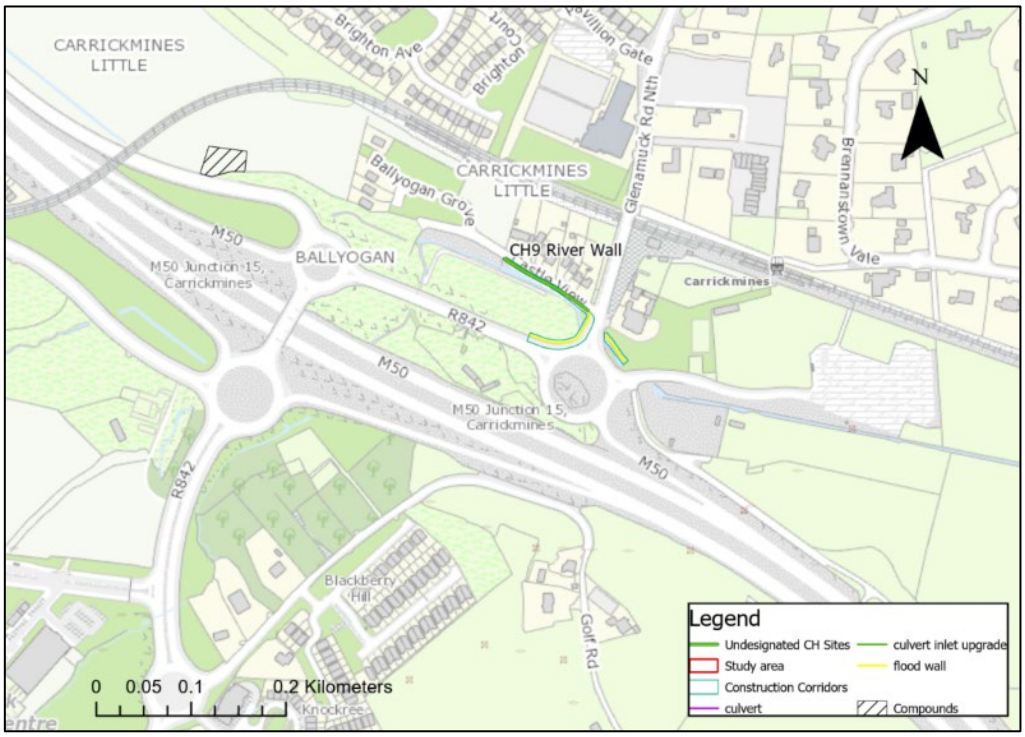

Figure 13.23: Cultural Heritage sites in the vicinity of the Kilgobbin Road Measure (CH9)

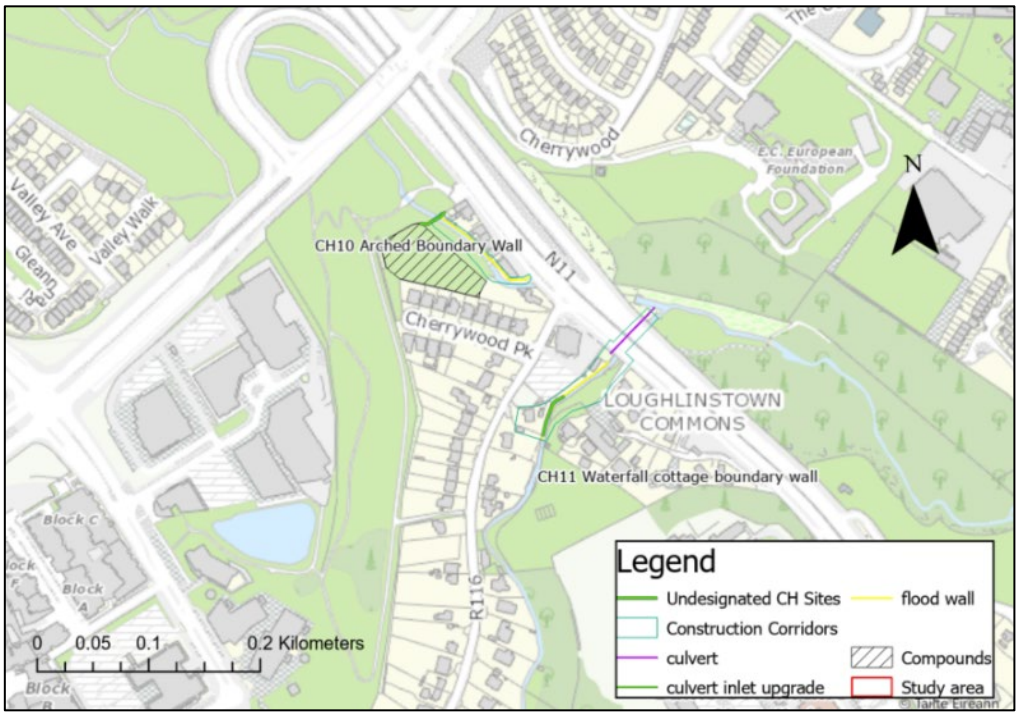

Figure 13.24: Cultural Heritage sites in the vicinity of the Kilgobbin Road Measure (CH10 and CH11)

Cultural Heritage Character Area

The Kilgobbin flood relief measure is within an area that possesses a distinctive cultural heritage character centred around Kilgobbin Road Bridge and Kilgobbin Castle, incorporating many cultural heritage features (CH1–CH8). While these collectively are not specific to any legal designation they support and provide historic context to protected structures in their vicinity (i.e. Kilgobbin House, Kilgobbin Villa and the protected structures on the approach to and from Kilgobbin). Special consideration was given to this area as part of the designed-in mitigation measures.

13.2.8 Underwater Archaeological Assessment

Introduction

An underwater archaeological impact assessment (UAIA) which included a wade (visual inspection) and metal detection survey of the Shanganagh River (Commons Road and Brookdene Measure), the Loughlinstown River North and South/Bride's Glen (Bray Link Road North and Lower Brides Glen and N11 measure, Carrickmines River (Glenamuck Road North Roundabout) and the Kilgobbin Stream (Kilgobbin Measure) was carried out by ADCO in August 2024, under licence to the National Monuments Service (NMS) DHLGH under Dive Licence Ref. No: 24D0214, and metal detection licence no. 24R0337.

A summary of the results of the survey areas are provided as follows and the full UAIA report is provided in Appendix 13.5.

Wade Survey Area 1 – Shanganagh River: Commons Road and Brookdene and Bayview flood measure

The UAIA of Shanganagh river completed a detailed measured and laser survey of Shanganagh Bridge (RPS 1772) providing a full baseline record of the bridge in Appendix 13.5. The bridge comprises three-arched stone-built road bridge that carries the Shanganagh Road over the river. There are Larsen piles along the right bank downstream of the bridge, while a low earthen bank that has dense overgrowth established forms the left bank. Upstream of the bridge, both banks retain series of concrete retaining slabs, and only give way to earthen banks some 100m upstream of the bridge. A floodplain extends 10-20m wide on the left bank, from where the ground rises and meets a stone boundary wall that appears to serve as the

townland boundary between Loughlinstown Commons (in the valley bottom) and Loughlinstown. The floodplain is overgrown with dense tree cover.

A footbridge crossing the river recorded on the 1910 historic OS maps has been replaced. Apart from Shanganagh Bridge, no archaeological features were observed in the survey, there was also no indication of an earlier fording point across the river (RPS 1773). Metal-detection within the river channel encountered modern debris, much of which is exposed on the riverbed surface.

Wade Survey Area 2 - Loughlinstown River: Bray Road North and N11 overflow culvert flood measure

The Loughlinstown River, also known as Bride's Glen River, flows in from the south and is referred to as Loughlinstown River South, while a stream flowing in from the north is referred to as the Loughlinstown River North or Carrickmines Stream. Both streams converge to the east of the N11 Dual Carriageway and continue as the Shanganagh River to the sea.

Lower Brides Glen and N11 Culvert Measure

Loughlinstown River South is a narrow channel with a flat stoney bed. To the west of the N11 Dual Carriageway, the upstream limit of the UAIA study area included a thatched house, Waterfall Cottage, which is a protected structure (RPS 1770). Several features on the riverbank (comprising a rubble granite river wall, stepped access to the river) were recorded in the UAIA and are part the curtilage of the protected structure. A footbridge crosses the river downstream of Waterfall Cottage and is recorded on historic OS mapping since the First Edition 6-inch series *c.* 1840. The footbridge (Ref: U182) gives access to a stone cottage that still stands (ADCO1).

The Loughlinstown River North flows east under the N11. The masonry bridge, 'Loughlinstown Bridge' that supported the pre-existing road survives as a well-built construction (ADCO 9). Construction of the Dual Carriageway added a reinforced concrete element to the east.

Metal-detection within the river channel encountered a small number of modern debris that gathers close to the bridge. Nothing of an archaeological interest was identified during the survey.

Bray Road North Measure

Loughlinstown River North is a narrow channel with a flat stoney bed. Historic mapping records two weir features and a footbridge in the channel which are no longer present. The river is canalised in this location until it passes behind the row of former houses that now serve as commercial premises. At this point, the riverbanks have a granite-built stone retaining wall that extends up- and downstream (ADCO Ref 4 and 5) of a stone arch constructed across the channel (ADCO Ref 6, also CH10). The arch is part of the northmost boundary wall that formerly enclosed the complex of buildings and the land area to the west of the channel. The channel is much overgrown. The left bank is furnished with ad hoc retaining walls associated with each premises. The right bank continues to show a granite-built retaining wall (ADCO 7) that reaches downstream and includes the riverbank element of the former Smithy recorded on the historic Ordnance Survey 25-inch map series (ADCO 8).

Metal-detection within the river channel encountered modern debris throughout and high concentrations of debris is noted behind the commercial premises. Metal-detection within the river channels east of the Dual Carriageway did not register material other than modern bottle caps and drinks cans.

Wade Survey Area 3 Carrickmines River – Glenamuck Road North measure

Assessment of a short stretch of the Carrickmines River that runs along the north end of the Zone of Archaeological Potential associated with the site of Carrickmines Castle did not reveal any features of archaeological interest.

Wade Survey Area 4 Kilgobbin Stream – Kilgobbin Road and Belarmine Park flood measure

Assessment of a short stretch of Kilgobbin Stream that runs north of Kilgobbin Castle confirms the presence of a stone-built bridge (UAIA Ref: U44- also CH5) recorded on historic OS maps that carries the Kilgobbin Road across the stream channel.

Conclusion

The majority of the underwater sites that had not previously been recorded in the SMR, RPS and NIAH were located in the UAIA survey Area 2 associated with the Lower Bridges Glen and N11 Culvert Measure and the Bray North Road measure. Some features lie outside the construction corridor of the proposed measures. All the designated and undesignated features that were identified in the UAIA survey within the rivers or on the river banks are listed in table below (Table 13.5) and their location shown on Figure 13.26–Figure 13.27.

Table 13.5: RPS UAIA sites

UAIA Survey Area	ID	Type	Status	ITM E, N	FRS Measure
Area 1	RPS 1772	Shanganagh Bridge	Upstanding	725369, 722980	Part of the Commons Road and Brookdene Measure
	U185	Footbridge	Not evident	725285, 722989	Part of the Commons Road and Brookdene measure
Area 2	RPS 1770 CH11- river wall	Waterfall Cottage Features associated with Waterfall cottage-river wall and stepped access.	Upstanding	724444, 723194	The Lower Brides Glen measure incorporates the river boundary wall and access steps into the river which are associated with the protected structure
	U182	Footbridge associated with ADCO 1	Upstanding	724511, 723237	Part of the Lower Brides Glen and N11 measure
	ADCO 1	Cottage in ruins on the left bank of the river	Upstanding	724506, 723245	The Lower Brides Glen measure is immediately to the south of the cottage.
	U189	Barell vaulted masonry Bridge on the N11	Upstanding	724523, 723247	Part of the N11 Culvert measure
	ADCO 2	Weir	Not evident	724534, 723263	Part of the N11 Culvert measure
	ADCO 3	Road	Not evident	724584, 723243	Outside of the N11 Culvert measure
	U114	Weir	Not evident	724293, 723413	Outside of Bray Road North Measure
	U115	Footbridge	Replaced	724320, 723398	Outside the Bray Link Road North Measure
	U119	Weir	Not evident	724342, 723382	Outside the Bray Link Road North Measure
	ADCO 4	River wall	Upstanding	724347, 723382	Outside the Bray Link Road North Measure
	ADCO 5	River wall	Upstanding	724349, 723376	Outside the Bray Link Road North Measure
	ADCO 6 (also CH10)	Arch/boundary wall	Upstanding	724358, 723372	Part of the Bray Link Road North Measure
	ADCO 7	River wall	Upstanding	724361, 723368	Part of the Bray Link Road North Measure
	U121	Footbridge	Replaced	724405, 723332	Just outside of the Bray Link Road North Measure
	ADCO 8	Smithy on the right bank of the river	Upstanding	724442, 723304	On the opposite bank of the flood wall at the Bray Link Road North Measure

	ADCO 9	Retaining wall and stone bridge associated with apron Loughlinstown Commons Bridge	Upstanding	724449, 723313	Part of the Bray Link Road North Measure
Area 3	DU026-005---	Carrickmines Castle complex			Part of the Glenamuck Road North Roundabout Measure
	NIAH 60260228	Water pump on Castle view			Part of the Glenamuck Road North Roundabout Measure
Area 4	U44 (also CH5)	Kilgobbin Road Bridge	Upstanding	719337, 724787	The Kilgobbin flood measure is in the immediate vicinity of the bridge structure
	RPS 1688	Kilgobbin Villa, curtilage	Upstanding	719338, 724749	The Kilgobbin flood measure is in the immediate vicinity of the property
	RPS 1684	Kilgobbin House, curtilage	Upstanding	719348, 724843	The Kilgobbin flood measure incorporates the boundary wall of the property
	ADCO 10 (also CH2)	River wall	Upstanding	719330, 724793	The Kilgobbin flood measure incorporates the wall

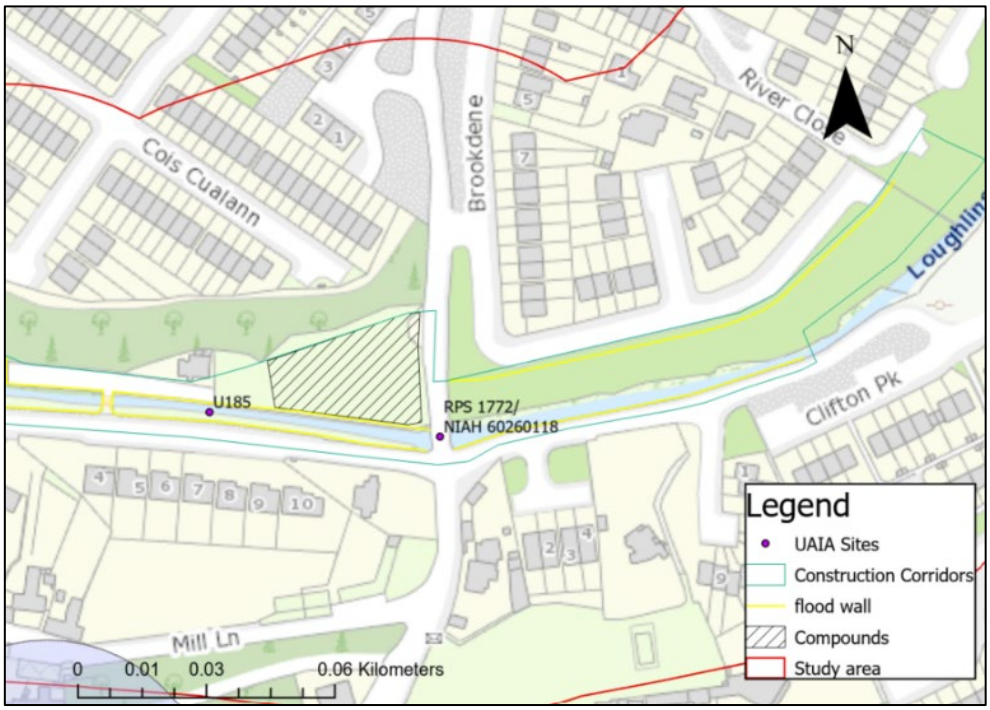

Figure 13.25: Sites recorded during the UAIA Survey Area 1 at the Commons Road and Brookdene Measure

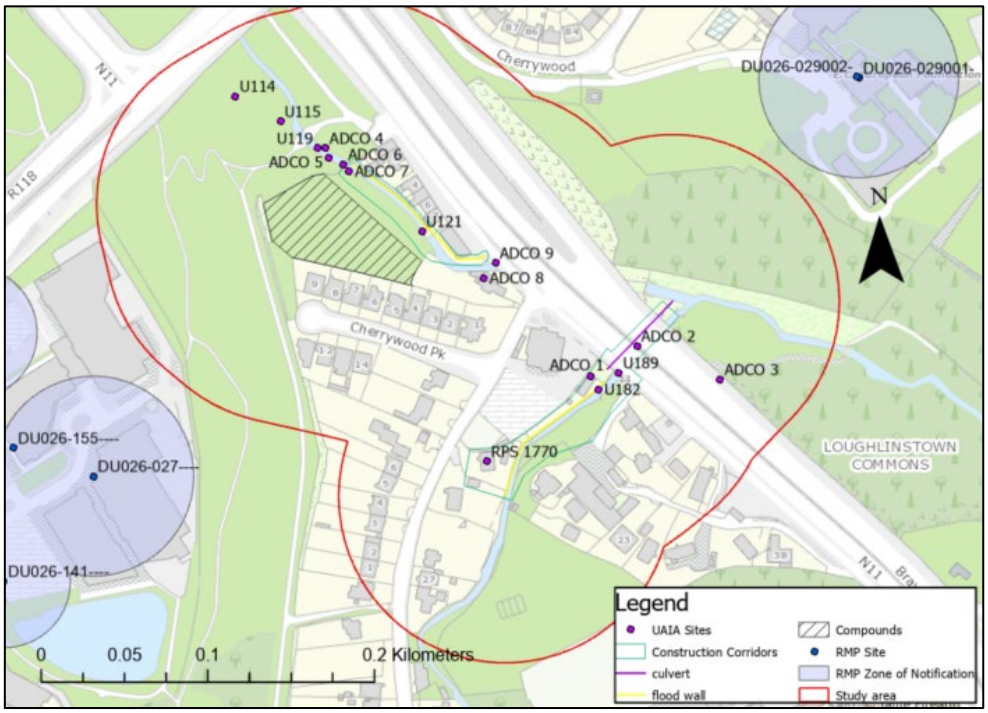

Figure 13.26: Sites recorded during the UAIA Survey Area 2 at the Bride Glen and N11 culvert measure and the Bray Road North Measure

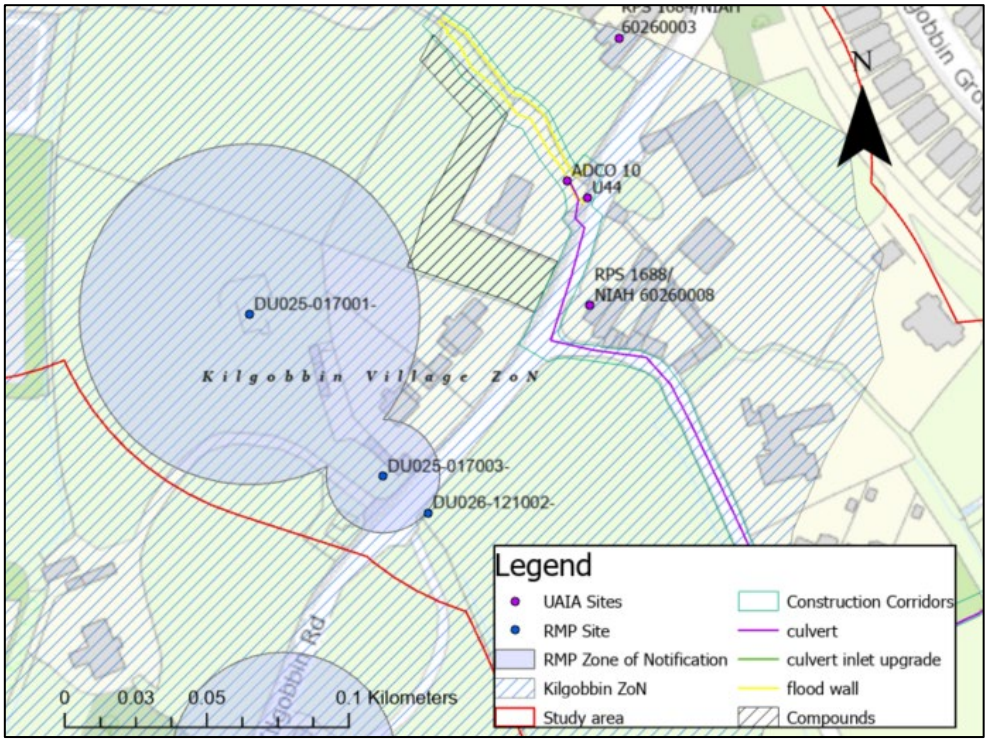

Figure 13.27: Sites recorded during the UAIA Survey Area 3 at the Kilgobbin flood measure

13.2.9 Geophysical Survey

A high-resolution magnetic gradiometry geophysical survey (GS) conducted under Detection Device Consent Licence No. 24R0431, issued by the National Monuments Service (NMS) was carried out 12th and 15th of February 2024 by J.M. Leigh Surveys Ltd. It focused on the proposed compound area located in a greenfield area to the south of the Bride's Glen River and the Bray Road North Measure.

The survey data is dominated by modern magnetic disturbance and ferrous responses (Figure 13.34). This results from modern ground disturbance and material within the topsoil. No responses of archaeological interest could be discerned within the dataset.

Figure 13.28: Summary of the geophysical survey interpretation

The geophysical survey report is provided in Appendix 13.6

13.2.10 Geotechnical Investigation Monitoring

The archaeological monitoring and metal detection of geotechnical investigations was carried in February 2023 under excavation licence No. 22E0794 and detection device No. 22R0382 from the NMS. The works comprised of 71 investigations of which there are 19 cable percussion boreholes (CP), 9 rotary core boreholes (RC), 7 dynamic probes (DP), 19 slit trenches (ST) and 17 trial pits (TP). Due to the small diameter of boreholes (CP, CP/RC and DP investigations) these works were not subject to archaeological monitoring. Out of these works 11 slit trenches and 3 test pits required licenced archaeological monitoring. The TP were on average 0.5m x 2.5m in plan and the max depth was 2.5m. ST were on average 0.5m x 5mx and up to 2.7m deep.

Where the natural ground level was exposed the monitoring of the GI works confirmed the natural ground comprises a blanket of cohesive glacial till (Dublin Boulder Clay). The monitoring took place at the Commons Road and Brookdene, the Belarmine, and N11 FRS measures.

- At Commons Road the trenches were excavated were adjacent the Loughlinstown Stream in the footpaths (2022-ST-020-023). The ground was completely made up, natural ground was not exposed in any of the trenches which were disturbed from the laying of service pipes beneath the footpaths for an average depth of 1.1m. The trenches excavated in the council yard adjacent to the north of Commons Road were excavated adjacent the retaining wall for the Loughlinstown River (2022-IP-20-21). The trenches were 2.5m in average length and were excavated to a depth of 1.8m. Services ran parallel to the retaining wall and the natural ground was completely disturbed from the excavations associated with these services. Natural ground was not exposed as the trench filled with water at a depth of 1.8m.
- At Brookdene, the trenches were excavated in green areas to the north of the housing estate adjacent the river (2022-ST-018-19and 2022-ST-024). A 19th century debris garden soil layer was visible at

0.60m BGL which corresponded to the location of a house and garden visible on the third edition map. Natural boulder clay was exposed at an average depth of 1.40m BGL.
- The GI works at Belarmine were in a landscaped park surrounded by apartments, schools, and houses (2022-TP-002 -003 and 2022-ST-003). The park comprised made up ground which was landscaped. A concrete block was recovered from a depth of 2.40m from the base of 2022 TP 003.
- At the N11 Veterinary Clinic the ground was overgrown and under rough pasture, one GI trench was excavated in this area (2022-TP-012). The uppermost horizon of this boulder clay was also possibly uncovered at the N11 Veterinary Clinic at GI pit 2022-TP-012.

No archaeological stratigraphy or objects were identified during the course of monitoring the above-described works. The full GI monitoring report is provided in Appendix 13.7.

13.3 Characteristics of the Proposed Development

The characteristics of the proposed flood relief scheme are set out in Chapter 3 of this EIAR and are discussed in detail in the assessment of potential impact below.

13.4 Potential Impact of the Proposed Development

The construction phase will have the potential to result in direct negative impacts on cultural heritage receptors, including sub-surface archaeological remains and above ground structures of architectural heritage significance. These potential construction phase impacts on archaeology may arise during ground reduction works or instream works undertaken during elements of the proposed development including but not limited to site investigations, enabling works, services diversion, excavation including services, drainage and hard and soft landscaping, and the provision of a temporary construction compound.

Impacts related to setting include alterations to the environs of built heritage sites. Impacts on the setting of heritage assets describe how the presence of a development changes the surroundings of a heritage asset (archaeological, or cultural heritage sites) in such a way that it affects (positively or negatively) the heritage significance of that asset. Visual impacts are most commonly encountered but other environmental factors such as noise, light or air quality can be relevant in some cases. Such impacts may be encountered at all stages in the life cycle of a development from construction to operational stages.

Following the construction phase, all site compounds and temporary access roads will be demobilised and reinstated in accordance with local authority requirements.

The potential effects of each flood relief measure on heritage assets are set out below in the following order and include their adjacent compound locations:

- Clon Brugh
- Belarmine Park
- Kilgobbin Road
- Glenamuck Road North Roundabout, Ballyogan Grove, Castle View, and Priorsland
- Cherrywood Road
- Lower Brides Glen
- Bray Road North– N11 Overflow Culvert
- Commons Road and Brookdene (Shanganagh Road Bridge)
- Bayview

A glossary of impacts as defined by the EPA (2022) is provided in Appendix 13.3. The assessment has been carried out according to best practice and guidelines relating to archaeological and architectural heritage assessment (Appendix 13.1). A summary table of potential impacts outlined below is presented in Table 13.6.

13.4.1 Clon Brugh FRS Measure

Proposed Development

This measure will include the upgrade of an existing wall and the realignment of an existing wall and footpath within the Clon Brugh housing development. A proposed reinforced concrete flood defence wall c.97m length and up to 1.1m in height will be installed parallel to the existing overland flow path.

Each segment of the flood defence wall will be excavated to the required formation level /foundation depth. The final excavation depth is dependent on the depth of the suitable in-situ bearing stratum. The immediate works area will be used as a site compound. There are no instream works required in this measure.

Archaeological Impacts

There are no RMP sites within 100m of the Clon Brugh measure which is located in a modern residential development. On historic OS mapping, this area comprises undeveloped scrubland. Archaeological monitoring[138] during the development of the residential estate and road to the south did not identify any features of archaeological potential. The proposed works will occur along the line of an existing wall and footpath in an area that has previously been subject to archaeological monitoring as part of the residential development. There will be no in-stream works or works along the banks of the river. This flood relief measure will have **no effect** on archaeological heritage environment.

Built Heritage Impacts

There are no RPS/NIAH sites within 100m of the Clon Brugh measure. There will be **no effect** on built heritage as a result of the construction of the flood measure.

13.4.2 Belarmine Park FRS Measure

Proposed Development

This flood relief measure is within an existing open green space associated with recently constructed housing development of Belarmine in the vicinity of Kilgobbin Stream (Figure 13.29). It includes the upgrade of an existing inlet structure and existing stream channel adjoining the estate at Sandyford Hall. The existing boundary walls (1.7m to 2.5m high) upstream of the existing culvert and adjoining Sandyford Hall will be replaced with a new reinforced concrete flood defence wall of c.96m length and up to 2.5m in height. There will also be an Installation of a new flood defence wall of c.36m in length and up to 1.7m in height to the south of the existing culvert inlet.

A potential site compound may be located in the parklands immediately to the south of the works area. Topsoil removal will be required to construct the compound. The extent of the proposed walls will be stripped of topsoil and excavated to the required foundation depth, which will depend on ground conditions.

Instream works will be necessary to accommodate regrading of the existing stream, removal of existing flow restrictions and to install the adjoining flood defence walls. Where works are expected to take place instream, a cofferdam sheet pile may be used to create a temporary dry working area within the existing river.

[138] McCabe. S (2002) Report on Archaeological Monitoring, Woodside Enniskerry Road, Sandyford, County Dublin. Unpublished Report ArchTech (Area 1). Licence Reference 02E1285(Ext)

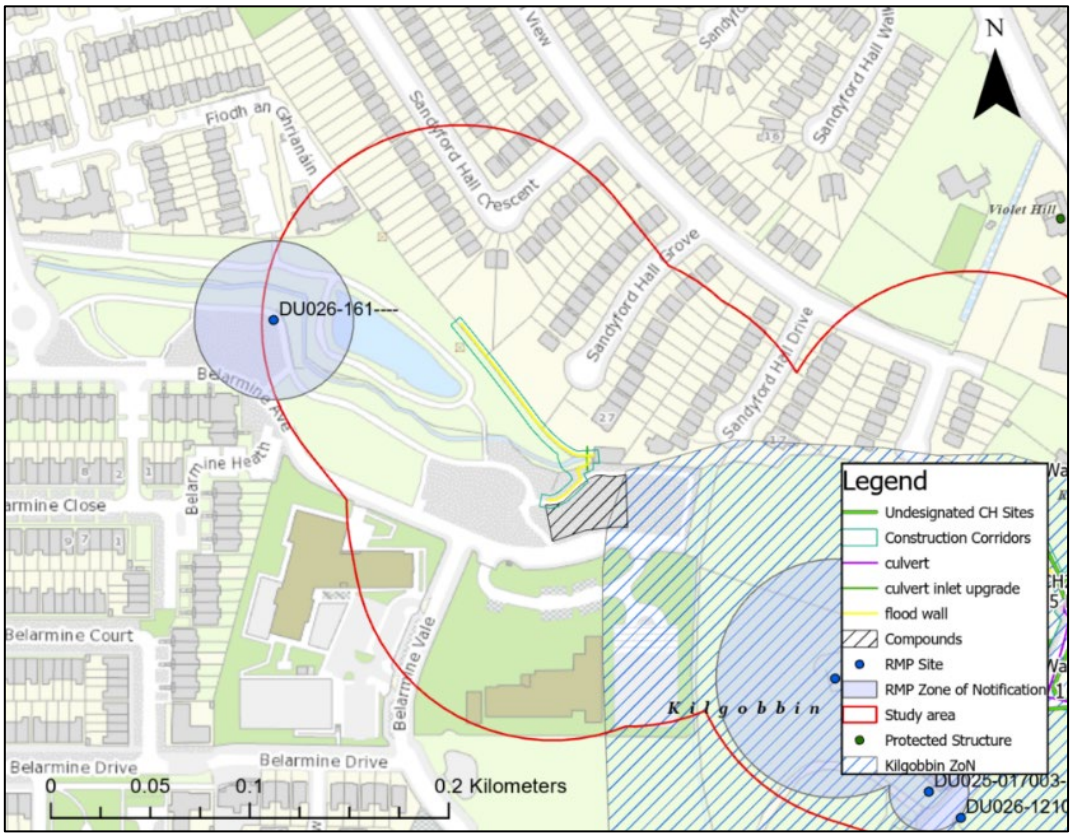

Figure 13.29: Cultural heritage features Belarmine Park Measure

Archaeological Impacts

The Belarmine Park measure is at least 75m from the Zone of Notification (ZoN) of the site of burnt mound (RMP Ref: DU026-161, Figure 13.29). This site was excavated in 2003, it was in a marshy area at a kink in the Kilgobbin Stream in a similar environment to the proposed measure. This site demonstrates the general riverine potential along the Kilgobbin Stream. There is no record of archaeological monitoring of the development of the Sandford Hall estate or in the area of the proposed measure within Belarmine Park, so the archaeological potential is unknown.

In Kilgobbin and Newtown little townland, extensive previously unknown archaeological features relating to settlement activity dating from the Neolithic, Bronze age, through to the medieval period and post -medieval period have been excavated in advance of development in the fields to the east, west and south of the measure and thus reinforces the greenfield archaeological potential of the river and its environs in this location. The easternmost side of the proposed compound incorporates the ZoN of Kilgobbin Village (DU025-017).

The UAIA survey of this area identified a small extent of stonework beneath a concrete slab feature and is the only indication of earlier activity at this location, it was and was not considered to be of cultural heritage value. Metal-detection within the stream channel encountered modern debris (Appendix 13.5).

The extent of any previous monitoring of Belarmine Park is unknown. Given the numerous archaeological findings in the general area that were identified during topsoil stripping in advance of phased construction, it is possible that some areas such as the greenspaces were not subject to disturbance and may have the potential reveal previously unknown subsurface archaeological sites, finds or features associated with the riverine and greenfield environment. The construction corridor for flood relief measure and the compound area are therefore considered to be areas of archaeological potential (AP1).

AP1 is of Unknown significance with a Low magnitude of effect, resulting in an **Indeterminable negative effect**.

Built Heritage Impacts

There is no NIAH or RPS sites within 100m of the proposed flood measure.

13.4.3 Kilgobbin FRS Measure

Proposed Development

The measure includes the removal and replacement of a c.73m of existing rubble stone wall which forms the existing curtilage of Kilgobbin House (RPS 1684) with a new flood defence wall to match the existing finishes. Approximately10m of the existing (curving) masonry section of the wall at Kilgobbin Bridge, the most publicly visible section, will be retained and strengthened. It will also include the installation of a c.86m flood defence walls between 1.1m and 1.7m in height on the western bank of the Ballyogan/Kilgobbin Stream between the existing culvert outlet and Kilgobbin Road Bridge. A new c.287m overflow pipe of 1050mm diameter from a flow control structure at Kilgobbin Bridge will run south along the Kilgobbin Road and at Kilgobbin Villa will run southeast along a local access road and a developed greenspace before discharging to the Ballyogan Stream (Figure 13.30).

Instream works will be necessary for the installation of the weir structure & new flood defence walls and removal of existing walls. The compound area is located in a greenfield to the south of the river and accessed from Kilgobbin Road. The extent of the proposed walls, pipeline and compound will be stripped of topsoil and excavated to the required foundation depth, which will depend on ground conditions.

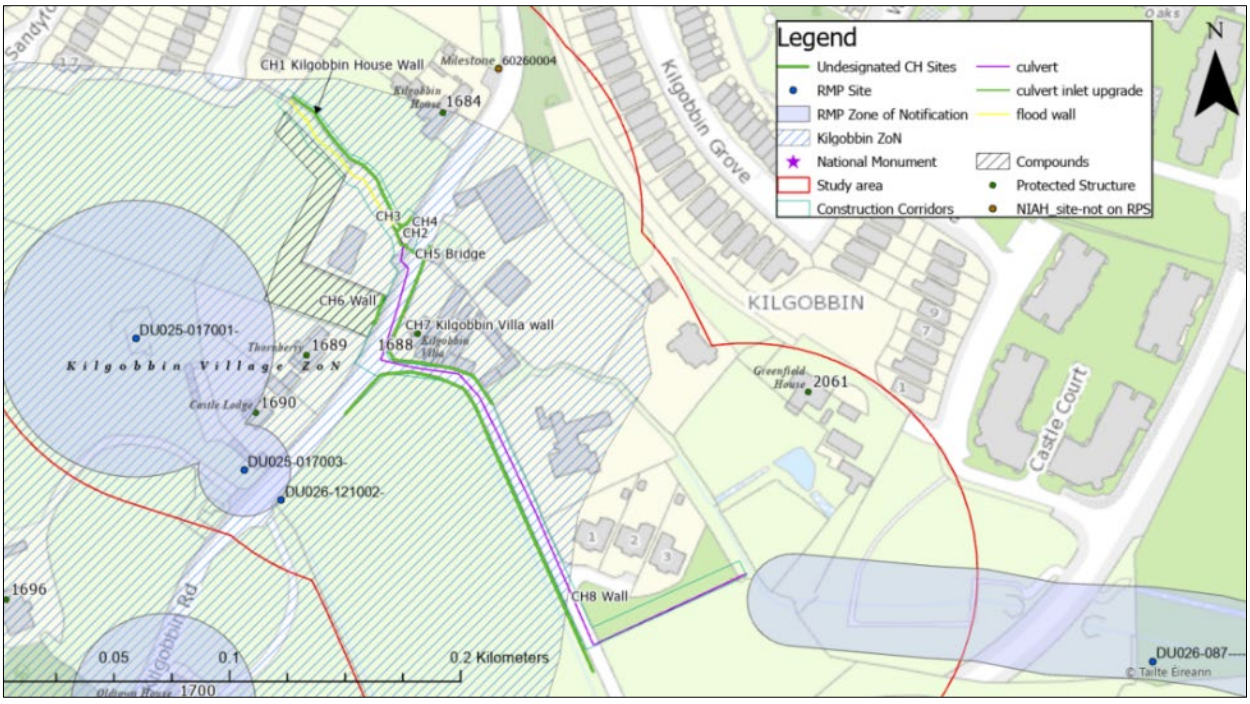

Figure 13.30: Cultural heritage features Kilgobbin Measure

Archaeological Impacts

This section of the Kilgobbin stream is located within the statutory RMP Zone of Notification (ZoN) of the historic settlement of Kilgobbin Castle (RMP DU025-017/DU026-121, Figure 13.30).

Predevelopment archaeological assessments (geophysical surveys and test excavations) carried out adjacent to the measure in Kilgobbin revealed extensive archaeological remains. Twelve archaeological features were identified within the field where the compound area is proposed; the in-situ archaeology includes medieval features related to drainage, land enclosure, and agricultural activity which were truncated by post-medieval and early modern activity, which included agricultural furrows, shallow ditches and stone-lined drains. The findings in this field in the vicinity of the river are unsurprising, as the river played a crucial role in the location and development of the medieval settlement of Kilgobbin. Given the many

phases of investigations carried out in the field already, additional testing for the present assessment was not feasible as any further investigations would potentially impact sensitive archaeological remains, particularly if they are prehistoric or ephemeral in nature. Based on the archaeological findings the compound area was minimised as much as possible in order to access and carry out the flood measure works.

Furthermore, any work on the Kilgobbin Stream channel and its banks holds the potential to reveal features or finds associated with the medieval settlement. The test trenches that were opened in proximity to the river filled immediately with water when opened, indicating at the potential for deeply buried waterlogged material close to the riverbanks or within the river channel (for example features such as mills). Aside from the built heritage features (discussed below), the UAIA visual survey of this stretch of the river did not identify any archaeological finds or features. The metal-detection within the stream channel encountered modern debris and no archaeological targets were observed (Section 13.2.8, Appendix 13.5).

There will be a direct permanent effect on the in-situ archaeological features that survives in the area of the compound and on any potential features that may lie undisturbed along the river, or on stray finds that might be buried in the stream bed or riverbank (AP2).

AP2 which contains known in-situ archaeology and is within a ZoN of a recorded monument is of Medium significance with a Medium magnitude of effect, resulting in an overall **Moderate negative effect**.

There will be excavation required for the overflow pipeline that will run from Kilgobbin Stream, across the Kilgobbin Road and along a private laneway to the Ballyogan Stream. The proposed pipeline runs within the ZoN of Kilgobbin (RMP DU025-017/DU026-121). The eastern end of the pipeline is just c.5m from the ZoN of a recorded section of the Pale boundary (DU026-087). The Pale boundary in this area may have continued along the Kilgobbin Stream as a natural boundary (as it had done further in sections further east), or more likely, as Goodbody has suggested, continued northwest and ran along the line the private laneway that had replaced the ditch in the early eighteenth century to connect with the linear earthwork at Kilgobbin Castle (DU025-121002). There is a potential that subsurface remains associated with the Pale ditch (such as wide truncated ditches), should they survive, will interact with the line of the overflow pipeline at some point along its route. The pipeline runs through a greenspace associated with Meadowbrook residential development where it will discharge into Ballyogan Stream following the line of an existing waterpipe (there are manholes on either side of the proposed overflow pipe), and there are also existing manholes on the laneway, which suggests that should the feature survive, it may be disturbed. The works proposed for the overflow pipeline in the Kilgobbin flood measure is considered to have the potential (AP3) to uncover subsurface archaeological sites associated with the development of Kilgobbin or features associated with the continuation of the Pale ditch boundary.

AP3 and the ZoN of the settlement of Kilgobbin are of Medium significance with a Low magnitude of effect, resulting in a **Slight negative effect**.

Built Heritage Impacts

The Kilgobbin flood relief measure is within an area that retains a distinctive rural country road character that is centred around Kilgobbin Castle and the Kilgobbin Stream river crossing. The area is distinguished by numerous rubble stone walls and a road bridge (CH1–CH8, Figure 13.38); while these cultural heritage features are undesignated, their importance resides in the way they support and enhance the historic context of the protected structures in their vicinity (i.e. Kilgobbin House RPS1684, Kilgobbin Villa RPS1688 and the protected structures on the approach to and from Kilgobbin RPS 1689,1690, 1696 and 1700). Kilgobbin is a rapidly expanding suburb, and these undesignated features are at risk from unsympathetic development.

Further to on-site consultation with and recommendations from the NBHS and consultation with the project conservation engineer (Southgate Associates), the rural character of the settlement was taken into consideration in the design mitigation strategy for the flood measure in the following ways (Figure 13.31):

- The Kilgobbin measure will have a direct effect on the riverside (southwestern) boundary wall of Kilgobbin House (RPS Ref: 1684), which requires removal. The design strategy, however, has minimised the effect by proposing to retain a 10m section of the distinctive curving boundary wall where the property meets Kilgobbin Bridge. This maintains the visual and built integrity of the boundary wall of the protected structure. To achieve this and to ensure flood alleviation, the flood wall will be constructed behind the existing curving wall so the character of the wall as seen from the road would remain unchanged, the inside of the wall will be cladded in a similar form to retain the character of the wall from the inside of the property.
- The upstream remainder of the Kilgobbin House boundary wall will be removed. The new flood wall, which will be constructed on the two sides of the river, will be cladded on both sides using the rubble stone from the dismantled stone wall in so far as reasonably practicable (or similar locally sourced stone), with a domed mortar capping. These walls will be cladded as per the specifications of the project's conservation engineer, and both the new and replacement walls will reflect the original character of the removed walls.
- A method statement and specification for the flood walls which was developed by the project's conservation engineer is provided in Appendix 13.8 (Sketch SA 202413/SK C4, and are also reflected in the cross-section drawings elsewhere in the EIAR)
- The low retaining wall on the river's left bank (CH2), connected to Kilgobbin Road Bridge (CH5), will also be retained. In a similar manner to the boundary wall, a new cladded flood wall will be constructed behind it, though at a higher level.
- The granite slab spanning the river (possible sluice gate, CH 3) will be retained in situ.
- Except for minor works to the parapet of Kilgobbin Bridge (CH5) there will be no impact on the bridge structure.
- The existing historic ramped access (CH4) to the river on the northern side of Kilgobbin Bridge shall be maintained; a flood defence gate, however, will be required here.

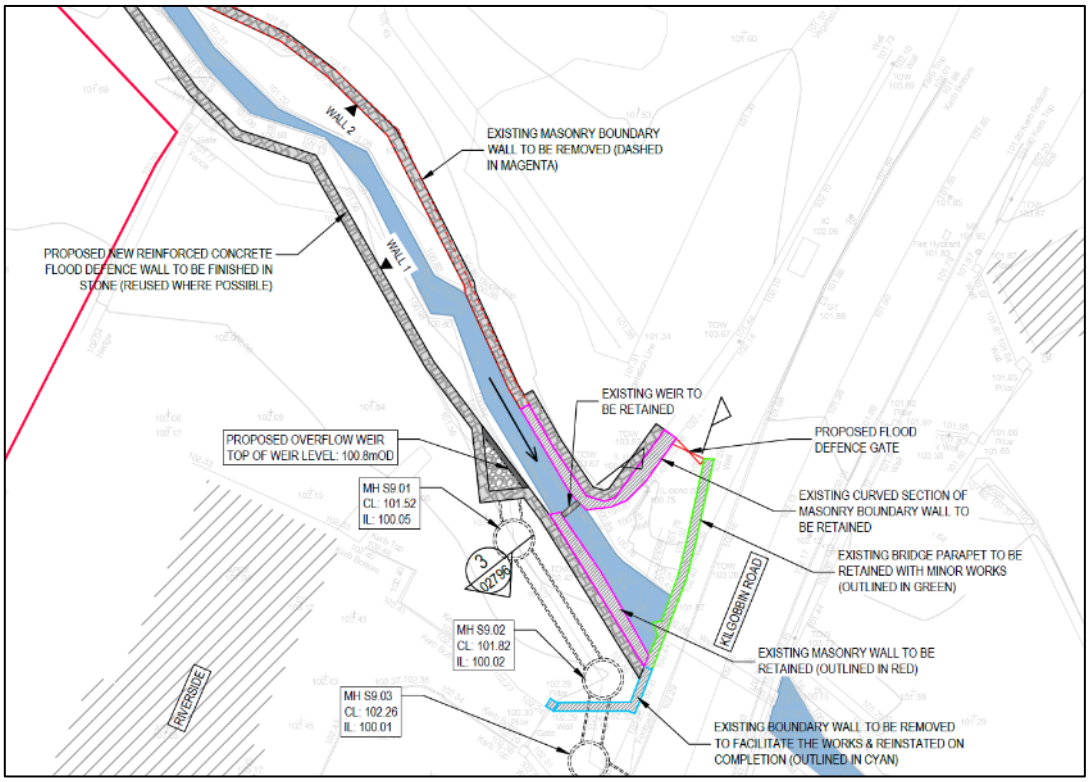

Figure 13.31: Detail of the Kilgobbin flood relief measure

The retention of Kilgobbin House curving wall, the low river wall, the bridge and the use of stone cladding in the new flood walls will retain the countryside character of the road. Kilgobbin House (RPS 1684) is of Medium significance (Protected Structure) with a Low magnitude of effect, resulting in a **Slight negative effect** of the character of the property.

A photomontage of the upstream view of the various cultural heritage features from Kilgobbin Bridge, with the above design measures in place, is provided in the LVIA Chapter 13. The images are extracted as follows in Figure 13.32 (existing view) and Figure 13.33. While there will be a visual change, the existing walls are still legible, the new walls are not out of place, nor will they compete with the existing walls.

Figure 13.32: Existing view upstream from Kilgobbin Bridge with the curving boundary wall on the right-hand side of the image, the granite slab spanning the river and the low river wall on the left-hand side.

Figure 13.33: Photomontage view upstream with the measure in place

The undesignated cultural heritage features CH2 (river wall), CH3 (granite slab), CH4 (access ramp) and CH5 (Kilgobbin Bridge) features will be retained in situ. These features are of Low significance with a **Negligible magnitude of effect**, resulting in an effect that is **Not Significant**.

The remaining walls identified in the assessment will not subject to impact (CH6–CH8) by the construction of the flood measure. The contractors however should be made aware of the heritage value of the walls.

13.4.4 Glenamuck Road North Roundabout FRS Measure

Proposed Development

The flood measure will include the removal and replacement of c.87m of existing masonry wall, this will comprise c.69m new flood defence wall ranging between 1.1m and 1.6m in height on the existing riverbanks

adjoining Glenamuck Road North along Castle View / Ballyogan Road and a new flood defence wall of c.13m in length and up to 1.5m in height within Priorsland house. It will also include the replacement of the existing safety railing at the upstream face of the bridge serving Glenamuck Road North culvert (Figure 13.34).

The extent of the proposed walls will be stripped of topsoil and excavated to the required foundation depth, which will depend on ground conditions. Instream works will be necessary for the installation of the debris screen. A potential site compound may be located in the to the west of the proposed works on the lands adjoining Ballyogan Grove, Luas & M50.

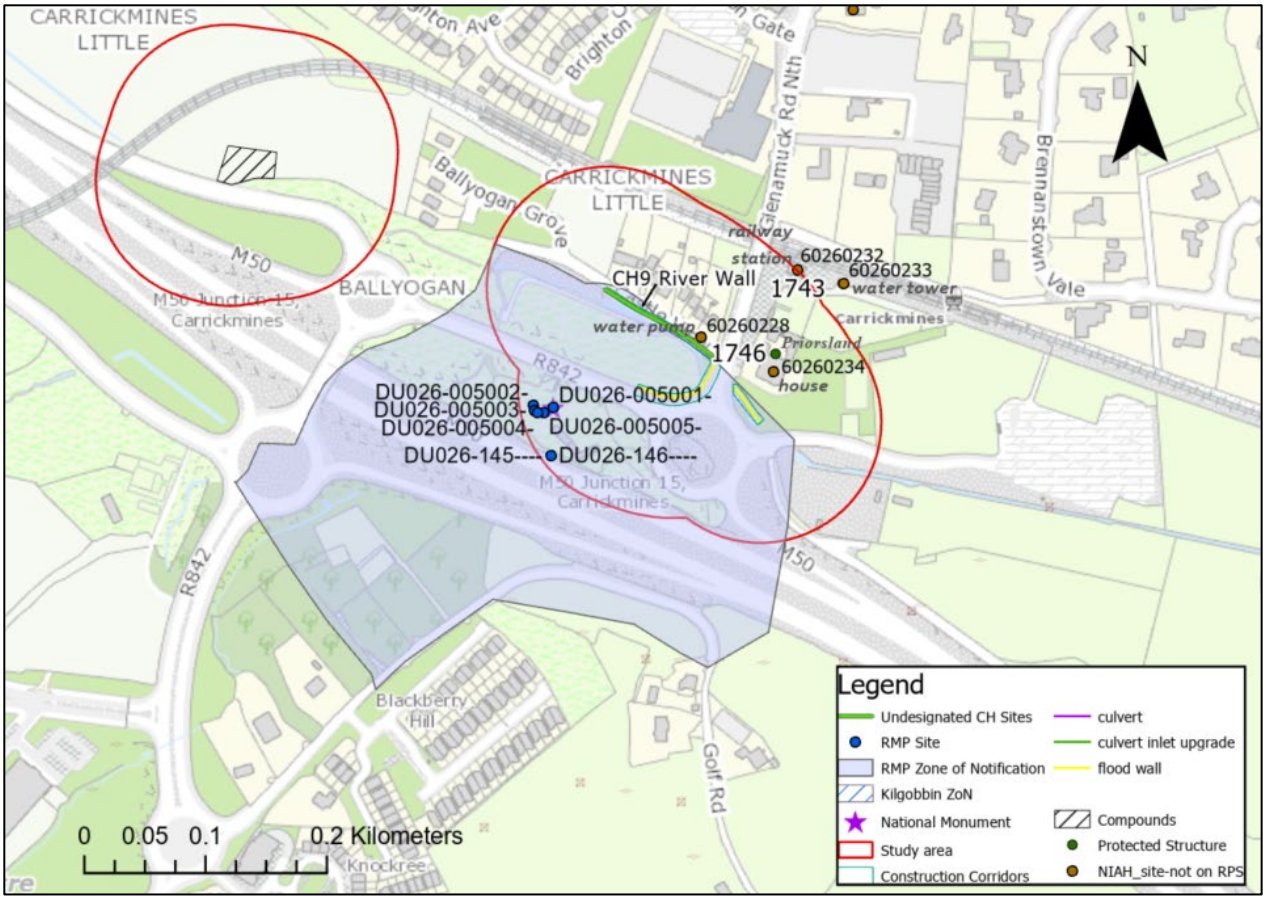

Figure 13.34: Cultural Heritage Sites and the Carrickmines Flood Measure

Archaeological Impacts

The Carrickmines flood measure is within the ZoN of Carrickmines Castle (RMP DU0026-005001-005) and settlement. The excavations at Carrickmines Castle in advance of the M50 were extensive, however as demonstrated in Section 13.2.4 above the flood measure lies within the unexcavated area of the site. It was not possible to carry out test excavation of this measure as the proposed construction area on the northern side of the river is either within the road/footpath or on the riverbank, or on the north side of the Glenamuck Road due to the presence of services (a sewer and gas pipeline, Figure 13.13).

The UAIA visual and metal detection survey of this stretch of the Carrickmines river did not identify archaeological finds or features (Section 13.2.8, Appendix 13.5).

Carrickmines Castle, and its environs are of significant archaeological potential, any earthmoving works associated with the construction of the new flood measure may reveal previously unrecorded subsurface archaeological deposits that might be associated with the Carrickmines settlement or earlier. All proposed flood relief works associated with the Carrickmines measure is considered to be an area of archaeological potential (AP4).

AP4 which incorporates the ZoN of Carrickmines Castle (RMP DU0026-005001-005) is of High significance (as a national monument) with a Low magnitude of effect, resulting in a **Moderate negative effect**.

The proposed compound it located in an area that has previously been stripped and used for a compound and as such is not considered to require further stripping for its reuse as a compound.

Built Heritage Impacts

The Carrickmines flood relief measure will remove a c.1m high of randomly coursed limestone rubble wall running along the bank of the Carrickmines River (CH9). The wall is in various states of repair along its length and has been rebuilt/ repaired in places. The new floodwall will be cladded on both sides with local stone salvaged (or similar locally sourced stone) from the stone wall being dismantled. A method statement and specification for the building new relief wall cladding and capping has been developed by the projects conservation engineer and is provided in Appendix 13.7 with sketches.

The existing stone wall (CH9) is of Low significance with a High magnitude of effect, resulting in a **Slight negative effect.**

A row of properties faces onto the river, most of which are modern. There are two early 20th century single storey cottages at the eastern end of the road. In front of the properties there is a freestanding 19th century cast-iron 'lion mask' water pump (that is disused). The new wall will be of similar height to the existing and as such the visual connection to the river from the properties fronting it will be similar to the current scenario. The water pump recorded in the NIAH (NIAH ref: 60260228) on the northern side of the road will not be impacted by the proposed FRS measure; however, care should be taken to prevent any accidental damage to this structure during construction works.

Priorsland House (RPS 1746) a mind 19th century house set back from the road and is behind a wall and a shelter belt of trees. The front entrance has an easterly aspect. The present structure is the result of the re-fronting an earlier structure in the 19th century to maximize the scenic views of the grounds and the 'semi-rural parkland'. The flood defence wall at Priorsland will be noticeable modern visual intrusion on Priorsland House on its parkland setting. The proposed flood defence wall will be cladded in natural stone and to mitigate the impact on the visual amenity of the property.

Priorsland House is of Medium significance with a Low magnitude of effect, resulting in a **Slight negative effect** on the setting of the property.

13.4.5 Lower Brides Glen and N11 Overflow Culvert FRS Measure

Proposed Development

The installation of c.129m of new flood defence walls replacing the existing retaining walls and slopes along the left bank of the Brides Glen River to the rear of the existing residential properties ranging in height between 0.4m to a maximum total height of circa 2.9m. Installation of 2x flood gates, continuous with the proposed flood defence wall, to provide access to the stream and to existing pedestrian bridge. The installation of a new c.53m overflow pipe of 2.4m diameter underneath the N11 (Figure 13.35).

The extent of the proposed walls will be stripped of topsoil and excavated to the required foundation depth, which will depend on ground conditions. Instream works will be necessary for the installation of the inlet weir and headwall structures.

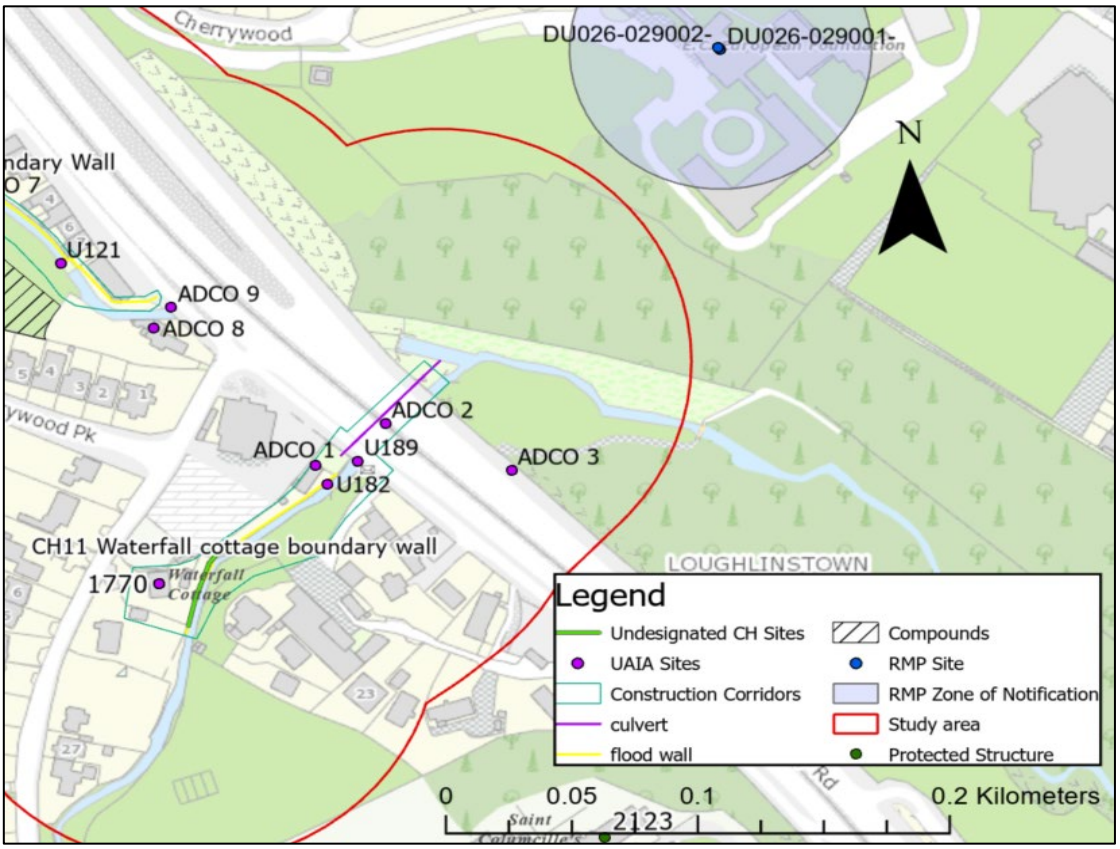

Figure 13.35: Cultural Heritage Sites and the Lower Brides Glen and N11 Overflow Culvert Measure

Archaeological Impacts

There are no recorded archaeological sites within 100m of the flood relief measure. However, given the extensive prehistoric landscape identified in advance of the development of Cherrywood further to the north there is a potential that similar features might be identified during earthmoving works associated with the FRS measure. The underwater archaeological assessment did not identify any features of archaeological interest along this stretch of river, the cultural heritage features identified are described below.

Despite the findings of the underwater survey and baseline research there is a potential that, as yet, undiscovered archaeology associated with the riverine environment (AP5) may be identified during the in-stream works or works along the riverbanks associated with this flood relief measure. Such archaeology may include fording points, evidence of milling or fishing weirs, etc., buried in the riverine deposits. Riverine deposits can be rich in preserved organic material and stray artefacts/objects.

AP5 is of Unknown significance with a Low magnitude of effect, resulting in an **Indeterminable negative effect**.

Built Heritage Impacts

Waterfall Cottage (RPS Ref: 1770) is a thatched structure, located on the left bank of Loughlinstown River South, the property and its linear garden along the riverbank enjoys open access to the river. A low rubble stone granite-built retaining wall (CH11) is built into the riverbanks and there is stepped access into the river at the upstream end of the property and directly in front of the cottage (these are described in detail in the UAIA report Appendix 13.5). Waterfall House is an important surviving example of traditional thatched roof workmanship, having a functional and aesthetic relationship to Loughlinstown River South. Access to the river will be retained in the area directly in front of the cottage location, a flood gate inserted here.

A photomontage the upstream view of the cottage, is provided in the LVIA Chapter 13. The images are extracted as follows in Figure 13.36 (existing view) and Figure 13.37. The construction of a c. 1m-1.5m high flood wall at Waterfall Cottage have a permanent negative visual effect and effect on the setting of the

structure. However, preventing the future flooding of the structure will have a **positive effect** on the physical fabric of the structure.

Figure 13.36: Existing view upstream from the N11, Waterfall cottage is in the middle ground of the photo

Figure 13.37: Photomontage view showing the flood walls

Waterfall Cottage (RPS 1770) and CH11 is of Medium significance (Protected Structure) the addition of a new boundary wall will have a Low magnitude of effect, resulting in a **Slight negative effect** on the setting of the property.

Upstream at the Loughlinstown bridge there is a single storey c. late 19th century derelict structure overgrown with vegetation (UAIA Report Ref. ADCO1, Appendix 13.5), which has an open aspect to the river. A flood wall will be constructed south and east of the structure. The structure is of Low significance, the addition of a new boundary wall will have a Low magnitude of effect, resulting in a **Slight negative effect** on the setting of the property.

The UAIA report identified a footbridge downstream of Waterfall Cottage (UAIA Ref U182, Appendix 13.5) which is found 25-inch OS (1910); 6-inch last edition (1940) OS Map. It comprised a timber parapet supported on two steel girders on concrete footings. The footbridge will be removed however access to the

river will be maintained and a new footbridge will be provided. The footbridge UAIA Ref: U182 is of Low significance with a Low magnitude of effect, resulting in a **Slight negative effect**.

The UAIA records and describes the N11 culvert, which is built onto an earlier single arch barrel-vaulted cut stone bridge on the upstream site. The bridge, labelled as Loughlinstown Bridge on historic mapping is an undesignated cultural heritage structure (UAIA Ref U189, Appendix 13.5). The proposed N11 overflow culvert works will **not impact** on the existing historic bridge structure.

13.4.6 Cherrywood Road FRS Measure

Proposed Development

This measure is within the gardens of 3 no. existing residential properties. Mature trees and vegetation are present along the river in this area. Construction of approx. 173m of reinforced concrete flood relief walls, installed over the existing retaining walls and slopes, approx. 1.1m to 2.75m high, along the left bank of the Loughlinstown River South, at the back of the existing residential properties (Figure 13.38). Instream works may be required.

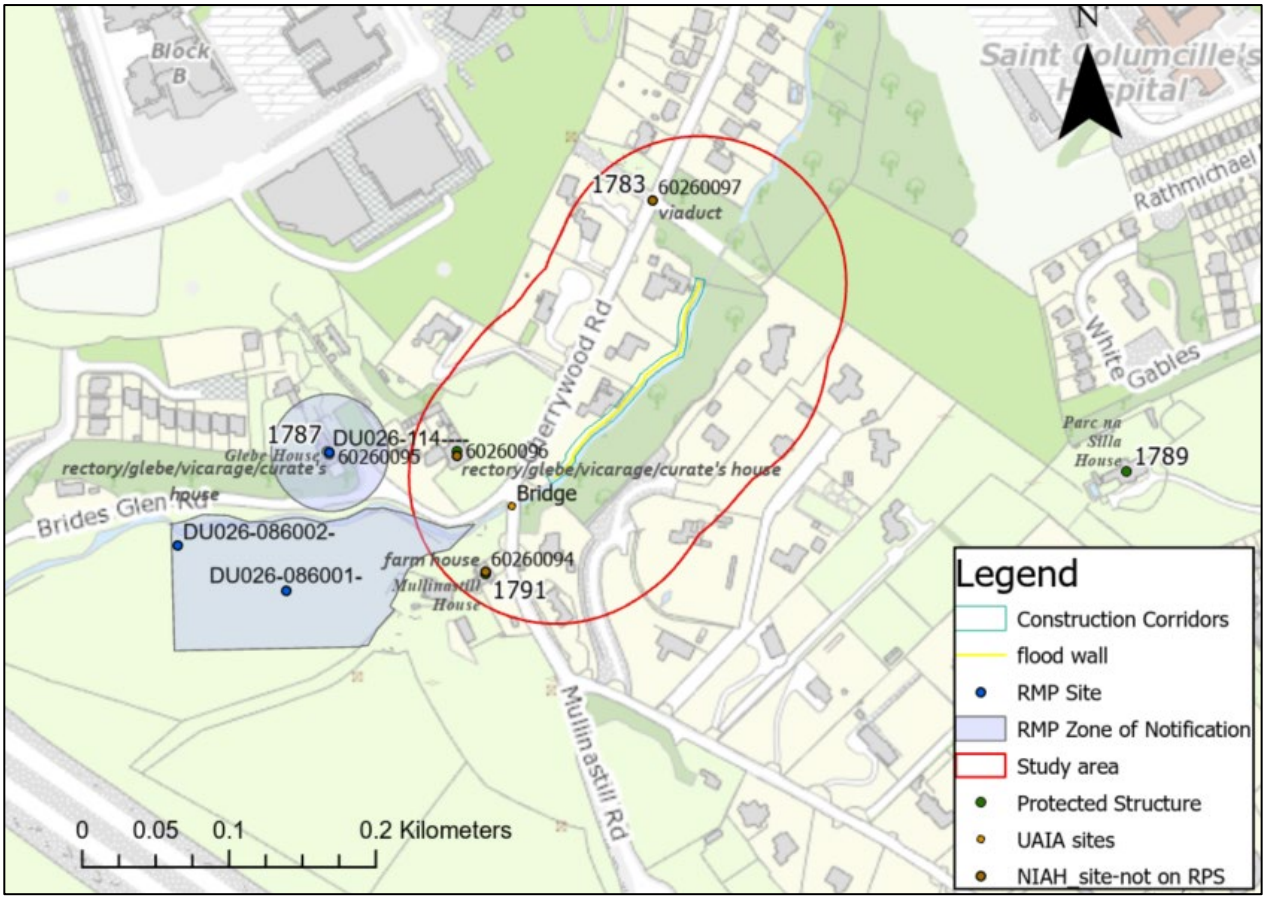

Figure 13.38: Cultural Heritage Sites and the Cherrywood Road Flood Relief Measure

Archaeological Impacts

Just within 100m of the flood measure on the south side of the Brides Glen Road on the south bank of the Loughlinstown River is the site of a fulling mill (RMP DU026-086001), the ZoN of which extends to the upstream side of Cherrywood bridge. The 1837 OS 6-inch map indicates the 'site of tuckmill' where a mill race is indicated upstream of the measure. The mill was likely to have been associated with Mullinastill House (a protected structure, RPS Ref: 1791). There are no mill-related features shown in the area of the proposed flood measure.

Given the archaeological potential of the riverine environment in an area that is relatively undisturbed, there is a potential that subsurface archaeological features or stray finds may be uncovered during the

construction of the walls or any instream measures that might be required for this measure (AP6). Such archaeology may include ephemeral prehistoric remains, or in the vicinity of the river fording points, evidence of milling or fishing weirs, etc., buried in the riverine deposits. Riverine deposits can be rich in preserved organic material and stray artefacts/objects.

AP6 is of Unknown significance with a Low magnitude of effect, resulting in an **Indeterminable negative effect**.

Built Heritage Impacts

There are several Protected structures within 100m of the flood measure. Downstream of the measure is Mullinastill House (RPS Ref: 1791), Cherrywood House (RPS Ref: 1788), Rathmichael House (RPS Ref: 1787, also the site of an earlier house RMP DU026-114). There is also an undesignated bridge carrying the Mullinastill Road over the river. Upstream from the measure is Bride's Glen Viaduct (RPS 1783), a 19th century five arch stone railway viaduct crossing Cherrywood Road and the Loughlinstown River attributed to William Dargan. The proposed measure is confined to the section of the banks of the river to the rear of modern properties and as such the proposed flood measure will have no impact on the built heritage environment.

13.4.7 Bray Road North

Proposed Development

The proposed development involves the installation of c. 101 m of new flood defence walls along the Loughlinstown River North and adjoining the southwest boundary of the existing residential and commercial properties on Bray Road. The flood defence walls will range between 0.7m to 3.4m in height. The installation of a new flood gate within the proposed flood defence wall to facilitate access to the adjoining lands via the existing pedestrian bridge. It will also include the realignment of c. 75m of the existing river channel along the right bank of the Loughlinstown River North, in front of the walls, to accommodate the installation of the flood relief walls. Strengthening of the existing masonry arch across the stream, upstream of the main flood relief works. A large compound area is located in a greenfield area to the south of the measures (Figure 13.39).

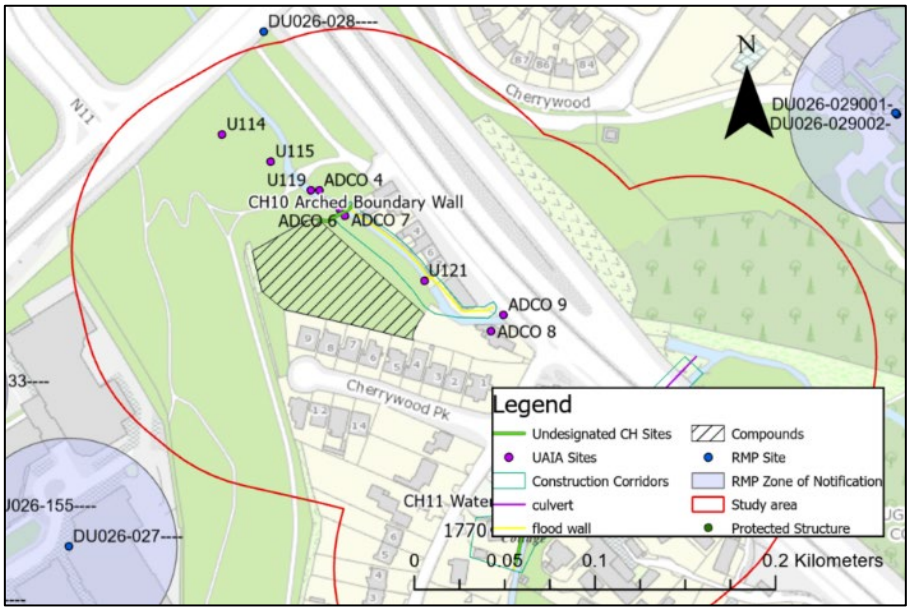

Figure 13.39: Cultural heritage features and the Bray Road North Measure

Archaeological Impacts

No recorded archaeological sites will be impacted by the Bray Road North Measure. Approximately c. 80m northwest of the flood measure, this site of a Beechgrove House - 18th/19th century (RMP DU026-028), it was excavated during the construction of the N11. There have been several archaeological discoveries in

advance of the development of the Cherrywood Science and Technology Park, these comprised prehistoric sites such as a ring barrow, two fulacht fiadh, a prehistoric house site and an enclosure, all of which have been added to the RMP (Figure 13.39). These sites demonstrate the archaeological potential of the river valley since the prehistoric period. There is a potential that the construction works associated with this measure may also reveal in- situ archaeological remains or stray finds dating to the prehistoric period.

Whilst the geophysical survey of the compound did not reveal any responses of archaeological interest, there remains a potential that, as yet, undiscovered archaeology associated with the riverine environment (AP7) may be identified during the in-stream works or works along the riverbanks or compound area associated with this flood relief measure. Such archaeology may include ephemeral prehistoric remains, or in the vicinity of the river fording points, evidence of milling or fishing weirs, etc., buried in the riverine deposits. Riverine deposits can be rich in preserved organic material and stray artefacts/objects.

AP7 is of Unknown significance with a Low magnitude of effect, resulting in an **Indeterminable negative effect**.

The UAIA identified several built heritage features along the flood measure, and these are discussed further below. Nothing of an archaeological interest weas identified during the wade survey and metal detection.

Built Heritage Impacts

There are no protected structures within 100m of the measure.

Field inspection identified an unrecorded arched boundary wall CH10 (described in detail in the UAIA report as Ref: ADCO 6, Appendix 13.5, Figure 13.39, Figure 13.40) located at the upstream end of the measure. The 600mm wide wall comprises a granite yellow brick boundary wall with a wide arch that crosses above the Loughlinstown River North River channel, it includes a gateway at the northern end. It is part of a boundary wall that incorporates several structures fronting the old Bray Road and is present on the 1st edition OS Map.

Figure 13.40: CH10 (ADCO 6) arched boundary wall located at the upstream end of the flood measure

An assessment of the structure by a conservation engineer concluded that in its current state the feature is incapable of withstanding the lateral load of flood water. As a result, the specification for the masonry repairs, and conservation/strengthening proposal for the boundary wall was developed (Appendix 13.8, Section 2, and drawing SKC4). CH10 is of Low significance with a Low magnitude of effect, resulting in a **Slight negative effect**.

The continuation of a granite built retaining wall on the right bank (southern bank) of the river was identified during the UAIA survey (UAIA Ref: ADCO 7), the feature is partially collapsed in section and is generally 0.50m high, further downstream it includes the riverbank element of the former Smithy recorded on the historic Ordnance Survey 25-inch map series (ADCO 8). The proposed flood wall is located on the northern

side of the river, and as such the retaining wall will not be subject to impact. However, the realignment of a c. 75m section of the right bank of the stream is required and sections of ADCO 7 retaining wall will be subject to impact. ADCO 7 is of Low significance with a Low magnitude of effect, resulting in a **Slight negative effect**. The retaining wall associated with the former smithy (ADCO 8) will not be impacted.

UAIA Ref: ADCO 9, is an undesignated bridge which comprises a single elliptical arch, which is supporting a long barrel vault constructed using granite blocks and resting on stone piers that are made of four courses of cut ashlar granite. It is illustrated on the first edition OS map of 1840. The new flood wall will not impact on this structure but will abut the end wall at the northern end of the bridge parapet.

A number of UAIA sites were identified outside the construction corridor of the flood measure works and as such these sites will not be impacted by the proposed works (U114, U115, U119, ADCO 4, ADCO 5 and Figure 13.39). A modern footbridge (U121) replacing an earlier structure provides access into the field south will be replaced with a new culvert for continued access.

13.4.8 Commons Road and Brookdene

Proposed Development

The Commons Road and Brookdene measure includes structural upgrade and strengthening works to Shanganagh Road Bridge (RPS Ref: 1773). The construction of approximately 176m of new reinforced concrete flood relief walls, approx. 1.1m to 2.4m high, along the right bank of the Shanganagh River, immediately upstream of the existing walls along Commons Road and the upgrade of approximately 206m of existing flood defence wall along the right bank of the Shanganagh River by Commons Road and 166m of existing boundary wall along the left bank of the Shanganagh River along Commons Road, upstream of the Shanganagh Road bridge. It also includes the construction of approximately 185m of reinforced concrete flood relief walls at the existing greenfield area at Brookdene, approx. 1.6m high. The site compound is located within an existing storage yard owned by DLRCC.

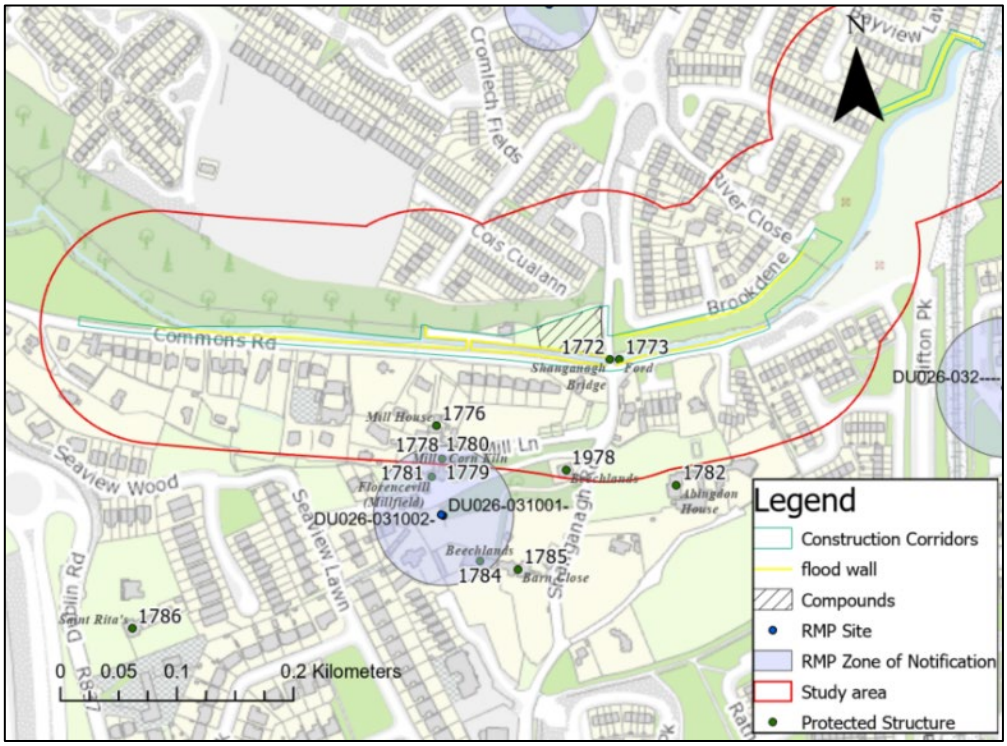

Figure 13.41: Cultural heritage features at Commons Road and Brookdene Measure

Archaeological Impacts

A milling complex is located c. 84m south of the flood measure on Mill Lane. There are no recorded archaeological sites that will be subject to impact from the construction or the operation of the flood measure.

Shanganagh Road Bridge (RPS Ref: 1773, NIAH 60260118) forms part of the flood relief measure. The bridge is on a historic routeway that connects Bray to Dublin and there is a significant potential that an earlier bridge structure or fording was located here. Apart from Shanganagh Bridge (discussed below), the UAIA did not identify any features of archaeological interest or potential in the survey. Previous extensive flood relief works have been carried out on the river in the 1990's, the UAIA noted Larson piles and rock armour and suggested that the river channel had been previously dredged.

The archaeological potential of this flood measure is deemed to be low, however there are areas (greenfield and earthen riverbanks) that may not have been subject to disturbance by the earlier flood relief works and as such there is a potential, albeit low that archaeological features or stray finds might be identified during construction work for this measure (AP8).

AP8 is of Unknown significance with a Low magnitude of effect, resulting in an **Indeterminable negative effect**.

Built Heritage Impacts

The proposed flood measure will directly impact Shanganagh Road Bridge, a protected structure (RPS Ref: 1773, NIAH 60260118). The project conservation engineer carried out a condition survey of the bridge, and found that is the bridge was in a reasonable condition for a structure of this type and age. However, the survey concluded that structural repairs and strengthening works to the bridge structure would be required to prevent scouring and undermining flood conditions due to environmental effects. The conservation engineers developed a specification for repairs to Shanganagh Road Bridge (Southgate Associates, Appendix 13.8) to ensure minimum intervention to retain the bridge's character; this includes a methodology for consolidating the bridge abutments and parapets, including removing vegetation, repointing, grouting, micro piling, and reinforcing the parapet with a concrete beam and the use of Helibars to repair structural cracks. A complete baseline survey comprising a written, photographic, and laser survey of the bridge was recorded in the UAIA (Appendix 13.5).

Shanganagh Road Bridge (RPS 1773) is of Medium significance with a **Negligible magnitude of effect**, resulting in a **Not Significant effect**.

13.4.9 Bayview

Proposed Development

The installation of c.104m new reinforced concrete flood defence walls ranging between 1.1m and 1.6m in height in the environs of the Bayview Estate. The removal and replacement of c.16m of existing boundary wall (2.7m to 4.3m high) at Bayview Lawns with a new reinforced concrete flood defence wall to match existing heights. Instream works will be necessary for the installation of the flood defence wall

Archaeological Impacts

There are no recorded monuments within 100m of the measure. There is however a general greenfield/riverine archaeological potential (AP9) that earthmoving works (instream and on the riverbanks) associated with the measure may reveal previously unknown subsurface archaeological features or finds. There will be a potential direct permanent impact on any in-situ archaeological features that might survive in the vicinity of the river or stray finds in the stream bed.

AP9 is of Unknown significance with a Low magnitude of effect, resulting in an **Indeterminable negative effect**.

Built Heritage Impacts

There are no RMP/NIAH sites within 100m of the flood measure. There is a railway bridge associated with the Dublin Southeastern railway line of industrial heritage merit at the eastern end of the measure, but it will not be subject to impact. There will be no built heritage effects.

13.4.10 Do-Nothing Scenario

In a Do-Nothing Scenario, flooding will continue to occur in the study area resulting in the degradation of the built heritage environment including to the RMP, RPS and NIAH sites.

13.4.11 Summary of impacts

The table below lists the potential effects to the cultural heritage features identified during the study. A glossary of impacts as defined by the EPA (2022) is provided in Appendix 13.3. The assessment has been carried out according to best practice and guidelines relating to archaeological and architectural heritage assessment (Appendix 13.1).

Table 13.6: Potential effects to cultural heritage receptors – pre-mitigation

CH ref.	FRS Measure	Significance/ Sensitivity Value	Magnitude of Effect	Quality of Effect	Significance of Effect	Duration
AP1 (Riverine and greenfield environment)	Belarmine Park Measure	Unknown	Low	Negative	Indeterminable	Permanent
AP2 (In-situ archaeological features within the compound and archaeological potential of the river and its banks)	Kilgobbin Compound and FRS Measure	Medium	Medium	Negative	Moderate	Permanent
AP3 (ZoN of Kilgobbin DU025-017001-003 and possible continuation of the Pale ditch between DU026-087 and DU025-121002)	Kilgobbin FRS Measure and overflow pipeline.	Medium	Low	Negative	Slight	Permanent
RPS Ref: 1684, CH1 (Kilgobbin House Boundary Wall)	Kilgobbin FRS Measure	Medium	Low	Negative	Slight	Permanent
CH2 (Retaining River wall at Kilgobbin Stream)	Kilgobbin FRS Measure	Low	Negligible	Negative	Not Significant	Permanent
CH3 (Granite slab spanning Kilgobbin Stream)	Kilgobbin FRS Measure	Low	Negligible	Negative	Not Significant	Permanent
CH4 (Access ramp Kilgobbin Stream)	Kilgobbin FRS Measure	Low	Negligible	Negative	Not Significant	Permanent
AP4 (ZoN of Carrickmines Castle (RMP	Glenamuck Road North Roundabout FRS Measure	High	Low	Negative	Moderate	Permanent

CH ref.	FRS Measure	Significance/ Sensitivity Value	Magnitude of Effect	Quality of Effect	Significance of Effect	Duration
DU0026-005001-005))						
CH9 (River wall on Castle View Carrickmines)	Glenamuck Road North Roundabout FRS Measure	Low	High	Negative	Slight	Permanent
RPS 1746 Priorsland House	Glenamuck Road North Roundabout FRS Measure	Medium	Low	Negative	Slight	Permanent
RPS 1770 Waterfall Cottage	Lower Bridges Glen and N11 Culvert FRS Measure	Medium	Low	Negative	Slight	Permanent
ADCO1 (Late 19th century derelict structure)	Lower Bridges Glen and N11 Culvert FRS Measure	Low	Low	Negative	Slight-Not Significant	Permanent
AP5 (General riverine and greenfield Archaeological Potential)	Lower Bridges Glen and N11 Culvert FRS Measure	Unknown	Low	Negative	Indeterminable	Permanent
UAIA Ref U182 footbridge	Lower Bridges Glen and N11 Culvert Measure	Low	Low	Negative	Slight	Permanent
AP6 (General riverine and greenfield Archaeological Potential)	Cherrywood Road FRS Measure	Unknown	Low	Negative	Indeterminable	Permanent
AP7 (General riverine and greenfield Archaeological Potential)	Bray Link Road North FRS Measure	Unknown	Low	Negative	Indeterminable	Permanent
CH10 Arched boundary Wall	Bray Link Road North FRS Measure	Low	Low	Negative	Slight	Permanent
ADCO 7 Granite built retaining wall	Bray Link Road North FRS Measure	Low	Low	Negative	Slight	Permanent
AP8 (General riverine and greenfield Archaeological Potential)	Commons Road and Brookdene FRS Measure	Unknown	Low	Negative	Indeterminable	Permanent

CH ref.	FRS Measure	Significance/ Sensitivity Value	Magnitude of Effect	Quality of Effect	Significance of Effect	Duration
Shanganagh Bridge (RPS 1773)	Commons Road and Brookdene FRS Measure	Medium	Negligible	Negative	Not Significant	Permanent
AP9 (General riverine and greenfield Archaeological Potential)	Bay view FRS Measure	Unknown	Low	Negative	Indeterminable	Permanent

13.5 Mitigation Measures

13.5.1 Mitigation by Design

Following guidance from the NMS and NBHS, a multidisciplinary approach was undertaken by the project engineers, archaeologists, and conservation engineers to develop the detailed design for the FRS measures on features of cultural heritage importance. A best practice conservation approach was adopted, focussing on minimising or eliminating impact at each cultural heritage site, for example the cultural heritage sites identified at the Kilgobbin Road and Commons Road FRS measures. The designed-in mitigation measures are discussed in the impact assessment above and include for example the retention where possible of historic walls/features (CH2, CH4 and CH5) and sections of wall (CH1, RPS Ref: 1684), the maintenance of river access points from properties facilitated by flood gates, the proposals to clad the new flood walls with original or similar stone and the repair and strengthening of structures such as an arched wall boundary (CH10) and Shanganagh Road Bridge (RPS Ref: 1773).

13.5.2 Built Heritage

Project Conservation Engineer

As recommended by the NBHS a project conservation engineer will be retained where appropriate during the preparation of the tender/works package, construction and reinstatement stages of the FRS scheme. The conservation engineer will ensure that the specifications and methodologies outlined in Appendix 13.8 are carried out in full, and that the work to the appropriate standards.

The methodologies will be submitted to the NBHS in advance of the works for discussion and approval. The NBHS may make additional recommendations and comments.

The proposed bridge reinforcement measure at Shanganagh Road Bridge will have the positive effect of protecting the bridge from future flood damage. The flood measures that occurred in the 1990's both upstream and downstream of the works have already altered the setting of the bridge structure; the proposed flood walls will be similar and, as such, will not cause any additional setting impacts. The bridge represents the site of an important fording point and routeway that have connected Dublin and Wicklow since at least the early medieval period up to the present. The public realm at the bridge crossing is run-down and uninviting; and as discussed with the NBHS the bridge's repairs and flood relief work may present an opportunity to improve this area. It is recommended that a public realm plan for the enhancement of Shanganagh Road Bridge is developed, this should include the reinstatement of the granite stone kerb stones that survive intermittently on the approach footpaths to the bridge and the cleaning of the bridge and historic date plaque, which have suffered environmental damage from the passing traffic.

Recording

The upstanding walls to be replaced and reinstated as part of the proposed flood relief scheme will be recorded in advance of construction. This will include a written and photographic record and scaled drawings and will serve to provide a record of the past. The record will note the capping stones, the coursing of the original masonry, where it exists or is preserved. Random rubble masonry will require the retention of all pinning stones so that the rhythm and texture of the original may be replicated and where it is built to courses the same attention to coursing is essential. The dismantling will be carried out by hand. When construction is complete the boundary walls will be rebuilt to match the original wall construction. The project engineer will provide a detailed methodology for this work and will review and advise on the works as they are being carried out.

13.5.3 Project Archaeologist

As recommended in the NMS 'Archaeology and Flood Relief Scheme Guidelines 'Dun Laoghaire Rathdown County Council and OPW will engage a Project Archaeologist (PA) to advise on the archaeological aspects of the FRS. This role will continue into the construction stage of the FRS where they will advise on archaeological mitigations, including surveys, archaeological monitoring, the assessment of potential on archaeological discoveries, archaeological excavations, and reporting requirements. This may include inspections of archaeological heritage (both terrestrial and underwater). They will also advise the contracting authority on post-excavation progress, requirements, and archiving and finally the publication and dissemination of results of archaeological works.

The PA will provide a consistent, independent approach to the portfolio of individual work packages and to manage a centralised framework for the development of all archaeological, architectural and cultural heritage considerations. The PA will advise on compliance with relevant legislation (including the Planning and Development Act, 2000, as amended), the implications of local authority listing of Protected Structures and ACAs, and compliance with the National Monuments Acts.

13.5.4 Archaeological Testing

Archaeological Testing

Archaeological testing was not suitable for much of the proposed scheme, owing to restricted space, and the obstacles of the existing walls, roads and services. Archaeological test excavation is recommended to take place in the following locations:

- At the Bray North Measure compound area to test the veracity of the geophysical survey;
- At the Glenamuck Road North Roundabout Measure in the vicinity of Carrickmines Castle as soon as it can be facilitated;
- And, along the watercourse and proposed overflow pipe in Kilgobbin within the Riverside property.

The testing will take place well in advance of the construction phase of the development. The highest archaeological risk to large flood relief projects are delays to the construction programme, it is recommended that the archaeological testing is carried out as soon as it is feasible, well in advance of construction and site enabling works. The results of the testing will inform tender packages and construction stage programme and will allow for the appropriate timing of the archaeological resolution (excavation) to take place in advance of construction.

Mitigation of the impact of development on the archaeological resource can take the form of 'preservation by record' (full hand excavation, i.e., sterilisation of archaeological area); and 'preservation in situ' (excluded from development, i.e., avoidance through design in a location where the future protection and interpretation of the site can be assured) or a combination of both.

Where archaeological features revealed by the test-trenching, are directly impacted by the proposed works and cannot be avoided (preserved in-situ), they will be preserved by record by means of archaeological excavation, recording and publication of results. Archaeological excavation ensures that the removal of any archaeological soils, features, finds and deposits is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a

specified area (i.e., preservation by record). As archaeological excavation involves the removal of the archaeological soils, features, finds and deposits, following this mitigation measure there is no further impact on the archaeological heritage.

An archaeological testing strategy will be developed in consultation with the OPW Project Archaeologist or DLRCC appointed Archaeologist. A method statement and licence or consent applications will then be submitted to the NMS for review and approval.

Archaeological Excavation

The features identified in the compound area associated with the Kilgobbin Flood relief measure (AP1) will be stripped of topsoil under archaeological supervision and the exposed features be preserved by record through archaeological excavation. Archaeological excavation will be carried out in well in advance of the construction at the Kilgobbin Measure. The excavated area will be cordoned off and the remainder of the field be excluded from all activities including parking, storage etc.

13.5.5 Archaeological Monitoring

Earthworks

The construction phase will involve earthmoving activities including excavations for the construction of flood walls and provision of construction compounds and temporary roads. All earthmoving activities within AP1–AP9 will be subject to archaeological monitoring under licence from the NMS of the DHLGH. Archaeological monitoring will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface.

The licensed archaeologist will have provision to inspect all excavation to the formation level for the proposed works and to temporarily halt the excavation work, if and as necessary. They will be given provision to ensure the temporary protection of any features of archaeological importance identified. The archaeologist will be afforded sufficient time and resources to record and remove any such features identified.

In the event of the discovery of archaeological finds or remains, the NMS and the National Museum of Ireland (NMI) will be notified immediately. If features are revealed, the immediate area will be investigated, allowing no further development to take place until the site is fully identified, recorded and excavated the satisfaction of the statutory authorities. The provision (time and funding) will be made for the full recording and, if necessary, excavation of the archaeological material in compliance with any measures that the DHLGH and the relevant local authority deem appropriate. This possibility will be accounted for in the Project programme and budget and will be undertaken at the earliest phases of the development to allow the archaeologists sufficient time to record/excavate as required.

Dún Laoghaire Rathdown County Council will make provision to allow for, and to fund, the necessary archaeological monitoring, inspection and excavation works that will be needed on-site during and prior to construction, either directly or indirectly via the appointed contractor.

All archaeological issues will be resolved to the satisfaction of the OPW Project Archaeologist, or the DLRCC appointed Archaeologist, DHLGH and the NMI.

Dredged material

An archaeological assessment of dredged/excavated spoil that is removed from riverbeds, streambeds, will be carried out. This material can be very rich in archaeological materials and objects, including organic materials.

In accordance with the flood relief Guidelines, all dredged spoil from areas within the Zone of Archaeological Potential (i.e., ZoN) for an historic town is assessed by means of spreading, searching for objects, and metal detection (for metal objects). This should occur during the works associated with the Glenamuck Road North Roundabout in the vicinity of the medieval settlement of Carrickmines (AP4) and Kilgobbin flood measure

in the vicinity of the historic settlement of Kilgobbin (AP3). In order for artefacts to be accurately provenanced, where practicable, searching and metal detection should take place before bulk excavations occur, for instance where riverbeds have been temporarily dewatered and exposed. In the other areas of the scheme a 25% volume assessment of spoil is required. The NMS will consider the scaling up or down of this based on the on the artefactual retrieval results over an agreed time. A methodology for the spreading of the material in a location in proximity to the works area should be developed in consultation with the contractor.

Sufficient archaeological personnel need to be on site to monitor all aspects of works for an FRS, including work in water. Suitably qualified underwater archaeological personnel should be available to carry out rapid inspections following underwater discoveries to ensure assessment and stabilisation.

DLRCC is aware of their responsibility to fund all necessary archaeological work. All recommendations are subject to approval by the National Monument Service of the Department of Housing Local Government and Heritage and the local authority.

13.5.6 Construction / Traffic Management Plan

The construction phase will have a detailed Construction Plan and Traffic Management Plan which will include measures to protect cultural heritage receptors. This will include the provision of signage alerting construction workers to cultural heritage features, and depending on the nature of the ground may require light machinery or bog mats in certain areas.

13.6 Residual Impacts

Built and Cultural Heritage

A residual effect is determined to be the degree of change to the cultural heritage environment that will occur after the proposed mitigation measures have taken effect. No significant negative residual impacts have been identified either in the Construction or Operational Phase of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1.

Following mitigation, there will be no residual effect to the archaeological heritage of Carrickmines Shanganagh FRS measures. Potential impacts to archaeological heritage sites (RMP / SMR sites and AP sites (AP1–AP8)) will be mitigated by archaeological monitoring, which will include, if necessary, preservation in-situ or full archaeological excavation (preservation by record). The overall residual impact to archaeological heritage sites will be **No effect**.

The overall effect on the built heritage environment will be positive, as potential negative construction phase impacts are mitigated by design and by the positive effect of preventing / reducing flooding which would cause degradation of the built heritage. The overall effect of the proposed FRS will be a reduction in flood extents, which will have a **positive effect** on cultural heritage receptors.

At present the undefended flood extents includes Kilgobbin House (RPS 1684), Kilgobbin Villa (RPS 1688), Priorsland (RPS1746), Waterfall Cottage (RPS 1770) and the flooding of these sites can cause a degradation to these cultural heritage receptors and their setting. The proposed FRS measures will defend these sites from flooding. In addition, there are a number of historic structures within the rivers such as Shanganagh Bridge (RPS 1772) and other undesignated bridges and features (CH10, CH5, ADCO1) that are especially vulnerable to flood events which will be strengthened to withstand flooding events. The protection of these cultural heritage receptors from flood events serves as a mitigating factor to potential construction phase effects and effects to setting. These features will be positively affected by the proposed scheme, the residual impact will have a **Slight positive significance of effect**.

The potential impact to the cultural heritage character of the features within the Kilgobbin FRS measure is related to changes to setting. In addition to the retention features and the most visible/distinctive sections of the walls the impacts to setting can be mitigated with the use of stone cladding on the flood walls under a detailed conservation specification and method statement developed by the conservation engineer (RPS

Ref: 1684/CH1, CH2, CH3, CH4). The overall residual effect will be Neutral. This will also be the case at the Glenamuck Road North Measure (CH9, RPS 1746), and Bray North Measure (CH10) and the Commons Road Measure (RPS 1773, Shanganagh Bridge).

The granite built retaining wall (ADCO 7) within the river at the Bray Link Road North measure will be dismantled. Whilst the slight negative effect will not change the rubble stone from the demolished walls can be reused as stone cladding on the proposed river walls if suitable.

13.7 Interactions

13.7.1 Cultural Heritage and Landscape and Visual

Interactions with Landscape and Visual comprise the potential for impacts to setting and visual amenity of cultural heritage receptors. Consultation between both disciplines has taken place with regard to potential impacts on the built heritage of the Carrickmines-Shanganagh FRS area. A strategy was agreed comprising the use of stone cladding in areas of heritage value and visual amenity.

13.8 Potential Cumulative Impacts

The projects whose duration of permission overlaps with the likely construction period of the proposed development (i.e., 2025 onwards) are included developments listed in Chapter 16 of this EIAR have been reviewed for potential cumulative impacts.

No cumulative impacts to cultural heritage have been identified in the proposed scheme.

14 Landscape and Visual Impact Assessment

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development on landscape and visual amenity. Other effects of lower significance have been included in this assessment to better inform the decision-making process.

This chapter should be read in conjunction with the planning drawings, scheme layouts, and the Options Report, as well as verified photomontages and the Biodiversity and Cultural Heritage chapters of this report.

14.1 Methodology

The landscape and visual amenity chapter will examine the potential effects of the proposed development on views from residential properties and nearby open spaces, in terms of visual intrusion and visual obstruction and the impact on landscape character areas from the permanent physical changes to the site brought about by the development.

The Landscape and Visual Impact Assessment in the EIAR will involve consideration of aerial photography, emerging design drawings, relevant various publications, and reports, together with visits to the site and environs of the proposed development.

The Assessment will be carried out in accordance with:

- Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports
- Guidelines for Landscape and Visual Impact Assessment (GLVIA) as published by the Landscape Institute (UK) and the Institute of Environmental Management and Assessment (3rd Edition, 2013)

It will also consider the DLR County Development Plan 2022-2028 (CDP) and CDP's Landscape Character Assessment

This LVIA was carried out in May 2024. The LVIA is a combination of desk studies, field surveys and verified photomontages, the work was carried out by a team of landscape architects in JBA Consulting.

14.1.1 Photomontage Methodology

The verified photomontages have been produced in accordance with the GLVIA guidance and specifically the following:

- Photography and photomontage in landscape and visual impact assessment (Landscape Institute Advice Note 01/11, 2011)
- Visual representation of development proposals (Landscape Institute Technical Guidance Note 02/17, 2017).

The photomontages are included in Appendix 14.1 to facilitate the assessment of visual impacts. The locations for the photomontages have been agreed following liaison with the local planning authority to represent views of receptors of higher sensitivity, a range of distances, directions and locations where the verified photomontage would provide the required clarity on the magnitude of change to the view.

Following a review of the Proposed Scheme, desktop study and two site visits in April and May 2024, a number of key reference viewpoints in the immediate surroundings were identified, photographed and surveyed for the purpose of preparing photomontages to help illustrate the visual effects of the Proposed Scheme. They are illustrated in Appendix 14.1.

In conjunction with the guidelines mentioned above, additional guidelines inform the preparation of Photomontages for this LVIA.[139]

Verified photomontages were produced by external consultants using images taken on-site. The photomontages produced are verified and have been prepared in order to accurately illustrate the Proposed Scheme in the Operational Phase. They have been included to inform the reader of the location and size of the development. The assessment of impacts was based on the on-site observations of the surveyors and took into consideration the verified photomontages.

In addition to the verified photomontages, one separate visualisation was produced showing the view of the proposed flood wall on Commons Road. This visualisation shows the proposed highest increase in height along Commons Road, at the access point to No. 60 Commons Road. This visualisation is not verified, and is shown purely for illustrative purposes, i.e., it was not used in the assessment of landscape and visual impacts. This is shown in Figure 14.21 (existing view), and Figure 14.22 (proposed view).

The available datasets listed in Table 14.1 have been consulted in the analysis of the baseline environment.

Table 14.1: Data sources used in the LVIA

Name	Source	Description	Version
Ordnance Survey Ireland (OSI)	Geohive	Current and historical mapping	Accessed 2024
OSI	Geohive	Historical aerial imagery	Accessed 2024
Google	Google Maps	Mapping and aerial imagery	Accessed 2024
Microsoft	Bing	Mapping and aerial imagery	Accessed 2024
EPA	EPA Maps	Environmental datasets	Accessed 2024
National Parks and Wildlife Service (NPWS)	NPWS Maps and Data	Datasets provides information on national parks, protected sites and nature reserves	Accessed 2024
Department of Culture, Heritage and the Gaeltacht (DCHG)	Historic Environment Viewer	Database provides access to National Monuments Service Sites and Monuments Record (SMR) and the National Inventory of Architectural Heritage (NIAH)	Accessed 2024
DLR County Development Plan 2022-2028	Designated Views data, Record of Protected Structures Schedule	Datasets provided as part of DLR County Development Plan Maps	Accessed 2024

14.1.2 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from a proposed project, the following criteria are considered:

- Landscape character sensitivity.
- Magnitude of likely impacts; and
- Significance of landscape effects.

[139] Landscape Institute, (2019) Visual Representation of Development Proposals Technical Guidance Note 06/19 (under review January 2024)

14.1.3 Sensitivity of the Landscape

The sensitivity of the landscape to change is the degree to which a particular Landscape Character Area (LCA) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics.

Landscape Sensitivity, often referred to as 'value', and is classified using the following criteria which have been derived from a combination of industry guidelines from the Landscape Institute for Landscape and Visual Impact Assessment and professional judgement.

- **Very high** - Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are very high value landscapes, protected at an international level e.g., World Heritage Site, where the principal management objectives are likely to be protection of the existing character.
- **High** - Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national level e.g., National Park, where the principal management objectives are likely to be protection of the existing character.
- **Medium** - Areas where the landscape character exhibits a medium capacity for change in the form of development. Examples of which are medium value landscapes, protected at a Local or Regional level e.g., Open space areas mentioned within a County Development Plan, where the principal management objectives are likely to be protection of the existing character.
- **Low** - Areas where the landscape character exhibits a high capacity for change and has very few or no designated landscapes or open space areas; and
- **Negligible** - Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

14.1.4 Magnitude of Likely Landscape Impacts

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed project. The magnitude considers whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the boundary of the proposed project that may influence the landscape character of the area.

- **Very high** - Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of uncharacteristic new elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
- **High** - Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of uncharacteristic new elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
- **Medium** - Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of uncharacteristic new elements or features that would lead to changes in landscape character and quality.
- **Low** - Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
- **Negligible** - Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceptible.
- **Neutral** - Changes that do not involve the loss of any landscape characteristics or elements and will not result in noticeable changes to the prevailing landscape character; and
- **Positive** - Changes that restore a degraded landscape or reinforce characteristic landscape elements.

14.1.5 Significance of Landscape Effects

The significance of the landscape impact will be the combination of the sensitivity of the landscape against the magnitude of the change. It is summarised in Table 14.2 below.

Table 14.2: Significance of Landscape and Visual effects based on Magnitude and Sensitivity (Adapted from GLVIA, 2013)

	SENSITIVITY				
MAGNITUDE	Very high	High	Medium	Low	Negligible
Very high	Profound	Very significant	Significant	Moderate	Slight
High	Very significant	Significant	Moderate	Slight	Slight
Medium	Significant	Moderate	Slight	Slight	Imperceptible
Low	Moderate	Slight	Slight	Imperceptible	Imperceptible
Negligible	Slight	Slight	Imperceptible	Imperceptible	Imperceptible
Neutral	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Positive	Positive	Positive	Positive	Positive	Imperceptible

14.1.6 Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape.

Visual receptors most susceptible to changes in views and visual amenity are:

- **Very high** - Residents in properties within protected landscapes and travellers on a Scenic route where awareness of views is likely to be heightened.
- **High** – Residents in properties with predominantly open views from windows, garden or curtilage. People, whether residents or visitors, who are engaged in outdoor recreation including use of public rights of way, whose attention or interest is likely to be focused on the landscape and on particular views, and those on a scenic route where the view is not specifically in the direction of the proposed development.
- **Medium** - Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience, and communities where views contribute to the landscape setting enjoyed by residents in the area.
- **Low** - People engaged in outdoor sport or active recreation on a local scale, which does not involve or depend upon appreciation of views of the landscape; and people at their place of work whose attention may be focused on their work or activity, not their surroundings and where the setting is not important to the quality of working life, and people travelling in vehicles where their view is limited to a few minutes at any viewpoint; and
- **Negligible** - Changes affecting restricted viewpoints.

14.1.7 Magnitude of Visual Impact

The magnitude of a visual effect is determined on the basis of several factors: the relative numbers of viewers, the distance from the viewpoint, the visual dominance of the proposed development within a view and its effect on visual amenity, as follows:

- **Very high** - The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene.
- **High** - The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene.
- **Medium** - The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity.

- **Low** - The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene; and
- **Negligible** - The proposal would be discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene.

Magnitude can also be described as:

- **Neutral** - Changes that are not discernible within the available vista and have no bearing the visual amenity of the scene; and
- **Positive** - Changes that enhance the available vista by reducing visual clutter or restoring degraded features.

14.1.8 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix as used earlier in respect of landscape effects, see Table 14.2.

14.1.9 Impact Classification Terminology

Table 14.3 overleaf presents the Impact Classification Terminology as published in the EPA guidance document (EPA, 2022). Standard definitions are provided in this glossary, which permit the evaluation and classification of the quality, significance, duration, and type of impacts associated with a proposed development on the receiving environment. The term temporary and reversible are considered interchangeable in this report. Impacts that are expected to last less than a year are considered short-term.

Each impact is described in terms of its quality, significance, extent, duration & frequency and type, where possible.

Table 14.3: Impact Classification Terminology (EPA 2022)

IMPACT CHARACTERISTICS	TERM	DESCRIPTION
Quality of Effects	**Positive**	A change that improves the quality of the environment.
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation within the margin of forecasting error.
	Negative/ Adverse	A change that reduces the quality of the environment.
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 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.
Extent and Context of Effects	**Extent**	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions.
Probability of Effects	**Likely**	The effects that can reasonably be expected to occur because of the planned project, if all mitigation measures are properly implemented.
	Unlikely	The effects that can reasonably be expected not to occur because of the planned project, if all mitigation measures are properly implemented.
Duration and Frequency of Effects	**Momentary**	Effects lasting from seconds to minutes.
	Brief	Effects lasting less than a day.
	Temporary	Effects lasting less than a year.
	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.
	Reversible	Effects that can be undone, for example through remediation or restoration.
	Frequency	Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).
Types of Effects	**Indirect/ Secondary)**	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do-Nothing'	The environment as it would be in the future should the subject project not be carried out.
	`Worst case'	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable	When the full consequences of a change in the environment cannot be described.
	Irreversible	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents.

14.1.10 Cumulative Impact Assessment

The cumulative effect of a set of developments is the combined effect of all the developments taken together. Cumulative effects on visual amenity consist of combined visibility and sequential effects. Combined visibility occurs where the observer is able to see two or more developments from one viewpoint.

- Combined visibility may either be in combination (where several developments are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the developments).
- Sequential effects occur when the observer has to move to another viewpoint to see different developments. For example, this could be when travelling along roads or paths. The occurrence of sequential effects may range from frequently sequential (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to occasionally sequential (long time lapses between appearances, because the observer is moving very slowly and / or there are large distances between the viewpoints).

Cumulative landscape effects affect the physical fabric or character of the landscape, or any special values attached to the landscape.

- Cumulative effects on the physical fabric of the landscape arise when two or more developments affect landscape components such as woodland, dykes or hedgerows. Although this may not significantly affect the landscape character, the cumulative effect on these components may be significant – for example, where the last remnants of former shelterbelts are completely removed by two or more developments.
- Cumulative effects on landscape character arise from two or more developments. Housing developments introduce new features into the landscape. In this way, they can so change the landscape character that they can create a different landscape character type. That change need not be negative; some derelict or industrialised landscapes may be enhanced as a result of such a change in landscape character. The cumulative effects on landscape character may include other changes, for example trends or pressures for change over long time periods, which should form part of any consideration of a particular project.

The areas in which the FRS is proposed, contains built elements such as walls and therefore there is potential for cumulative effects on landscape and visual amenity.

14.1.11 Relevant Guidelines, Policy and Legislation

The assessment has been carried out with reference to the following legalisation, policy, and guidelines.

Legislation

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive);
- Planning and Development Act 2010, as amended;
- Planning and Development Regulations 2001, as amended; and
- European Landscape Convention 2000.

Policy

- DLR County Development Plan (CDP) 2022 – 2028;
- Landscape Strategy for Ireland 2015-2025 (NLS)

Guidelines

- Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA (2022);

- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), TII (2020);
- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads - Standard (PE-ENV-01102), TII (2020);
- Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) Guidelines for Landscape and Visual Impact Assessment (hereafter referred to as the GLVIA) 3rd edition (Landscape Institute and IEMA 2013);
- Landscape Institute Technical Information Note 05/2017 (Revised 2018) on Townscape Character Assessment (hereafter referred to as the TCA) (Landscape Institute 2018);
- Guidelines for treatment of tourism in an Environmental Impact Statement (Fáilte Ireland, 2011);
- Landscape Institute Technical Advice Note 06/19 (Landscape Institute, 2019).

14.1.12 Landscape and Visual Mitigation

Mitigation measures are likely to form an important part of the final scheme design in reducing landscape and visual impacts. Mitigation proposals may be developed to address impacts as they are determined as part of the appraisal and assessment process. This will be an interactive process. Where proposed mitigation measures are incorporated into the scheme design, they will inform further impact assessment, and this will in turn will inform refinement of the mitigation. Residual effects will also be assessed and described.

The levels of mitigation necessary will be mostly based on broad-scale quantification of effects on a landscape scale. Where significant localised effects are evident more detailed description of mitigation may be required, but this is likely to be limited to proximity to highly sensitive visual receptors. Mitigation within the scheme extents is likely to include the following:

- Providing visual screening between visually sensitive properties or areas of sensitive landscape character using a mixture of landform and/or planting with a high evergreen content;
- Creating or maintaining vistas or views towards focal points or features of local importance by introduction/ reinstatement of planting and/or the creation of earth mounding;
- Reconnection of severed and fragmented habitats and creation of green corridors and compensation plating.

14.2 Receiving Environment

14.2.1 Site Context

The DLR County Development Plan 2022 – 2028 defines the county such; *The landscape, and biodiversity of DLR represent some of the most important intrinsic assets of the County. Indeed, to a great degree they actually define the County. The extensive network of public parks and open spaces in the County, provide important areas for passive and active recreation, as well as key spaces for eco-systems and enhancement of biodiversity. The County is framed by its coastal and upland landscapes, and the diverse range of landscape character areas 'Between the Mountains and the Sea', testify to the variety of landscapes in what is the smallest administrative County in Ireland*

14.2.2 Landscape Character

DLR County Development Plan (CDP) 2022 - 2028 defines Landscape Character Areas (LCA) across the county. The study sites for the proposed FRS covers several areas of south County Dublin and are described in the CDP. The County is framed by its coastal and upland landscapes, and the diverse range of landscape character areas.

Since the Stepaside Action Area Plan (2000), the Kiltiernan/Glenamuck Local Area Plan (2013) and the Sandyford Urban Framework Plan, have led to a considerable amount of rural development in the area, creating a significant impact on the landscape from Kilternan through Stepaside and into Sandyford, which includes Clon Brugh, Belarmine and Kilgobbin Road, 3no. of the locations within the FRS.

The Planning and Development (Amendment) Act, 2010 defines landscape as per Article 1 of the European Landscape Convention (ELC) (2000) "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".

The ELC definition introduced the concept of landscape as a dynamic system, not just confined to the countryside; but including urban, peri-urban and rural areas, and encompassing land, inland waters, coastal and marine areas.

The extensive network of open spaces and public parks across the County, provide important places for active and passive recreation, along with some key areas identified for eco-systems and enhancement of biodiversity. The county's landscape, biodiversity and cultural heritage serve as a valuable, economic resource.

These 3 areas that make up the proposed FRS are part of the Landscape Character Assessment from Appendix 8 (CDP 2022 – 2028) and described below:

Shanganagh

"This enclosure is essentially the area between Shankill and Bray which takes in the cemetery at Shanganagh, Shanganagh Park and Woodbrook golf course. This enclosure also includes the land to the west between the Dublin Road and the N11. The Dublin Road from Shankill to Bray traverses this enclosure. Big houses include The Aske, Beauchamp, Wilford, Woodbrook and Shanganagh House. When viewed from Killiney Hill and also from Carrickgollogan this area belt is effectively indistinguishable from the overall plain. The entire expanse appears to be dominated by low-density housing. When viewed from the Dublin Road, the trees prevent any sense of a vista but instead provide for a tree lined Avenue. This enclosure sits between the urban and the rural landscapes and is capable of accommodating development".

Carrickmines

"Motorway to the north, the Glenamuck Road to the South and the Enniskerry Road to the west. The most dominant visual feature of this enclosure is the new 50-acre Retail Park at Carrickmines intersection of the M50. The former Ballyogan landfill which is ear marked for future development as a park is located at the edge of the built-up area of Dún Laoghaire-*Rathdown and functions as a buffer between the more densely built-up area of Leopardstown/Stepaside and the lower density suburban generated housing area of Kiltiernan. This enclosure is visible from a height adjacent to Dingle Glen pNHA. From this viewpoint one gets a clear view of the enclosure. The impact of the multitude of urban uses – the tiphead, retail park, pylons and houses on the landscape is evident"*.

Cherrywood/Rathmichael

"This area was originally outlined in the Landscape Character Assessment Study as it was an area undergoing significant change with the introduction of the Luas B1 line and the development of the Cherrywood Science and Technology Park. This area is now subject to the Cherrywood Strategic Development Zone (SDZ) Planning Scheme which was adopted by An Bord Pleanála in April 2014. Development in this area will be in accordance with the adopted SDZ Planning Scheme".

14.2.3 Site of Proposed Development

The full description of the Proposed Site Locations and Context of the proposed scheme is provided in Chapter 3 of the EIAR.

The proposed scheme stretches across the following locations, the Shanganagh River, Carrickmines River, Bridges Glen River, Ballyogan Stream to the Kilgobbin Stream within Dun-Laoghaire Rathdown County Council. The sites contained in this report are broken into sub-categories and named as follows:

- Defence 1. Clon Brugh
- Defence 2. Kilgobbin Road
- Defence 3. Belarmine Park

- Defence 4. Glenamuck Road
- Defence 5. Cherrywood Road
- Defence 6. Lower Brides Glen Road
- Defence 7. N11 Culvert
- Defence 8. Commons Road
- Defence 9. Bayview
- Defence 10. Bray Road

Proposed defences are described in Chapter 3 of the EIAR.

14.3 Potential Impact of the Proposed Scheme

14.3.1 Context of Potential Impacts

As described in the methodology, the impacts to the landscape and visual amenity have been assessed based on the sensitivity of the receptor and magnitude of change. This assessment as part of an EIAR is focused on potential significant impacts, and secondarily on impacts of lower significance.

Receptor groups were identified during the initial desktop investigation using aerial imagery and verified on site during the site visit. Receptors were grouped in terms of function, i.e., residential buildings, community buildings, public open space, etc., location and expected significance of impact. See Figures 14-16 to 14-20 for the Visual Receptor Plans, which show the identified receptor groups.

These receptor groups are discussed in below, with an assessment of the effects on their visual amenity. 8 (No.) verified photomontages have been produced showing the expected visual impact of the proposed development from selected points in public locations along the scheme.

This provides a sense of the degree of screening and magnitude of change to these views as a result of the proposed development. The compendium of photomontages is presented in Appendix 14.1 of the EIAR. Photomontages are also shown below the discussion of visual impacts.

Impact Duration is considered permanent if a receptor had a distinct alteration to the horizon line or if views of a structure would continue to remain visible. During assessment, the landscape was also considered in the context of permanency. For example, retained mature trees were considered permanent, with management and evolution. Naturally colonising vegetation will in the short- to medium-term become a permanent screening feature due to size and density and presence in the vicinity of the proposed development.

Type of Impact was considered positive only if the proposals contribute to the character of the locality and would not be detrimental to the landscape or visual amenity. An adverse *Type of Impact* might occur if the proposals diluted the character, perception or had a detrimental impact on the view.

Do-nothing. Under the do-nothing scenario the landscape character and visual amenity of the areas would be unchanged, and they would continue to be susceptible to flooding. During flood events, public open spaces and residential areas could be flooded, resulting in periodic adverse impacts on landscape and visual amenity during flood events.

During construction, the placement of compounds in open spaces, such as at Belarmine Park, located within the park, will lead to adverse impacts on the landscape the character of these spaces. These impacts will be short-term and temporary.

Predicted impacts are summarised in Table 14.4 divided into each location and consider each specific proposed defence location and context.

14.3.2 Landscape Impact Assessment

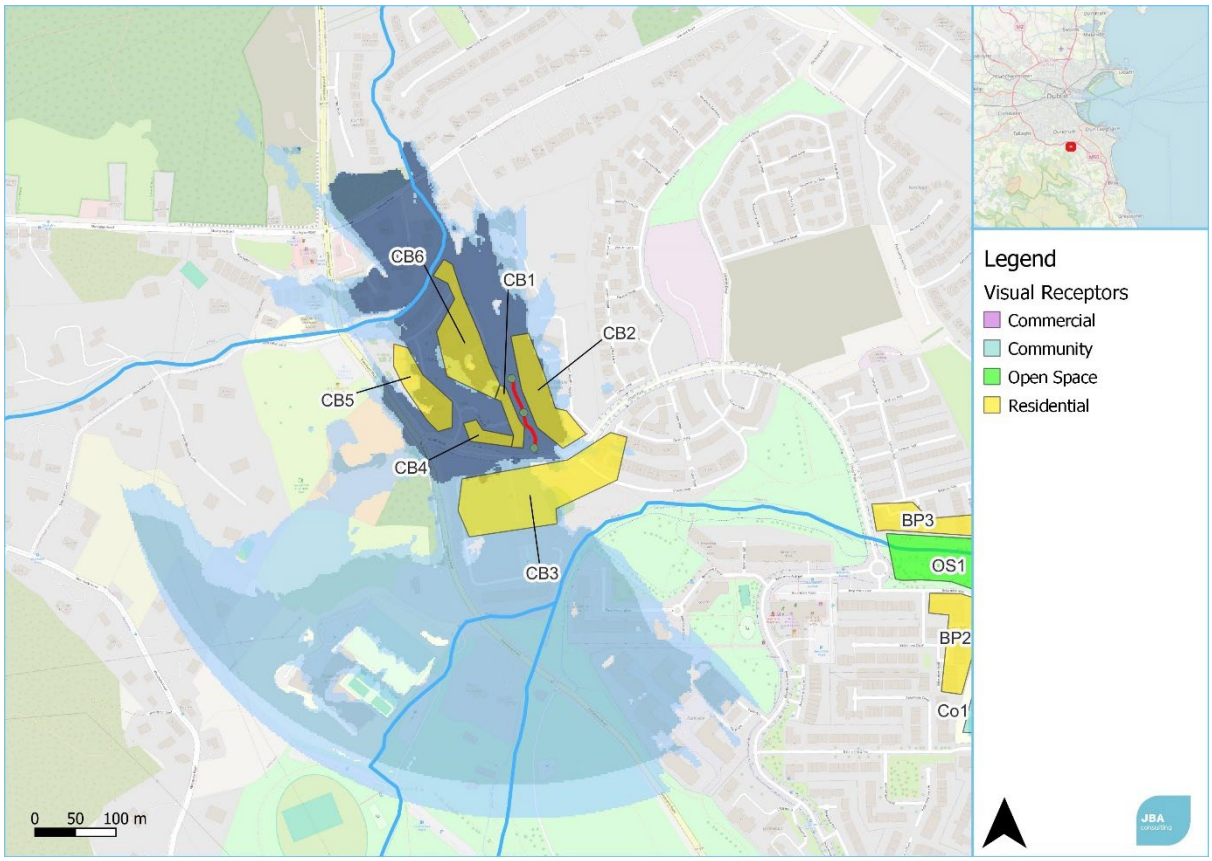

Figure 14.1: Map showing receptor groups in Clon Brugh.

Clon Brugh – 1.A, 1.B

The proposed Flood Defence is located within the residential development of Clon Brugh, off the Enniskerry Road in Sandyford, Dublin 18. A small area of a much larger development consisting of town houses and apartments bounded to the north and east by an unmanaged hedgerow, and amenity strip. The area adjacent to the buildings are landscaped with semi-mature trees and shrubs planting. A natural stone wall approx. 1m high is located between the residences and the hedgerow, with a grassed swale and mown grass. The proposal here is to contain any overflow from the Carysfort-Maretimo stream.

The landscape of the residential development at Clon Brugh is not considered sensitive and has no designated or protected structures located within the site. The nearest designated monument is located 0.12km from the proposed site (DU022-068 House 16th/17th century: Woodside) and is not expected to be affected by the works.

Sensitivity Landscape sensitivity is Low.

There is no proposed removal of the existing hedgerow within this area. The removal of 2no. planted trees in the area adjacent to the residences, will be necessary for the re-alignment of a small section of the existing wall and a further 1no. tree to accommodate the proposed flood wall further to the east. The surrounding landscape mainly consists of planted trees with green amenity spaces located throughout the residential development and adjacent developments.

The location of the proposed wall within Clon Brugh, limits any potential for impact on landscape character. The proposed defence will be confined to the upgrading of the existing wall (approx. 201m) and the installation of the proposed wall (approx. 97m) further south. As such the proposed defence will be placed in an area that already contains a similar built feature, in this case a wall.

Magnitude The landscape will only be disturbed in the short term during the proposed upgrading of the existing stone wall and the construction of the proposed wall. The magnitude of change will be *Negligible*.

Effect In accordance with Table 14.2 the significance of the visual effect will be *temporary, negative, slight* during construction and *permanent, negative, imperceptible* after installation.

Figure 14.2: Images of Clon Brugh existing stone wall to be upgraded and re-aligned.

Belarmine Park – 2.B, 2.D

Belarmine Park is a small open green space with housing to the north (Grianan Fidh) east, (Sandyford Hall), west, (Belarmine Copse) and Stepaside Educate Together National School to the south. Mature trees are present along with an infiltration pond, groups of vegetation and pedestrian routes through the parkland. The area is a well-used local amenity and as such has a value to the local area. The local National School is located adjacent to the park, as well as a number of apartments buildings who overlook the park.

The proposed defences are being placed in an area which already contains built features, such as boundary wall to the eastern residences of Sandyford Hall, which will be upgraded there will be no permanent alteration to their view, only a temporary one. The proposed wall along the eastern end of the park, adjacent to the existing culvert will be approx.37m.

The landscape of the residential development at Belarmine is not considered sensitive. An Archaeological feature (DU026-161 Burnt mound: Kilgobbin) is located (approx. 0.18km/ 0.25km) from the existing wall and is integrated into the landscape of the park. There will be no impact on the feature.

Sensitivity Landscape sensitivity is deemed *Low*.

Magnitude The national school and residences adjacent to the park, have their front aspect facing directly into the park. The primary landscape will only be disturbed in the short term during the proposed upgrading of the boundary wall, to the residences along the northeast of the park in Sandyford Hall, 2no. trees will be removed to facilitate the works. Thereafter the existing vegetation will reinstate and remove any further visual impact. The removal of 3no. trees at the location of the proposed wall to be built to the east, will allow partially availability through angled views, glimpsed through retained vegetation. The magnitude of change will be *Negligible*.

Effect In accordance with Table 14.2 the significance of the visual effect on the landscape will be *temporary, slight,* adverse during construction of the proposed flood wall and *permanent, imperceptible* after installation.

Figure 14.3: Map showing receptor groups in Belarmine Park and Kilgobbin Road

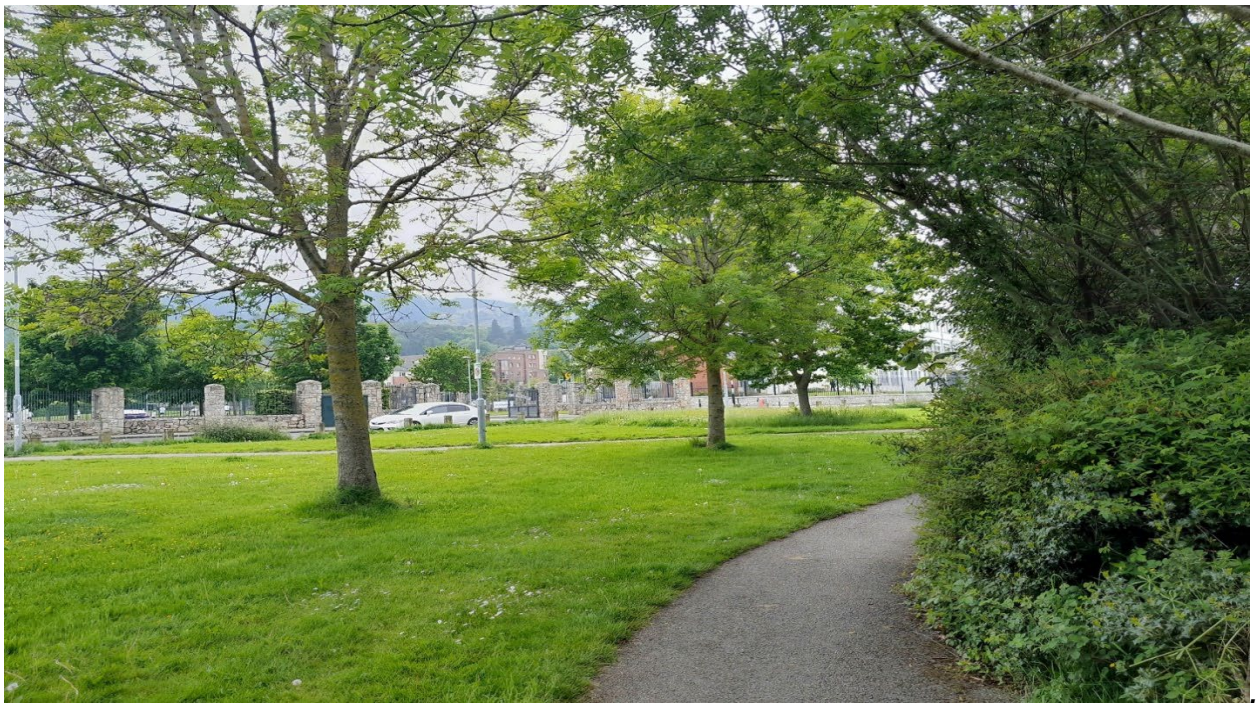

Figure 14.4: Image of Belarmine Park showing location of proposed defence wall adjacent to the footpath on the right.

Figure 14.5: Image of Belarmine Park showing location of existing boundary wall to the rear gardens of Sandyford Hall.

Kilgobbin – 2.E, 2.G

The proposed measures on Kilgobbin road, will run along the boundary of Kilgobbin House (RPS 1684), and the adjacent property of 'Riverside', it will be culverted beneath Kilgobbin road. Both properties exhibit mature landscaped gardens. To the west of 'Riverside' a greenfield site, appears to be used for animal grazing during certain periods.

The existing historic boundary wall of Kilgobbin House, will be removed and reconstructed, re-using the existing natural stone, with a new flood defence wall (approx.37m) to match the existing finish and heights. The proposed flood defence will be located on the right bank upstream of Kilgobbin Road Bridge.

The other properties along this stretch of the Kilgobbin Road are mainly detached residences with large mature gardens and high vegetated frontage. Buildings adjacent to Kilgobbin House, include agricultural sheds, most properties along this stretch of the road exhibit natural stone boundary wall, approx. 1m to 1.8m in height, including Kilgobbin House (approx.1.5m) and 'Riverside' (approx.1m).

Sensitivity Landscape sensitivity is deemed *Low*.

Magnitude The main impact will be to the private garden of Kilgobbin House and Riverside, as the proposed works would be largely on and adjacent to the property, no significant impact is expected to the wider landscape. The magnitude of change on the landscape area would be *Low.*

Effect In accordance with Table 14.2 the significance of the landscape effect will *temporary, negative, moderate* during construction and *permanent, negative, imperceptible* after installation.

Figure 14.6: Image of Kilgobbin Road (Private Garden of 'Riverside') showing location of existing Historic Wall to be removed and reconstruct. A proposed defence wall will be located within the private garden.

Figure 14.7: Image of Kilgobbin Road (Private Garden of 'Riverside') showing location of existing Historic Wall.

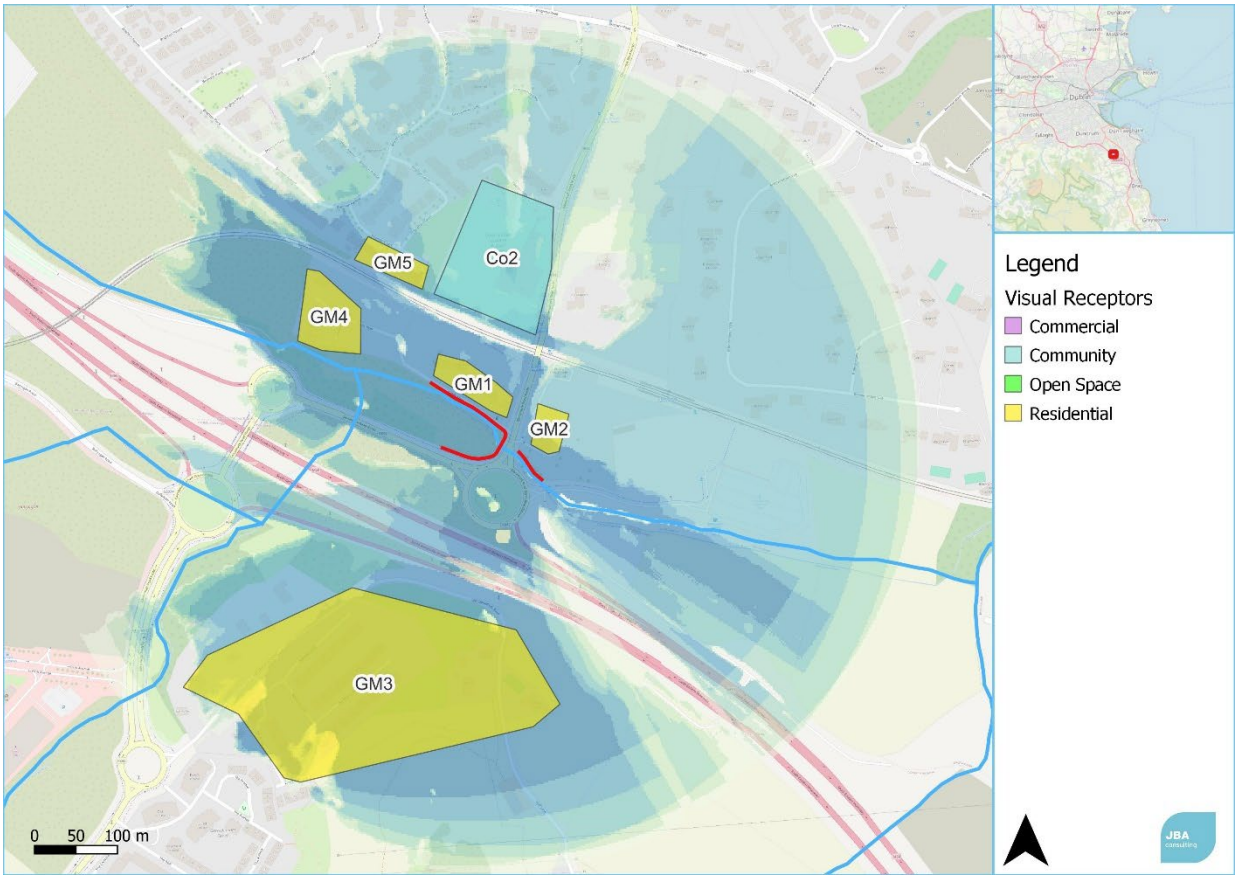

Figure 14.8: Map showing receptor groups in Glenamuck Road.

Glenamuck Road North Roundabout - 3.A

The proposed area for the FRS is a busy link road between Glenamuck Road North and the M50 Junction 15, with access also to the Carrickmines Luas Park and Ride, and residential properties at Castle View,

Ballyogan Grove and east of the Glenamuck Road North roundabout. The existing walls at Castle View, Ballyogan Grove and Priorsland House have existing vegetation along them, including mature trees.

Behind the existing stone wall along Castle View and Ballyogan Grove a line of mature trees and understorey planting sit along the banks of the Shanganagh River. 10no. trees will need to be removed in order to facilitate the scheme. The existing wall (approx. 87m) along Castle View and Ballyogan Grove will be upgraded and raised, to match the proposed new walls to the adjacent property 'Priorsland'. The proposed (approx. 32m) flood wall will be installed adjacent to the footpath at Priorsland House. The House itself boast large, landscaped garden with mature trees and shrubs to the frontage along the location of the proposed defences.

Sensitivity Landscape sensitivity is deemed *Low*.

Magnitude The main impact will be along the existing stone wall on Castle View and Ballyogan Grove, due to of removal of some trees and vegetation. The magnitude of change on the landscape here would be *Negligible to locally Medium.*

Effect In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, moderate* during construction and *permanent, negative, slight to locally moderate* after installation.

Figure 14.9: Image of Glenamuck Road showing location of Priorsland boundary along the river.

Figure 14.10: Image of Castle View off Glenamuck Road adjacent to Priorsland.

Figure 14.11: Image of Ballyogan Grove from Castle View.

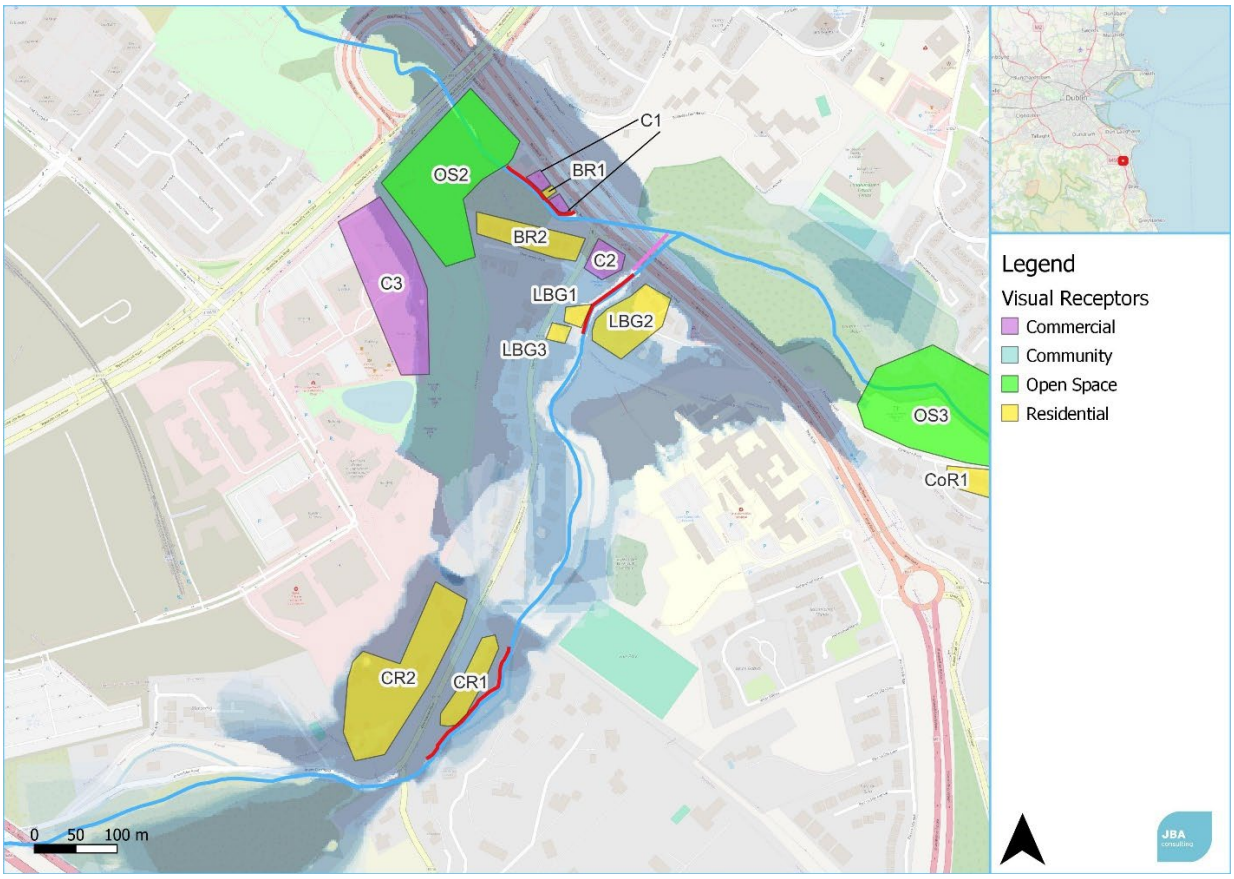

Figure 14-12: Map showing receptor groups in Bride's Glen, Cherrywood, and Bray Road

Cherrywood Road – 4.A

The proposed works are within the gardens of 3 no. existing detached residential properties. Mature trees and vegetation are present along both sides of the Loughlinstown River South at this location. A woodland area stands between several large, detached properties off the Falls Road on the opposite side of the river. The river has a riparian corridor here consisting of mature trees and other vegetation. Immediately downstream of this point, the river flows beneath the Cherrywood Viaduct, which is a protected structure (RPS No. 1783).

The properties all contain large mature landscaped gardens with their eastern boundary to the river. 7no. trees will need to be removed to facilitate the works of the proposed flood wall, along the left bank, approx. 173m.

Sensitivity Landscape sensitivity is deemed *Low.*

Magnitude The main impact will be along the left bank of the river due to of removal of some trees and vegetation. This is only impacting a limited area within the wider landscape character. The magnitude of change on the landscape here would be *Low.*

Effect In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, moderate* during construction and *permanent, negative, slight* after installation.

Lower Brides Glen – 4.B

The proposed defence wall will be constructed within a private garden (Waterfall Cottage) off the Cherrywood Road. The detached residence has a large, landscaped garden that surrounds the property with a clear boundary to the edge of the Carrickmines River. The defence wall will be approx. 129m and approx. 1.1m. high it will traverse the river's edge along Waterfall Cottage and an additional 3no. residential property further upstream with some mature tree cover to the river side and beyond.

Sensitivity Landscape sensitivity is deemed *Low*.

Magnitude The main landscape impact will be the proposed wall along the riverbank at Waterfall Cottage. The magnitude of change on the landscape would be *Medium* here and further upstream the magnitude would be *Low.*

Effect In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, moderate* during construction and *permanent, negative, slight* after installation.

Figure 14-13: Image of vacant cottage and 'Waterfall Cottage'

Figure 14-14: Image of 'Waterfall Cottage' existing embankment wall.

N11 Overflow Culvert – 4.C

The current proposal allows for the installation of an overflow culvert to the Loughlinstown River South under the N11. The construction of a new pipe open sewer under the N11, north of the existing culvert will include headwalls and ancillary works. Due to the proposed works a cluster of trees on the northside of the N11 will need to be removed to facilitate the works. At this point the N11 is joined by a merging lane and an extended cycle/foot path back dropped by woodland tree planting to the north side of the carriageway.

Sensitivity Landscape sensitivity is deemed *Low*.

Magnitude The main landscape impact would be *Negligible.*

Effect In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, slight* during construction and *permanent, imperceptible* after installation.

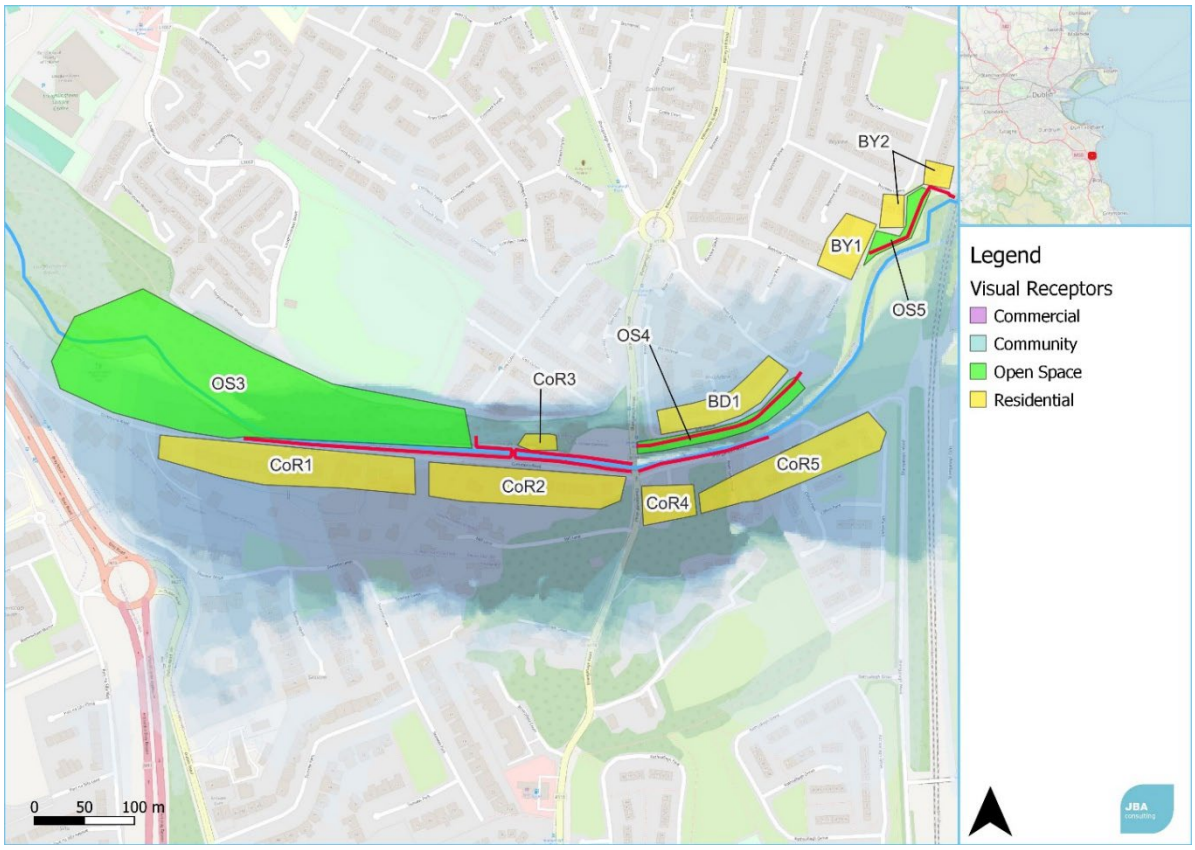

Figure 14.12: Map showing receptor groups in Commons Road, Brookdene and Bayview

Commons Road and Brookdene – 5.A

Commons Road runs adjacent to a section of the Shanganagh River, mainly residential, with numerous private detached properties located along the road, a wooded area sits along the river and the Loughlinstown Pitch & Putt to the north.

The defence consists of an existing flood wall running along part of Commons Road and Shanganagh Wood, on the right bank of the Shanganagh River. The wall is mainly hidden by trees and scrub vegetation that grow along both sides of the river forming a wooded area behind, 1no. private residence is located towards the eastern end of Commons Road with access across the river. This flood wall will be upgraded and raised, along with a new flood wall built to match at the western end of the area. No trees are to be removed at this location.

Brookdene is a residential development consisting of semi-detached properties, a large green open space with trees planting is situated between Brookdene and the adjacent River Lane development of Clifton Park. The proposed flood wall will be located on the north side of the river, in the green open space, between an existing treeline/woodland and the internal development road. No trees are proposed to be removed at this location. Planting along the wall would assist in softening the expected impact.

Brookdene, the residential development where a proposed flood wall is to be installed along the open green area between the river and the facing residences. The wall will be approx. 1.2m high and pocket planting along the length could soften any expected impact within the development.

Engineering work on the Shanganagh Road Bridge will also be required to secure the proposed defences.

Sensitivity Landscape sensitivity is deemed *Medium.*

Magnitude The main landscape impact would be *Medium.*

Effect In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, moderate* during construction and *permanent, negative, slight* during operational phase.

Figure 14-16: Image of bridge on Shanganagh Road

Figure 14-17: Image of Commons Road with heavy growth along the river embankment

Figure 14-18: Image of open embankment to the west end of Commons Road

Bayview – 5.C

Bayview is a residential development located in Hackettsland, Killiney. The landscape is of typical residential format, with grass verges and open green amenity spaces containing landscaped planting. The proposed flood wall will be in an existing green open space that runs between Bayview Lawns and Bayview Glen. The boundary wall of No. 20 Bayview Lawns will be upgraded, 2no. trees will need to be removed to facilitate the work.

The proposed wall will be approx. 120m with heights from approx. 1.1m to 1.8m high, adjacent to the river in Bayview Lawns. The area is used by residence as a walking track, dog walkers frequent this stretch of the development along the river. The remaining trees and access to the wider green space will be retain after construction.

Sensitivity Landscape sensitivity is deemed *Low*.

Magnitude The main landscape impact would be Low.

Effect In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, slight* during construction and *permanent, negative, imperceptible* after installation.

Figure 14-19: Image of grassed access from Bayview Glen to Bayview Lawns.

Figure 14-20 Image of grassed amenity space in Bayview Glen along the river

Bray Road – 5.D

The proposed defences on Bray Road, are to be constructed along the rear of commercial premises adjacent to the open space which is private. The proposed defence location is generally not accessible to

the public but is partially visible from residences in Cherrywood Park and the open green space to the west. The open space landscape consists of semi-natural grassland and tree planting. **Giant Hogweed** is present and signage is currently provided for users. The flood wall will run to the rear of the properties, approx. 99m along the left bank of the Loughlinstown River North. The removal of 8no. trees on the left and 2no. on the right bank along this stretch of the river will be required to facilitate the proposed flood wall.

Sensitivity

Landscape sensitivity is deemed *Low*.

Magnitude

The main impact will be along the left bank of the river due to of removal of trees and vegetation. The magnitude of change on the landscape here would be *Negligible.*

Effect

In accordance with Table 14.2 the significance of the landscape effect will be *temporary, negative, slight* during construction and *permanent, negative, imperceptible* after installation.

Table 14.4: Landscape Impact Assessment

Proposed Development Area	Sensitivity	Magnitude of change	Predicted impact and duration	
			Construction	Operation
Clon Brugh	*Low*	*Negligible*	*Temporary, negative, slight*	*Permanent, negative, Imperceptible*
Belarmine Park	*Low*	*Negligible*	*Temporary, slight negative,*	*Permanent, Imperceptible*
Kilgobbin Road	*Low*	*Low*	*Temporary, negative, moderate*	*Permanent, negative, Imperceptible*
Glenamuck Road	*Low*	*Negligible*	*Temporary, negative, moderate*	*Permanent, negative, Imperceptible*
Cherrywood Road	*Low*	*Medium - Low*	*Temporary, negative, moderate*	*Permanent, negative, Slight*
Lower Brides Glen Road	*Low*	*Low*	*Temporary, negative, moderate*	*Permanent, negative, Imperceptible*
N11 Culvert	*Low*	*Negligible*	*Temporary, negative, slight*	*Permanent, Imperceptible*
Commons Road	*Medium*	*Negligible*	*Temporary, negative, moderate*	*Permanent, negative, Slight*
Bayview Glen	*Low*	*Low*	*Temporary, negative, slight*	*Permanent, negative, Imperceptible*
Bray Road	*Low*	*Negligible*	*Temporary, negative, slight*	*Permanent, negative, Imperceptible*

14.3.3 Summary of Landscape Impacts

The locations of the proposed development, within the county, is expected to limit its potential for impacts on landscape character. The proposed defences are to be placed in areas which already contain similar built features. The proposed development will provide flood protection to existing channels; open areas of floodplain will continue to flood but in a more controlled manner, ensuring this aspect of landscape character in the area remains unchanged once the scheme is operational. This will also ensure that existing open spaces in the area around the locations will remain as such.

None of the location of the proposed defences for the FRS are classified as sensitive. The proposed works are very localised and therefore, it is unlikely that the proposed development will have any impacts on any sensitive areas due to distance.

The landscape sensitivity is deemed *Low* along the proposed scheme route. These are small scale proposals, strategically sited to provide localised interventions. The magnitude of change is likely to be *low* to *negligible*, with the main impacts occurring during construction due to the transportation of materials and

localised works. The operational phase will include new low/ medium height walls and a small increase in wall height located on rear boundaries to residential properties and carriageways.

The predicted landscape impact of the proposed developments along the Carrickmines – Shanganagh River corridor, is on balance *temporary, negative, slight* during construction and *long-term, negative, slight to imperceptible* during operational phase, due to the small scale and strategic siting of the proposed works. Detailed information on each location is described above.

14.3.4 Visual Impact Assessment

In order to identify the locations where visual receptors might experience changes to their views, the Zone of Theoretical Visibility (ZTV) was examined at a proportionate distance of 500m from the proposed development. This distance was deemed proportionate in this occasion given the low level and reduced extents of vegetation removal, the height of the proposed development, the site context and the elevation of the location that it is proposed in.

It would be expected that the landscape and visual effects of the potential project can extend outside the study area as well as the ZTV For these receptors the effect is not expected to be significant and have therefore been excluded from this assessment.

Receptor groups were identified during the initial desktop investigation using aerial imagery and verified on site during the site visit. Receptors were grouped in terms of function, i.e., residential buildings, community buildings, etc., and location. Visual amenity is primarily on a local or household scale, with residences in the area comprising short distance views, enclosed to each specific housing estate.

Motorists and users of the roads network are considered receptors of low sensitivity. With the absence of scenic routes as well as the low intervention to the existing environment of the proposed measures, the visual impact on these receptors throughout the scheme is expected to be slight at the highest. Therefore, they will not be further assessed in detail below.

The Visual Receptor Maps in Figure 14.1, Figure 14.3, Figure 14.8, and Figure 14.12 in the sections above show the identified receptor groups. These receptor groups are discussed in detail below and summarised in Table 14.5 with an assessment of the effects on their visual amenity.

14.3.5 Visual Receptors

CB 1 - CB 2.

These receptor groups comprise an apartment building in Clon Brugh facing the existing wall and the elevated Dun Gaoithe residential development to the east. The primary views for both are partially screened by the hedgerow and trees bounding the proposed defence location in Clon Brugh. Lower terraced vegetation to the east does not allow a sufficient distance to be discernible from Dun Gaoithe.

Sensitivity – Residents at home and visitors are the main receptors in these locations. Passersby on the Village Road may perceive an elevated view of the wall. Sensitivity is *high*.

Magnitude – Most receptors have side or angled views to the proposed defence. The existing wall shall remain and is expected to partially screen the proposed wall. The magnitude of the change is considered *negligible*.

Effect - The proposed defences are expected to be discernible within the available views and are not expected to detract from the overall visual amenity. In accordance with the methodology, the significance of visual effects are expected to be *temporary, negative, slight* during construction, and *permanent, slight,* adverse during operation

CB 3

This receptor group comprises apartment buildings and houses south of Clon Brugh, on the southern side of Village Road, with north-facing views of the site of the proposed wall beyond Village Road. The view is further broken by the terraced vegetation to the east in Dun Gaoithe,

Sensitivity – Residents at home are the main receptors. Passersby on the Village Road may perceive an elevated view of the wall. Sensitivity is *high.*

Magnitude – Most receptors are expected to have angled or elevated, partial and filtered views into the location of the proposed defences. The terraced vegetation to the east in Dun Gaoithe filters and screens views of the proposed wall reducing any expected changes to allowed views. The magnitude of the change is *low.*

Effect - The proposed defences are expected to be discernible within the available views and is not expected to detract from the overall visual amenity. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* during operation

CB 4 – CB 5.

These receptor groups comprise apartment buildings in Clon Brugh behind other buildings and have very limited views towards the direction and into the location of the proposed defences. The primary views for both are partially screened by apartment buildings adjacent to the proposed defences.

Sensitivity – Residents at home are the main receptors in these locations. Sensitivity is *high*.

Magnitude – A small number of receptors would have distant views to the proposed defence. The existing wall shall partially screen the proposed wall. The magnitude of the change is considered *negligible*.

Effect - The proposed defences are expected to be discernible within the available views and is not expected to detract from the overall visual amenity. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation

CB 6.

This receptor group comprises residences in Clon Brugh facing the existing wall and the hedgerow to the east adjacent to Dun Gaoithe. The primary view is directly east, therefore only angled views of the proposed defence to the south are available.

Sensitivity – Residents at home and visitors are the main receptors in these locations. Sensitivity is *high*.

Magnitude – All receptors have side or angled views to the proposed defence. The existing wall shall remain and is expected to partially screen the proposed wall. The magnitude of the change here is considered *negligible*.

Effect - The proposed defences are expected to be discernible within the available views and are not expected to detract from the overall visual amenity. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation

BP 1.

This receptor group comprises semi-detached residential homes In Sandyford Hall, the rear garden walls bounding Belarmine Park. The existing wall is to be retained and upgraded. The views from the residences are not expected to be altered in the long-term. The proposed wall will replace the existing garden walls of these houses, which already constrains potential views into the park from their downstairs windows.

Sensitivity – Residents at home, visitors, public using the park for amenity and the adjacent Schools and are the receptors in this location. Sensitivity is *high*.

Magnitude – The proposed wall will replace the existing garden wall of these houses. The magnitude of the change is considered *negligible.*

Effect - The proposed defences are expected to be visible from these receptors but will have the same effect on their views as the existing wall. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

BP 2.

This receptor group comprises residential properties in Belarmine Heights, their rear garden walls bounding Stepaside Educate Together NS. The views into the park from the residences are distant. The proposed wall is at the far side of the park to this receptor group, with intervening vegetation present.

Sensitivity – Residents at home and visitors. Sensitivity is *high.*

Magnitude – Receptors in Belarmine Heights shall only view the proposed wall from an angled distance, with existing vegetation in the park providing filtering. The magnitude of the change is considered *negligible* to *neutral.*

Effect - The distance and angle mean that the available views into the park are not expected to be affected by the proposed wall. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

BP 3.

This receptor group comprises residential properties in Grianan Fidh, the side elevations of some properties bound Belarmine Park to the south with a few having rear views into the park. The angle, distance and vegetation from the proposed wall is considered sufficient to limit any visual effect on these properties in the long term.

Sensitivity – Residents at home and visitors. Sensitivity is *high*.

Magnitude – Receptors in Grianan Fidh shall only view the proposed wall from an angled distance, with intervening vegetation providing further filtering. The magnitude of the change is considered *negligible* to *neutral.*

Effect - The distance and angle mean that the available views into the park are not expected to be affected by the proposed wall. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

OS 1.

This receptor includes Belarmine Park. This area is shown in Photomontage 1 in Appendix 14.1, and below in Figure 14.13.

Sensitivity - The main receptors are members of the public, who use this amenity as a leisure space and frequent it at regular intervals. The softer views are part of the amenity offered in this location. Sensitivity is *medium.*

Magnitude – The upgrading of the boundary wall to Sandyford Hall is not expected to create any long-term visual effect on the landscape. The proposed defence wall is located within existing deciduous vegetation, to the west end of the park and will be adjacent to the footpath. Due to the fact that other built structures lie within setting of the proposed wall, any degrading impact on the overall landscape is expected to be insignificant. The users of the park will only view the proposed wall for a short stretch within the park. In

addition to this, the proposed wall will replace an already existing wall. The magnitude of the change is considered *negligible.*

Effect –. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, adverse imperceptible* during operation.

Co 1.

This receptor group comprises 2 no. Schools, Stepaside Educate Together NS and Gaelscoil Thaobh na Coille. The schools are situated south of Belarmine Park with some views into the park.

Sensitivity - The pupils and teachers at the schools are the receptors. Sensitivity is *low*.

Magnitude – The pupils, teachers and visitors to the school are transient receptors and do not have a direct view of the proposed wall. The proposed wall will replace an existing wall and is partially filtered from the schools by existing vegetation. The height and location of the proposed wall within existing deciduous vegetation will limit visual impact and not detract from the overall view. The magnitude of the change is considered *negligible* to *neutral.*

Effect - In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

KG 1.

The receptors are the residents and visitors to Kilgobbin House (RPS 1684), a large, detached residence on Kilgobbin Road. The front and west boundary walls are old, rumbled stone, behind lay mature gardens, with shrub and tree planting. The southern boundary wall of the garden of Kilgobbin House (adjacent to the river) is shown in Photomontage 2 in Appendix 14.1, and below in Figure 14.14.

Sensitivity – Main receptors are residents at home. Sensitivity is *high*.

Magnitude – The proposed works include the dismantling, upgrading and reinstating of part of the wall along the western boundary with 'Riverside Cottage'. The proposed wall is expected to be visible from inside the house at an angle and filtered through existing vegetation. The proposed wall will be visible by vehicular traffic and passersby on Kilgobbin Road, however these views will be limited and interim in nature. The proposed wall will be similar in appearance and scale to the existing stone wall. The magnitude of the change is considered *negligible.*

Effect - In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

KG 2.

This receptor group are the residences in the Castle Grove residential development off the Ballyogan Road where rear garden boundary walls face toward the proposed works. The bult structures and mature tree canopy between Castle Grove and Kilgobbin Road ensure that no views towards the proposed works location are available.

Sensitivity – Residents at home. Sensitivity is *high*.

Magnitude – Receptors in these properties are not expected to have views toward the proposed works on Kilgobbin Road, due to the vegetation and built environment partially or fully screening their views. The magnitude of the change is *neutral.*

Effect – In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

KG 3.

This receptor group includes residences and commercial premises located down the Private Lane off Kilgobbin Road, southeast of the proposed wall along Kilgobbin House. These receptors, due to the intervening vegetation and buildings, will not have views of the works at Kilgobbin House. The proposed overflow culvert will run along the private lane, however.

Sensitivity – Residents at home and commercial employees. Sensitivity is *high*.

Magnitude – Receptors in these locations are not expected to have views toward the proposed works on Kilgobbin Road. During construction, works in the private lane will be temporarily visible. The magnitude of the change is considered *negligible.*

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

KG 4.

The receptors are the residents of 'The Mews, Kilgobbin Villa' and agricultural buildings on Kilgobbin Road, adjacent to the proposed works location. The house is partially filtered from the road by existing mature trees along its frontage.

Sensitivity – Residents at home and place of business. Sensitivity is *high*.

Magnitude – Receptors in the location do not have direct views toward the proposed wall due to angle and mature vegetation, therefore mitigating any visual impact on the vista. The magnitude of the change is considered *negligible.*

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

KG 5.

This is a residential receptor comprising 'Riverside Cottage' adjacent to the river and Kilgobbin House. The proposed defence wall will be located to the northeastern boundary of 'Riverside Cottage' along the river that runs between the two properties. The garden has mature planting between the Cottage and the River, the location for the proposed defence wall. Part of the garden can be seen in Photomontage 2 in Appendix 14.1, and below in Figure 14.14.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – Receptors in the residence are expected to have direct views toward the proposed wall from the side elevation of the cottage. Mature vegetation will help to mitigate any visual impact on the vista. The magnitude of the change is considered *medium.*

Effect – The visual impact of the wall will alter the vista to the east of the Cottage along the River for all receptors. In accordance with the methodology, the significance of visual effects will be *temporary, moderate, adverse* during construction, and *permanent, moderate to slight, adverse* during operation.

KG 6.

Receptors in 'Thornberry', 'Castle Lodge' and 'Oldtown Cottage', 3 no. detached residential properties are adjacent to the green field on the west of 'Riverside Cottage, on Kilgobbin Road. These receptors due to their side elevation, distance and mature vegetation will not have direct views into the location of the proposed works.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – Receptors in these locations are not expected to have views toward the proposed works on Kilgobbin Road. The magnitude of the change is *neutral.*

Effect – There will be no impact on any views for the residents in these locations. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

KG 7.

Receptors in this group are residents of Sandyford Hall residential development, behind Kilgobbin House and adjacent to the green fields. These receptors due to their side elevation and mature vegetation will not have direct views into the location of the proposed works. Some residents may have elevated views into the proposed works location, but it would be limited due to the mature vegetation.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – Receptors in these locations are not expected to have views toward the proposed works. The magnitude of the change is considered *negligible* to *neutral.*

Effect – There will be no impact on any views for residents in these locations. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

GM 1.

Receptors in this group are the residents of Castle View and Ballyogan Grove. The properties are detached and lie along a narrow road bounded on the opposite side by a low stone wall and the river embankment with mature tree planting. An open green space on the opposite side of the river also contains a riparian strip and is adjacent to Glenamuck Road North. The view from the houses on the eastern end of Castle View is shown in Photomontage 3 in Appendix 14.1, and below in Figure 14.15.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – Receptors in these locations have views directly toward the proposed works. The magnitude of the change is considered *Medium.*

Effect – There will be an impact on the view for these residents toward the river due to the removal of 10 no. trees from the location of the upgraded and raised wall. In accordance with the methodology, the significance of visual effects will be *temporary, moderate, adverse* during construction, and *permanent, moderate to slight, adverse* during operation.

GM 2.

The receptors are the residents of Priorsland, a large, detached residence located on the corner of Glenamuck Road North Roundabout. The garden bounds the Carrickmines River, and contains large mature trees that will be retained.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – The proposed wall within the garden of Priorsland will be partially visible from indirect or angled views, partially filtered through existing trees. The magnitude of the change is considered *low.*

Effect – The proposed wall will have a slight visual effect by introducing a built element in the view which is currently composed of trees. The existing trees will be retained which will reduce the potential visual impact. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* during operation.

GM 3.

The receptors are the residents across the M50 in Blackberry Hill and Golf Lane. Due to the distance from the proposed defences and direction of views the views from this location are unlikely to have any impact on the residents.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – The receptors of Blackberry Hill and Golf Lane have limited indirect views toward the proposed works due to angle and distance. The magnitude of the change is *neutral.*

Effect – There will be no impact on the views for the receptors due to the angle and distance of the properties. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

GM 4.

The receptors are the residents at the end of Ballyogan Grove. There are 4 no. detached properties located in a group at the end of the road. These receptors are located at a greater distance from the proposed works location than those in GM 1.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – These receptors will not have views of the proposed works. The magnitude of the change is *neutral.*

Effect – There will be no impact on any views for the residents in these locations. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

GM 5.

The receptors are the residents at the end of Brighton Court, directly north of the Luas Green Line. These are residential properties located in a development to the northwest of Castle View.

Sensitivity – The main receptors are residents at home. Sensitivity is *high.*

Magnitude – The receptors of Brighton Court have no direct views toward the proposed works due to angle, distance and tree canopy. The magnitude of the change is *neutral.*

Effect – There will be no impact on any views for the residents in these locations. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

Co 2.

This receptor comprises a tennis club situated north of Castle View and Ballyogan Grove in a slightly elevated position, north of the Luas Green Line. These receptors are located at a distance from the proposed works location and all views from the Club would be filtered through the surrounding landscape. Mature hedge and tree planting run along the southern boundary and screen any views from within the grounds and Club.

Sensitivity – The receptors are the members and staff of the Carrickmines Croquet & Lawn Tennis Club. Sensitivity is *low.*

Magnitude – The receptors at the Club will have no direct views toward the proposed works due to the residences in Castle View and Ballyogan Grove, distance and tree canopy. The magnitude of the change is *neutral.*

Effect –. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

LBG 1.

The receptors are the residence of 'Waterfall Cottage' on Cherrywood Road. The residents have direct private views of the river from the house and from their garden, which extends over both sides of the river. The property contains a mature landscaped garden with shrub and tree planting to the side elevations of the property. The neighbouring bank has a grass verge with a block-built wall to the boundary of a small, elevated group of residential and business properties, (LBG 2). 'Waterfall Cottage' and its private garden can be seen in Photomontage 4 in Appendix 14.1, and below in Figure 14.16.

Sensitivity – The main receptors are residents at home. Sensitivity is *high.*

Magnitude – Receptors in the residence will have direct views toward the proposed wall from the cottage. There is currently no screening along the river boundary of the property. The view will be partially interrupted by the proposed wall; however the river will remain visible over the wall, through the railing. The visual impact of the wall will alter the vista of the river from the Cottage and the adjoining garden. The magnitude of the change will be *medium.*

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, moderate, adverse* during construction, and *permanent, moderate, adverse* during operation.

LBG 2.

The receptors are the residences along Loughlinstown Commons, east of the proposed defences at Lower Brides Glen. The properties are generally surrounded by garden walls or vegetation, with limited views beyond their immediate surroundings.

Sensitivity – The main receptors are residents at home. Sensitivity is *high.*

Magnitude – Views of the proposed defences are expected to be limited due to the existing boundary hedge and tree planting along the access road. One residence at the top of the road will have a limited distant view from the upper floor of the proposed wall on the boundary of 'Waterfall Cottage'. The expected magnitude of change will be *negligible.*

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

LBG 3.

The receptors are the residence of 'Cherrywood Cottage' which is situated on the Cherrywood Road adjacent to 'Waterfall Cottage but set back further from the river.

Sensitivity – The main receptors are residents at home. Sensitivity is *high.*

Magnitude – Receptors in the residence will not have a direct view toward the proposed wall. The southern end of the wall may be partially visible from the far eastern side of their garden but will not form part of their regular views or affect any existing views of the river. The magnitude of the change is *neutral.*

Effect – In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

BR 1.

The receptors are the property that sits between commercial premises on the Bray Road facing the N11. The proposed wall is located to the rear of the property within the parkland adjacent to the river. The location of the proposed defences contains tree and scrub planting along the riverbank within the parklands.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – The location of the proposed defences contains tree planting along the riverbank which will be retained in this location. The wall will be visible from rear windows but will replace an existing wall in the same location. The magnitude of the change is considered *negligible.*

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, imperceptible* during operation.

BR 2.

The receptors are the residents of the properties where the rear boundary overlooks the parkland from Cherrywood Park. The proposed wall is located to the far side of the park adjacent to the river. The location of the proposed defences contains tree and scrub planting along the riverbank within the parklands.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – The location of the proposed defences contains tree planting along the riverbank which will be mainly retained and as such will allow a filter to the proposed defences. There is not expected to be any significant impact to the views in the long-term due to distance and filtered views. During construction, a compound will be located in the field immediately adjacent to the rear gardens, which will be partially visible from the houses. The magnitude of the change is considered *low* to *negligible.*

Effect – The effect on the views from the upper floors of the residential properties in Cherrywood Park are not expected to change significantly due to the level of the proposed wall and screening of the existing vegetation. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* during operation.

CR 1.

The receptors are a group of residential properties on Cherrywood Road, with back gardens adjacent to the river. Views are expected to be direct toward Brides Glen River from the rear of the residence. The proposed works are within the rear gardens of 3 no. existing detached residential properties, with boundaries along the river. Immediately downstream, the river flows beneath the Cherrywood Viaduct, which is a protected structure (RPS No. 1783). The properties all contain large mature landscaped gardens with their eastern boundary to the river. 7no. trees will need to be removed to facilitate the works.

Sensitivity – The main receptors are residents at home. Sensitivity is *high*.

Magnitude – Receptors in the residences are expected to have direct views toward the proposed wall from their properties, partially interrupted by landscaping within the private gardens. The view is expected to be impacted by the proposed wall, but the existing private landscape is expected to partially filter views of the proposed wall. The magnitude of the change is considered *medium* to *low.*

Effect – The visual impact of the wall is expected to alter the vista slightly to the river from the properties. In accordance with the methodology, the significance of visual effects will be *temporary, moderate, adverse* during construction, and *permanent, slight to moderate, adverse* during operation.

CR 2.

The receptors are a group of residential properties on Cherrywood Road, west of CR 1 and the proposed defences.

Sensitivity – The main receptors are residents at home. Sensitivity is *high.*

Magnitude – Receptors in the residences are not expected to have views toward the proposed wall from their properties. The magnitude of the change is *neutral.*

Effect – In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

C 1.

The receptors are the staff and customers of the commercial premises on the Bray Road facing the N11. The proposed wall is located to the rear of these premises within the parkland adjacent to the river and turns back toward the Bray Road along the river at Best Drive Tyre Shop.

Sensitivity – The receptors are members of staff at work and members of the public. Sensitivity is *low*.

Magnitude – The location of the proposed defences contains tree planting along the riverbank which will be largely retained in the location. Main views at this location are not focused on the rear of the properties. The magnitude of the change is considered *low.*

Effect – In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

C 2.

The receptors are the staff and customers who frequent the businesses on the Bray Road facing the N11, adjacent to the proposed defences at Lower Brides Glen.

Sensitivity – Receptors are staff and visitors to the premises. Sensitivity is *low.*

Magnitude – The proposed development is not expected to be visible from the premises. The magnitude of the change is considered *neutral.*

Effect – The proposed wall will not alter the view from these receptors. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

C 3.

The receptors are the staff and visitors who frequent the buildings in Páirc Choill Na Silíní, Cherrywood to the west of the proposed works location.

Sensitivity – Receptors are staff and visitors to the premises. Sensitivity is *low.*

Magnitude – The location of the proposed defences is not expected to be directly visible from the premises. The magnitude of the change is *neutral.*

Effect – The proposed wall will not alter the view from these receptors. In accordance with the methodology, the significance of visual effects will be *imperceptible* during both construction and operation.

OS 2.

This receptor group has direct views within the parklands on Bray Road.

Sensitivity - The receptors are members of the public, who use this amenity as a leisure space and frequent it at regular intervals. Sensitivity is *medium.*

Magnitude – The users of the park will only view the proposed wall within the park if they venture off the pedestrian pathway. The proposed defence wall is located within existing deciduous vegetation and tree planting to the east side of the park entrance but is not adjacent to any of the footpaths. The wall will be screened by the retention of existing deciduous vegetation and tree planting in the location. During construction a greater degree of visual intrusion may be experienced, but this will be temporary. The magnitude of the change is considered *low* to *negligible* during construction and *neutral* during operation.

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, *and imperceptible* during operation.

OS 3.

This receptor group comprises Loughlinstown Pitch and Putt Club and Loughlinstown Woods walkways. Part of the Pitch and Putt grounds is shown in Photomontage 5 in Appendix 14.1, and below in Figure 14.17, viewed from Commons Road.

Sensitivity - The receptors are members of the public, who use this amenity as a leisure space and frequent it at regular intervals. Sensitivity is *medium.*

Magnitude – The receptors will only directly view the proposed wall from a small part of the site, at its far eastern side. The proposed defence wall is located to the far end of the Pitch and Putt Club on Commons Road, replacing the existing fence line in part. Therefore, the visual impact will be transient and localised to that area and its immediate surrounds. The magnitude of the change is considered *negligible* to *neutral.*

Effect –In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* to *imperceptible* during operation.

OS 4.

This receptor group comprises the open space located in Brookdene residential development between the houses to the north and the proposed wall to the south. The open space is grassed with several mature Ash, Cherry and Willow trees, and used by residents as an amenity space. This open space is shown in Photomontage 7 in Appendix 14.1, and below in Figure 14.19.

Sensitivity - The public are the receptors. Sensitivity is *medium.*

Magnitude – The users of the open space will directly view the proposed wall within the actual location. The proposed wall will require the removal of 3 no. trees, however this will be mitigated slightly by the inclusion of a hedgerow along the front of the wall. The magnitude of the change will be *medium* to *low*.

Effect – The height and location of the proposed wall is expected to have an impact on the overall visual amenity of the space, as will the removal of 3 no. trees. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* during operation.

OS 5.

This receptor group comprises the open space located in Bayview residential development between the houses to the west and the proposed wall to the east. The open space is grassed and contains groups of tree planting along the river, and is used by the residents as an amenity space. This open space is shown in Photomontage 8 in Appendix 14.1, and below in Figure 14.20.

Sensitivity - The public are the receptors. Sensitivity is *medium.*

Magnitude – The proposed defence wall is located within the open space, between Bayview Cresent and Bayview Lawns. The removal of 2 no. trees adjacent to No. 20 Bayview Lawns is required to facilitate the proposed defence wall, with the remaining trees to be retained. The visual impact will be localised to the area of open space and its immediate surrounds. Due to its amenity status within the development the proposed wall will have an impact on views for the users, however this will be mitigated slightly by the planting of a hedgerow along the front of the proposed wall. The magnitude of the change will be *medium* to *low.*

Effect – The height and location of the proposed wall in the open space is expected to have an impact on the overall visual amenity of the space. In accordance with the methodology, the significance of visual effects

will be *temporary, moderate, adverse* during construction, and *permanent, moderate to slight, adverse* during operation.

CoR 1 & CoR 2.

These receptor groups are the properties along the south side of Commons Road, facing the proposed wall along the Shanganagh River. The proposed works will upgrade part of the existing wall and install an additional wall section adjacent to the public footpath further along the river toward the Loughlinstown Pitch & Putt Club. Most of the existing vegetation along the bank shall be retained, with some limited removal to facilitate construction. The western end of Commons Road, facing east, is shown in Photomontage 5 in Appendix 14.1, and the eastern end including Shanganagh Bridge is shown in Photomontage 6. The photomontages are also shown below in Figure 14.17 and Figure 14.18. A separate visualisation, showing the point along Commons Road at which the increase in height will be greatest, is shown in Figure 14.21 (existing view), and Figure 14.22 (proposed view).

Sensitivity - The main receptors are residents at home. Sensitivity is *high.*

Magnitude – The main receptors are the residents of the properties opposite the proposed works and as such they will be impacted by the elevated wall height and disturbance to the vegetation that currently screens the existing wall. The replacement of a galvanised fence in part for a natural stone wall and recolonising vegetation in the area will partially mitigate this impact. The magnitude of the change will be *low* to *medium.*

Effect – The additional height to the existing wall and proposed defence wall is expected to have limited impact in the long-term on the overall views from these houses. The main views from the front of the houses will be unchanged, i.e., their existing view of the wall and tall vegetation beyond it will remain. In accordance with the methodology, the significance of visual effects will be *temporary, moderate to slight, adverse* during construction, and *permanent, slight, adverse* during operation.

CoR 3.

A detached house on the northern bank of the river, north of the proposed defences. The proposed works will upgrade part of the existing wall and additional works will be required on the Shanganagh Road Bridge.

Sensitivity - The residents of No. 60. Commons Road are the receptors. Sensitivity is *high.*

Magnitude – The proposed works will be visible from the house and will partially affect views. However, the existing walls will remain in place, with the changes being a slight increase in wall height. The magnitude of the change is considered *low.*

Effect – The additional height to the existing wall and proposed defence wall is expected to have limited impact in the long-term on the overall visual landscape. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* during operation.

CoR 4 & CoR 5.

These receptor groups are the residential developments of River Lane, River Lane Grove and Clifton Park. The main receptors are the residents to the front of the development, which face north towards the proposed development.

Sensitivity - The main receptors are residents at home. Sensitivity is *high.*

Magnitude – The main receptors are the residents of the properties opposite the proposed works. Due to distance, elevation and angle of the views, filtered through tree planting, it is not expected to have any impact on the current vista for these receptors. The magnitude of the change is considered *low.*

Effect – The additional height to the existing wall in this location, is not expected to have any significant long-term impact on the overall visual landscape. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* during operation.

BD 1.

This receptor group are residents in the residential developments of Brookdene, who have direct views towards the proposed defence wall. The proposed works are located within a green open space, containing mature Ash, Cherry and Willow trees. The open space facing these properties is shown in Photomontage 7 in Appendix 14.1, and below in Figure 14.19.

Sensitivity - The main receptors are residents at home. Sensitivity is *high.*

Magnitude – Due to their proximity to the proposed wall, it is expected to have an impact on the current vista for these receptors. Mitigation in the form of proposed hedgerow and perennial planting is proposed along the front of the wall (shown in Figure 14.23). The magnitude of the change is considered *medium* and expected to reduce to low as proposed vegetation reaches maturity.

Effect – The proposed wall located in an open space will have an impact on views from these houses in the long-term. The proposed planting along the front of the wall will help to reduce the effect over time. In accordance with the methodology, the significance of visual effects will be *temporary, moderate, adverse* during construction, and *permanent, moderate, negative,* reducing to *slight* during operation.

BY 1.

This receptor group comprises residents within the residential development of Bayview Crescent and Bayview Grove. The houses are two-storey semi-detached, with either back windows or side elevations facing towards the proposed development.

Sensitivity - The main receptors are residents at home. Sensitivity is *high.*

Magnitude – The proposed defence wall is located within the open space to the east of the houses, behind the back gardens of those in Bayview Grove. The proposed wall will only be visible from upstairs windows and will be partially screened by the existing garden walls and vegetation, and proposed planting. It is expected that the magnitude of change on the current views for these receptors will be *low* to *negligible.*

Effect – In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* to *imperceptible* during operation.

BY 2.

This receptor group are residents within Bayview Lawns. The proposed defence wall is located within the open space in Bayview Lawns, which is adjacent to these houses. The open space to the rear and/or side of these houses is shown in Photomontage 8 in Appendix 14.1, and below in Figure 14.20.

Sensitivity - The main receptors are residents at home. Sensitivity is *high.*

Magnitude – These receptors are the residents of the properties adjacent to the open space in Bayview Lawns. Due to their proximity to the proposed wall, it is expected that views will be limited to angled, partial from upstairs or side windows. The magnitude of change will be *low* to *negligible.*

Effect – These receptors have side elevated views onto the open space from within the properties. In accordance with the methodology, the significance of visual effects will be *temporary, slight, adverse* during construction, and *permanent, slight, adverse* to *imperceptible* during operation.

Table 14.5: Visual Receptor Summary

Receptor No.	Distance from proposed development	Sensitivity	Magnitude of change	Predicted impact and duration	
				Construction	Operation
CB 1	8.7m	High	*Negligible*	*Temporary, slight, negative*	*Permanent, slight, negative*
CB 2	9.7m	High	*Negligible*	*Temporary, slight, negative*	*Permanent, slight, negative*
CB 3	6.5m	High	Low	*Temporary, slight, negative*	*Permanent, slight, negative*
CB 4	93m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
CB 5	98m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
CB 6	150m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
BP 1	10m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
BP 2	88m	High	Negligible to Neutral	*Temporary, slight, negative*	*Permanent, imperceptible*
BP 3	90m	High	Negligible to Neutral	*Temporary, slight, negative*	*Permanent, imperceptible*
OS 1	0m	Medium	Low to Negligible	*Temporary, slight, negative*	*Permanent, adverse imperceptible*
Co 1	95m	Low	Negligible to Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
KG 1	0m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
KG 2	98m	High	Neutral	*Imperceptible*	*Permanent, imperceptible*
KG 3	18m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
KG 4	9m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
KG 5	0m	High	Medium	*Temporary, moderate, negative*	*Permanent, moderate to slight, negative*
KG 6	29m	High	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
KG 7	13.5m	High	Negligible to Neutral	*Temporary, slight, negative*	*Permanent, imperceptible*
GM 1	18m	High	Medium	*Temporary, moderate, negative*	*Permanent, moderate to slight, negative*
GM 2	17m	High	Low	*Temporary, slight, negative*	*Permanent, slight, negative*
GM 3	216m	High	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
GM 4	109m	High	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
GM 5	161m	High	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
Co 2	148m	Low	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*

Receptor No.	Distance from proposed development	Sensitivity	Magnitude of change	Predicted impact and duration	
				Construction	Operation
LBG 1	0m	High	Medium	*Temporary, moderate, negative*	*Permanent, moderate, negative*
LBG 2	13m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
LBG 3	25m	High	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
BR 1	0m	High	Negligible	*Temporary, slight, negative*	*Permanent, imperceptible*
BR 2	31m	High	Low to Negligible	*Temporary, slight, negative*	*Permanent, slight, negative*
CR 1	0m	High	Medium to Low	*Temporary, moderate, negative*	*Permanent, moderate to slight, negative*
CR 2	77m	High	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
C 1	0m	Low	Low	*Temporary, imperceptible*	*Permanent, imperceptible*
C 2	23m	Low	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
C 3	177m	Low	Neutral	*Temporary, imperceptible*	*Permanent, imperceptible*
OS 2	34m	Medium	Low to Neutral	*Temporary, slight, negative*	*Permanent, imperceptible*
OS 3	0m	Medium	Negligible to Neutral	*Temporary, slight, negative*	*Permanent, adverse imperceptible*
OS 4	0m	Medium	Medium to Low	*Temporary, slight, negative*	*Permanent, slight, negative*
OS 5	0m	Medium	Medium to Low	*Temporary, slight, negative*	*Permanent, slight, negative*
CoR 1	19m	High	Medium to Low	*Temporary, moderate to slight, negative*	*Permanent, slight, negative*
CoR 2	14m	High	Medium to Low	*Temporary, moderate to slight, negative*	*Permanent, slight, negative*
CoR 3	0m	High	*Low*	*Temporary, slight, negative*	*Permanent, slight, adverse*
CoR 4	27m	High	*Low*	*Temporary, slight, negative*	*Permanent, slight, negative*
CoR 5	37m	High	*Low*	*Temporary, slight, negative*	*Permanent, slight, negative*
BD 1	20m	High	Medium	*Temporary, moderate, negative*	*Permanent, moderate, negative*
BY 1	0m	High	*Low to Negligible*	*Temporary, slight, negative*	*Permanent, negative, slight to imperceptible*
BY 2	0m	High	*Low to Negligible*	*Temporary, slight, negative*	*Permanent, negative, slight to imperceptible*

Figure 14.13: Photomontage 1, proposed view at Belarmine Park

Figure 14.14: Photomontage 2, proposed view at Kilgobbin Road

Figure 14.15: Photomontage 3, proposed view at Castle View

Figure 14.16: Photomontage 4, proposed view at Waterfall Cottage

Figure 14.17: Photomontage 5, proposed view at Commons Road, west

Figure 14.18: Photomontage 6, proposed view at Commons Road, east, and Shanganagh Road Bridge

Figure 14.19: Photomontage 7, proposed view at Brookdene

Figure 14.20: Photomontage 8, proposed view at Bayview

Figure 14.21: Visualisation of Commons Road, existing view

Figure 14.22: Visualisation of Commons Road, proposed view

14.4 Mitigation Measures

14.4.1 Construction Phase Mitigation

No significant landscape nor visual impacts are expected during construction. Despite that, less visually intrusive hoarding where appropriate, can reduce visibility of moving plant from outside the site while allowing for visual connectivity when required.

14.4.2 Operational Phase Mitigation

No significant landscape nor visual impacts are expected during the operational phase. Nonetheless, the proposed development design includes limited removal and widely retention of trees and vegetation throughout the scheme extent that will help to mitigate against some of the less significant landscape and visual impacts on receptors most affected.

The design of the proposed flood wall along more sensitive locations will be similar to that of the existing wall and will use the same materials from the existing wall where possible. Where this is not possible, a similar looking finish will be used. This will further mitigate visual impacts of the proposed wall to views facing towards it. In sensitive locations like Brookdene where the proposed defences are more noticeable, although the impacts might not be significant, they are heightened for the residents. It is recommended that actions are taken to soften the appearance of the defences and further reduce the adverse impacts to the visual amenity. These actions can be in the form of additional planting.

At Brookdene (BD 1) and Bayview (BY 1 and BY 2), a landscape plan has been developed which will partially mitigate the visual impact associated with the proposed wall. The landscape plans (shown in Figure 14.23 and Figure 14.24, and are reproduced in full with planting details shown in Appendix 14.2) are composed of native hedge planting, wildflower meadow planting, and low ornamental planting. This will reduce the permanent visual impact at these sites to slight to imperceptible.

Following the implementation of these mitigation measures, the visual effect on these receptors is shown in Table 14.6.

Table 14.6: Visual Receptor Summary, post-mitigation

Receptor No.	Distance from proposed development	Sensitivity	Magnitude of change	Predicted impact and duration	
				Construction	Operation
LBG 1	0m	High	Medium	*Temporary, moderate, negative*	*Permanent, moderate, negative*
BD 1	20m	High	Medium	*Temporary, moderate, negative*	*Permanent, slight, adverse to imperceptible*
BY 1	0m	High	*Low to Negligible*	*Temporary, slight, negative*	*Permanent, imperceptible*
BY 2	0m	High	*Low to Negligible*	*Temporary, slight, negative*	*Permanent, imperceptible*

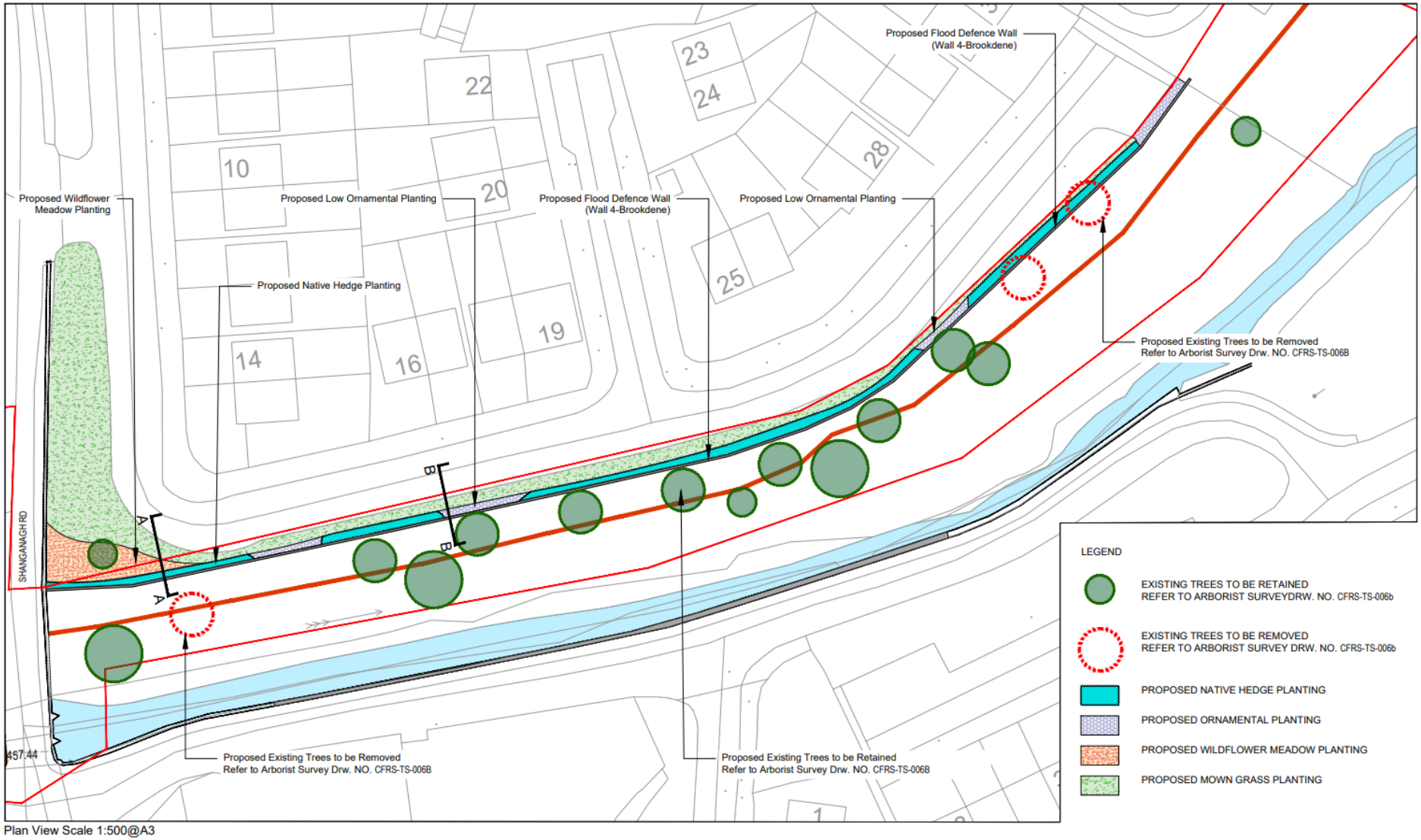

Figure 14.23: Landscape plan at Brookdene (BD 1)

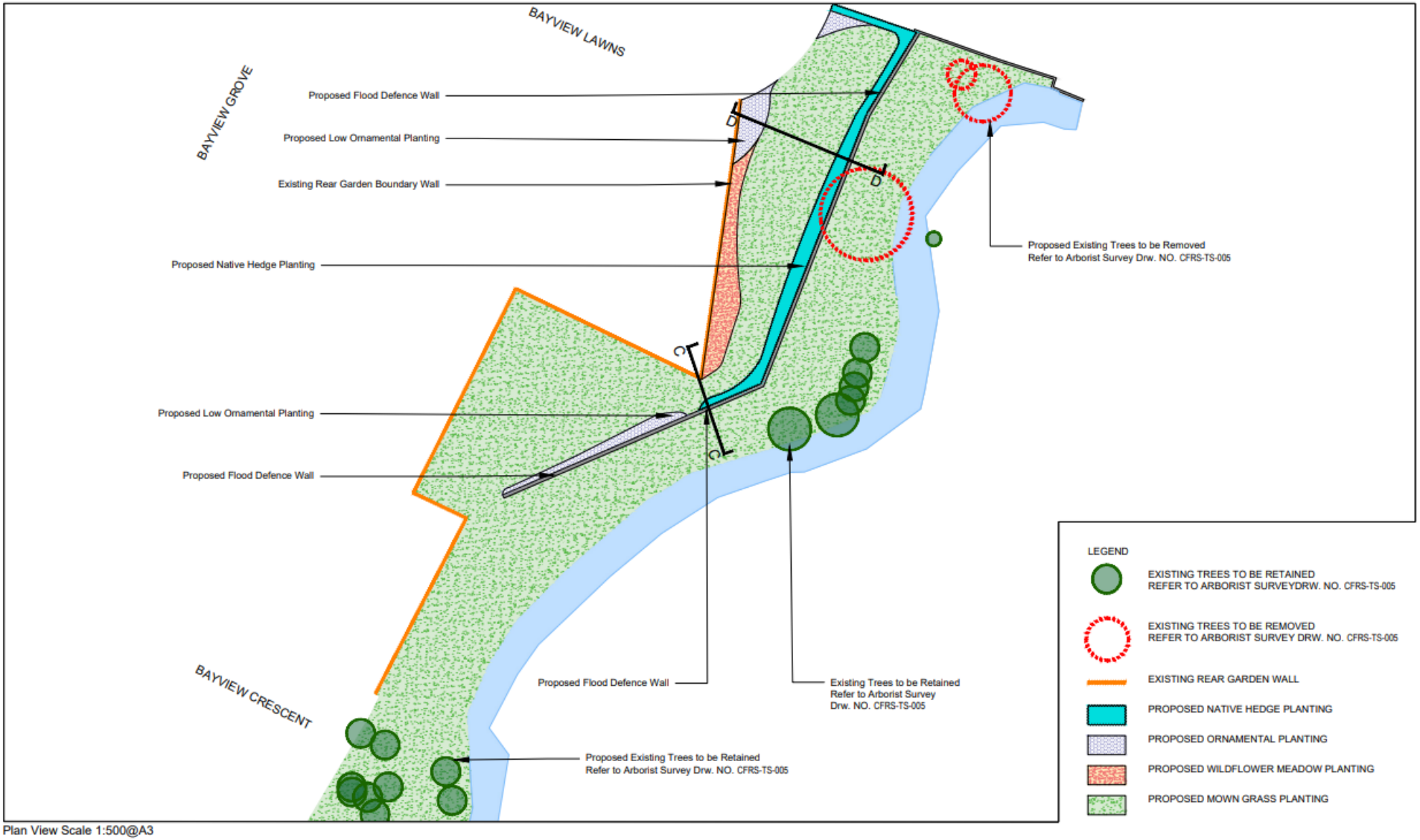

Figure 14.24: Landscape plan at Bayview (BY 1 and 2)

14.5 Residual Effect of the Proposed Development

The residual effect is the effect which remains after mitigation measures have been applied. The residual effects of the proposed development on landscape and visual amenity will range from *permanent, moderate, adverse* to *imperceptible*. Residual effects for most receptors will be *imperceptible*, with higher impacts being limited.

14.6 Interactions

The EIAR must also consider in-combination effects, or the interactions between the different factors discussed.

14.6.1 Landscape and Visual Amenity and Biodiversity

Effects on biodiversity, such as the removal of trees or trimming of other vegetation to allow for construction access, can have further effects on landscape and visual amenity. Limited tree removal is proposed, which will have an impact on visual amenity and landscape as discussed above. This will have further impacts as discussed in Chapter 8 Biodiversity. Mitigation measures included in the Biodiversity chapter, such as the use of root protection zones, will help to further mitigate impacts on visual amenity and landscape.

14.6.2 Landscape and Visual Amenity and Cultural Heritage

The construction of flood walls at Kilgobbin Road, will impact the setting of the buildings there. The proposed flood walls will incorporate stone from the existing walls or of a similar type, reducing these adverse impacts on setting and visual amenity. The interaction between landscape and visual amenity and cultural heritage will be imperceptible.

14.7 Cumulative impact

The projects listed in Table 16-1 were considered and assessed in terms of their potential impact on landscape and visual amenity and their potential to be experienced cumulatively with the proposed development.

It is possible that the construction period of the proposed development will overlap with that of several developments in the area. This would result in a temporary slight adverse cumulative effect on the local visual amenity and landscape for the duration of the overlapping construction period. A significant impact would not occur in this scenario.

Due to the nature of the proposed development and the nature of the other projects listed, cumulative effects during the operational phase are expected to be imperceptible.

15 Interactions

The EIA Directive (2014/52/EU) requires a description of:

> '*the interaction between any of the foregoing aspects'.*

Interactions can occur when a predicted impact causes interaction or dependency with other environmental aspects. This section discusses the interactions between aspects and assesses them as positive, adverse or neutral (as having no interaction or interdependency).

The interactions of environmental effects were considered throughout the design development for the proposed flood relief scheme and adjustment were made to the design of the layout to mitigate impacts arising from these interactions. Interactions between certain environmental aspects are discussed in the sections below. The interactions of environmental effects were considered throughout the EIA process for the proposed development and adjustments were made to the design of the layout to mitigate impacts arising from these interactions. In Table 15.1, interactions between environmental aspects are marked with a 'Y' and discussed in the text below.

No significant interactions are expected to occur as a result of the proposed development.

No interaction expected	Interaction expected	
✘	✓ Imperceptible	✓ Slight

Table 15.1: Summary of environmental impacts interactions

Interaction	Population and Human Health		Biodiversity		Land and Soil		Water		Cultural Heritage		LVIA		Material Assets		Air Quality and Dust		Climate		Noise and Vibration	
	Con	Op.	Con	Op.	Con	Op.	Con	Op.	Con	Op.	Con	Op.	Con	Op.	Con	Op.	Con	Op.	Con	Op.
Population and Human Health			✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✓	✗
Biodiversity					✓	✗	✓	✗	✗	✗	✓	✓	✗	✗	✓	✗	✗	✗	✗	✗
Land and Soil							✓	✗	✗	✗	✗	✗	✓	✗	✓	✗	✓	✗	✗	✗
Water									✗	✗	✗	✗	✓	✗	✓	✗	✗	✗	✗	✗
Cultural Heritage											✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
LVIA													✗	✗	✓	✗	✗	✗	✗	✗
Material Assets															✗	✗	✗	✗	✗	✗
Air Quality and Dust																	✗	✗	✗	✗
Climate																			✗	✗
Noise and Vibration																				

15.1 Air Quality and Dust – Population and Human Health

Significant quantities of dust or impacts to air quality could lead to adverse effects for population and human health in the vicinity of the proposed development. The effect of dust generation on population and human health will be **imperceptible** and **not significant**, as the effect from air quality and dust as outlined in the Construction Impacts chapter will be negligible.

15.2 Air Quality and Dust – Biodiversity

During construction works, the potential for dust generation and emissions, or impacts on air quality could lead to indirect effects on biodiversity on site or in the surrounding areas. The Biodiversity chapter considered this potential and that mitigation measures outlined in Chapter 6: Construction Impacts would be put in place. The effect of dust generation on any biodiversity receptors will be **imperceptible** and **not significant**.

15.3 Air Quality and Dust – Land and Soil

The movement and excavation of soils during construction could lead to increases in dust generation and movement. This has been considered in the air quality and dust chapter, and the impact of works to land and soil will not lead to a significant interaction with air quality and dust. Furthermore, mitigation measures described in Chapter 6 of the EIAR, and in the CEMP, will further reduce any potential for interactions between land and soil and air quality and dust. The effect of any interaction between air quality and dust and land and soil will be **imperceptible** and **not significant**.

15.4 Air Quality and Dust – Water

Earthworks during the construction phase could give rise to impacts on water quality due to dust impacts. The Water chapter considered this potential and found that impacts due to dust are not expected to be significant. In addition to this, mitigation measures for the control of dust during construction are described in Chapter 6 of the EIAR, and in the CEMP. These mitigation measures will further reduce any potential for impacts on water due to dust deposition. The effect of any interaction between air quality and dust and water will be **imperceptible** and **not significant**.

15.5 Air Quality and Dust – Landscape and Visual Amenity

Large depositions of dust could have an adverse impact on landscape or visual amenity for receptors in the Carrickmines-Shanganagh River FRS area. This is not expected to occur due to the predicted impact of dust being negligible, and mitigation measures outlined in the Construction Impacts chapter. The interaction between these aspects will be **imperceptible** at worst and **not significant**.

15.6 Population and Human Health – Noise and Vibration

Excessive noise or vibration during construction could interact negatively with population and human health in the surrounding area. Mitigation measures outlined in the Construction Impacts chapter will ensure that the effect of noise and vibration on population and human health will be **imperceptible** and **not significant**.

15.7 Population and Human Health – Water

Impacts to water quality could negatively interact with population and human health, due to either impacts to drinking water, or the amenity value of the Carrickmines-Shanganagh River Network and Killiney Bay. Adverse interactions with population and human health are not expected to occur, due to the mitigation measures to be put in place for the protection of water, and residual effects to water being **slight adverse to imperceptible** and **not significant.**

15.8 Material Assets – Population and Human Health

Impacts to material assets, in particular to utilities or roads, traffic, and transport, could lead to interactions with population and human health if significant or allowed to go on for a long time. They have the potential to affect the local population and their daily activities during the construction phase, or commuters passing through the area.

During construction, there will be short disruptions to utilities which will inconvenience a small number of people close to construction sites. These will be communicated to residents in advance and will be kept to the shortest time possible. The overall impact of these disruptions, with mitigation measures in place as outlined in Chapter 12, will be **temporary and imperceptible** and **not significant**.

During construction, temporary disruptions to traffic and access due to partial road closures will occur. This will lead to temporary adverse impacts for residents and people passing through the area, particularly at the N11 overflow culvert, as outlined in Chapter 11. With mitigation measures in place as outlined in Chapter 11, the overall adverse impact on population and human health due to interactions with roads, traffic, and transport will be **temporary, slight, adverse** and **not significant**.

Once operational, no impacts on Material Assets are expected and therefore there will be no operational phase interactions with Population and Human Health.

15.9 Land and Soil – Biodiversity

Interactions between soils, geology, and biodiversity can occur through surface, groundwater, and air pathways. The proximity of the Loughlinstown Woods and Dalkey Coastal Zone and Killiney Hill pNHAs poses a significant risk for the entry of contaminants via surface water run-off, dewatered groundwater, and soil erosion. Introduction of contaminants and suspended solids could lead to habitat degradation.

The import and export of soil or fill material could lead to movement of invasive species if contaminated soil sources are used. This could have an adverse interaction with biodiversity. The potential for adverse effects from invasive species is assessed in the Biodiversity chapter, with biosecurity mitigation measures developed in that chapter and above in Section 9.6. The effects of the development due to invasives are **not significant**.

Without the implementation of mitigation measures outlined in this chapter and Chapter 8, potential impacts through interaction would be **short-term, significant, negative**. With the implementation of appropriate mitigation measures, these combined effects would be reduced to **short-term, imperceptible, adverse** and **not significant**.

15.10 Land and Soil – Water

Soils and geology share direct links with groundwater and surface water. Soil quality and characteristics such as granularity, pore space, moisture content and texture have effects on the rate of groundwater recharge, infiltration, percolation, transmissivity, and run-off. Similarly, surface water run-off can affect soil quality and condition through deposition or withdrawal of chemicals, suspended solids, and nutrients.

Proposed flood relief measures at Bayview, Kilgobbin, Glenamuck Road, Cherrywood, Commons Road, and Brookdene will involve instream works or works within the riparian zone. All waterbodies at these locations have a ‘Good’ WFD status. It is therefore imperative that proposed flood measures do not have adverse impacts or cause a reduction in quality status. Effects arising from surface water run-off are further discussed in Chapter 10 of this EIAR. Without mitigation, the interaction between effects on Hydrology and Soils and Geology could result in a **short-term, significant, adverse** effect. Through implementation of mitigation measures outlined in this chapter and Chapter 9 of the EIAR, the potential impact through interaction is reduced to **short-term, slight, adverse** and **not significant.**

15.11 Land and Soil – Material Assets

A significant proportion of proposed flood relief measures are in urban areas adjacent to houses or along roads. The temporary use of public and private roads will be required during the construction phase. Access to private properties will require appropriate liaison with owners. Diversions, temporary disruptions, and increased traffic volumes are anticipated as a result of the increase in truck movements for the movement of materials.

It is likely that there will be interaction with utility networks such as ESB substations and networks, underground and overhead electric cables and masts, sewer networks, and streetlights which fall within the footprint of works proposed across the proposed development area. Without mitigation, the resulting interaction effects could be **short-term, significant, negative**. Through the implementation of appropriate mitigation measures as outlined in Chapter 9, Chapter 11, and Chapter 12, these effects will be **short-term, imperceptible** and **not significant.**

15.12 Land and Soil – Climate

Works where excavation of soil is proposed may occur in areas of seasonal waterlogging. Anaerobic conditions in soils can lead to an increase in carbon dioxide. Excavation of material across the scheme area will release sequestered carbon increasing greenhouse gas levels in the air. These effects are further discussed in the chapter addressing Air Quality and Climate, Chapter 6. The interaction of these effects will be **long-term, imperceptible, not significant**.

15.13 Landscape and Visual Amenity – Biodiversity

Effects on biodiversity, such as the removal of trees or trimming of other vegetation to allow for construction access, can have further effects on landscape and visual amenity. Limited tree removal is proposed, which will have an impact on visual amenity and landscape as discussed in Chapter 14. This will have further impacts as discussed in Chapter 8 Biodiversity. Mitigation measures included in the Biodiversity chapter, such as the use of root protection zones, will help to further mitigate impacts on visual amenity and landscape. The effect of this interaction will be **long-term, imperceptible** and **not significant**.

15.14 Landscape and Visual Amenity – Cultural Heritage

The construction of flood walls at Kilgobbin Road will impact the setting of the buildings there. The proposed flood walls will incorporate stone from the existing walls or of a similar type, reducing these adverse impacts on setting and visual amenity. A natural stone finish will also be used at Glenamuck Road North Roundabout, where an existing stone wall will be replaced, and at Lower Brides Glen. The interaction between landscape and visual amenity and cultural heritage will be **imperceptible** and **not significant**.

15.15 Water – Biodiversity

The Carrickmines-Shanganagh River Network is a valuable ecological corridor and provides habitat for a number of significant and protected species. Impacts on waterbodies could affect aquatic habitats and species. The main potential impacts identified in the Biodiversity chapter include accidental sediment release or pollution due to spills or leaks, or disruption to habitats due to instream or bank-side works. Mitigation measures included in the Water chapter and the Biodiversity chapter will ensure that no significant interactive effects occur. The effect of this interaction would be **temporary, slight, adverse** at worst, and **imperceptible** once the mitigation measures outlined in both chapters are implemented in full.

15.16 Water – Material Assets

Construction vehicles moving on site during the construction phase could result in hydrocarbons entering the surface water drainage system, leading to effects downstream. This is mitigated against by measures

included in the Water chapter for the prevention of pollution or increased sedimentation. The mitigation measures are also included in a preliminary Construction Environmental Management Plan (CEMP), which outlines the site compound locations and require all vehicles to be maintained frequently and to carry spill kits at all times. Without mitigation in place, this could lead to a temporary significant adverse effect. However, with the measures outlined in Chapters 10 and 12, the interaction between these will be **temporary, imperceptible** and **not significant**.

There is also the potential for a flood event to occur during construction. With mitigation measures in place, interactions between these effects are not expected to be significant.

16 Cumulative Impacts

This chapter provides a summary of the potential cumulative effects assessed throughout this EIAR. The cumulative effects of the proposed development in combination with other relevant existing, planned and permitted projects have been assessed to determine whether these would give rise to significant effects on the environment.

Any predicted cumulative effects arising from the proposed development in combination with other existing, planned and permitted projects are set out in Sections 16.1 to 16.11. Figures 16.1 to 16.3 and Table 16.1 below provide summary details of the projects/developments that have the potential to impact resources, traffic, or the local area, and so could have potential cumulative effects with the proposed flood relief scheme.

Only those projects whose duration of permission overlaps with the likely construction period of the proposed development (i.e., 2025 onwards) are included. Small developments such as house extensions and alterations, or the construction of a single dwelling or structure, have been excluded as the likely effects of such developments will not be significant either in isolation or cumulatively with the proposed development, except where they are taking place adjacent to or in close proximity to the proposed defences.

In addition to the projects shown in the table and figures below, the Dublin Array Wind Farm project is also proposed in the area, with onshore elements likely to be close to several parts of the proposed development. DLRCC and the Dublin Array project team are liaising closely. The construction periods for both developments may overlap; once operational, no cumulative impacts are likely.

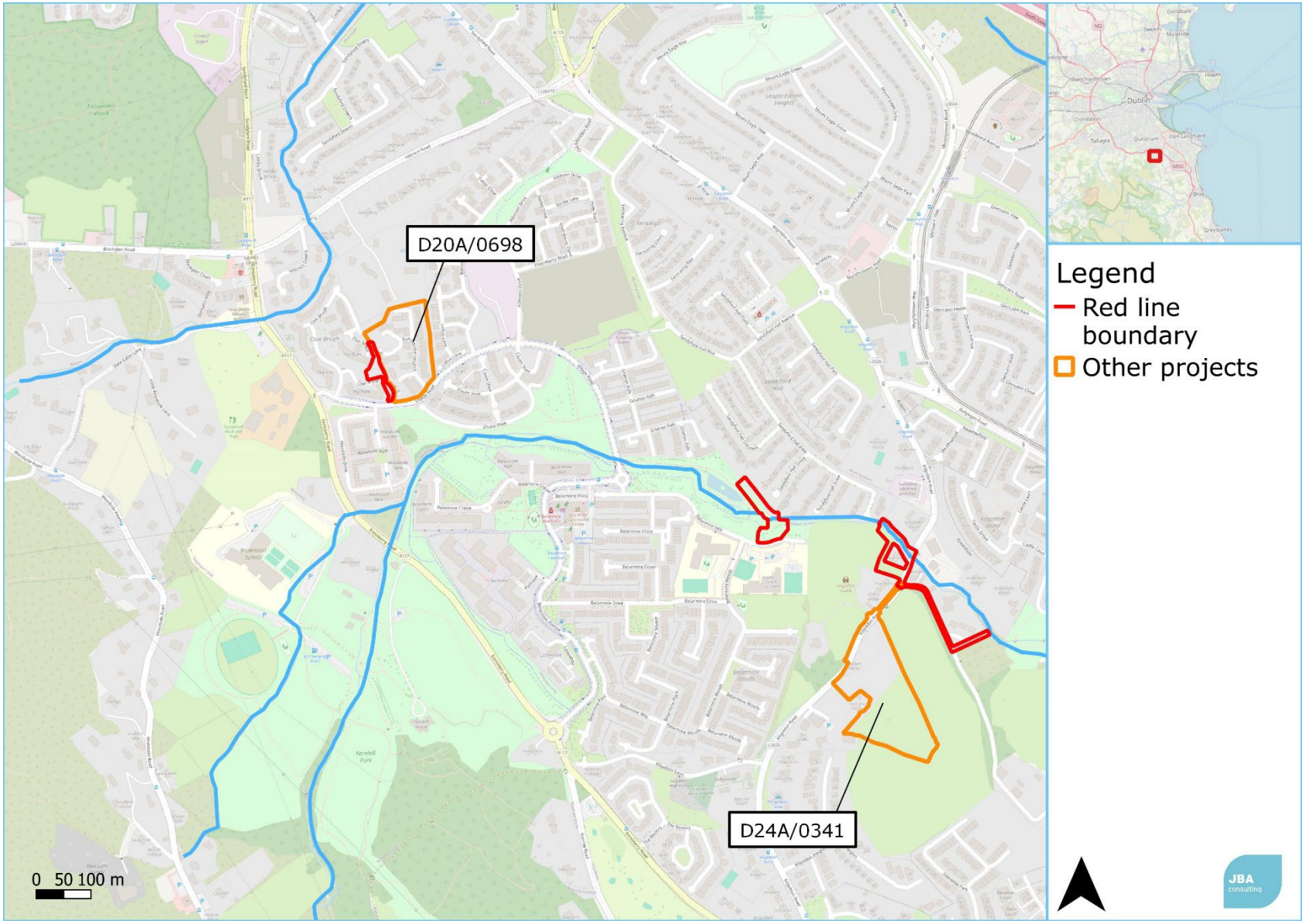

Figure 16.1: Other projects considered, Clon Brugh to Kilgobbin Road

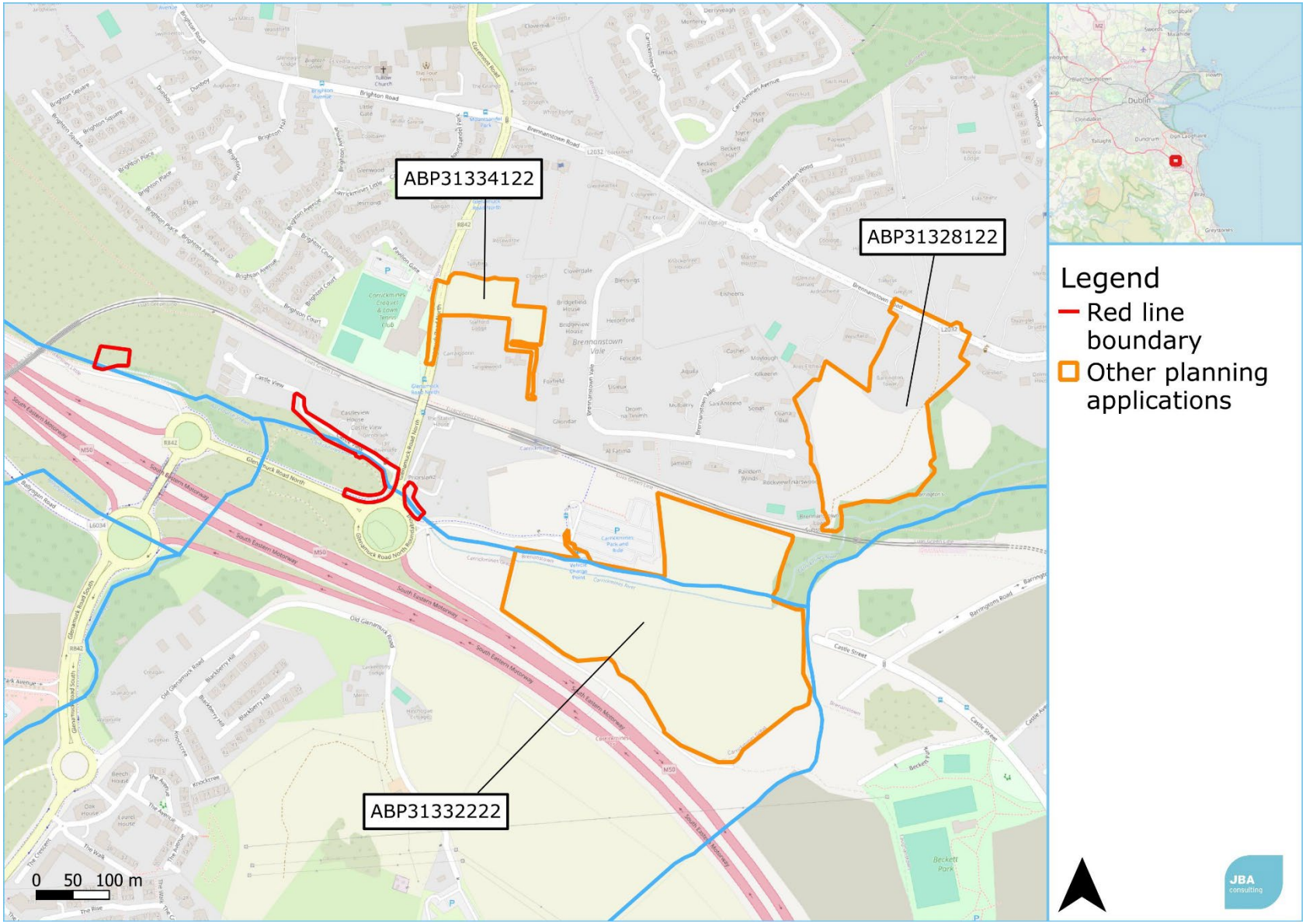

Figure 16.2: Other projects considered, Glenamuck Road North Roundabout

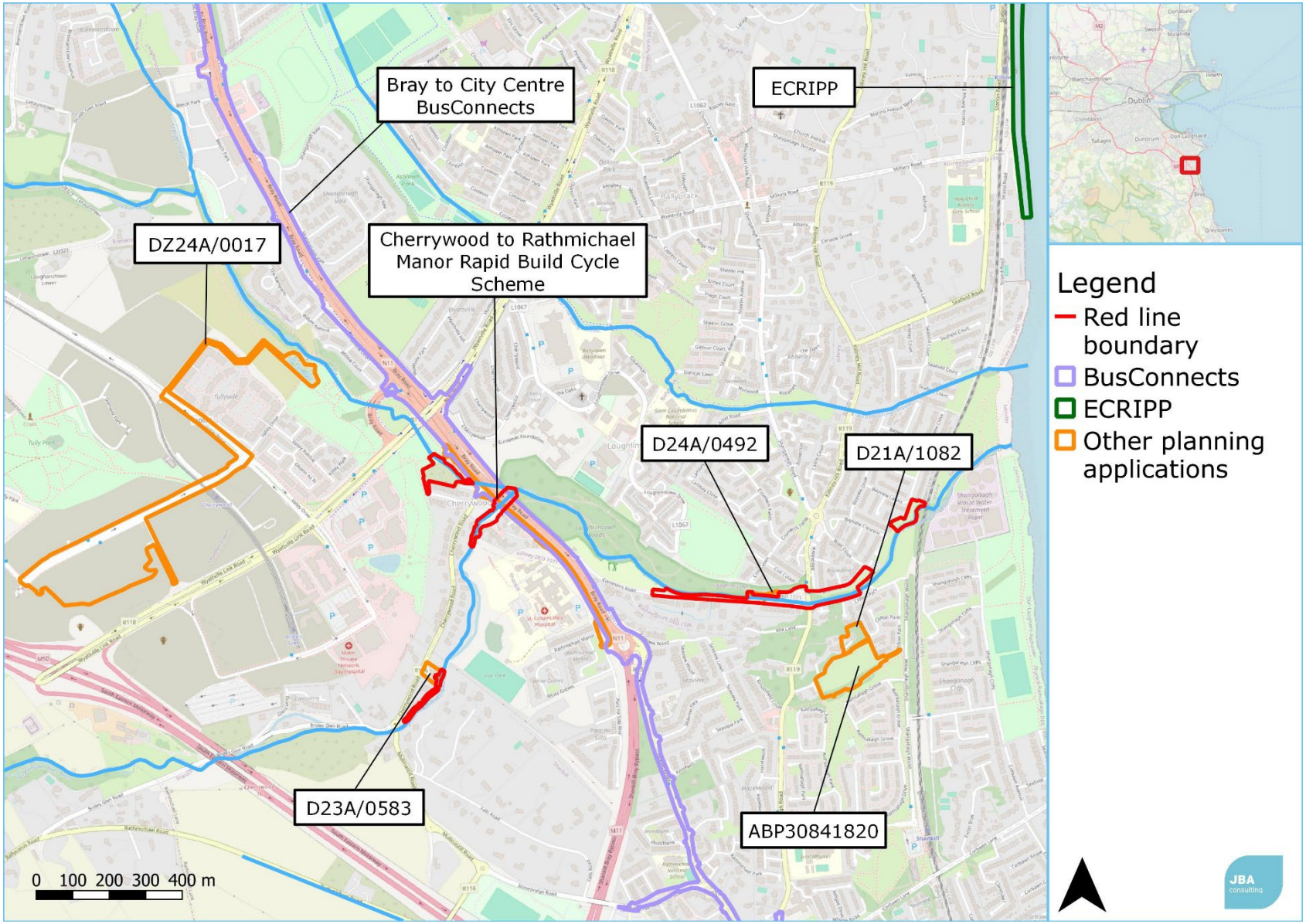

Figure 16.3: Other projects considered, Cherrywood to Bayview

Table 16.1: List of projects considered for Cumulative Effects

Project name or Reg. Ref.	Location	Description	Status
East Coast Railway Infrastructure Protection Projects (ECRIPP)	CCA2-3 – Dalkey Tunnel to Shanganagh Bray Wastewater Treatment Plant	CCA2/3 is the section of the coast that stretches from Dalkey Tunnel to just south of Killiney Martello Tower (near Shanganagh-Bray Wastewater Treatment Plant). This frontage is mainly non-urban with natural cliffs and intermittent man-made structures supporting the railway corridor. The Emerging Preferred Scheme for CCA2/3 to be taken forward to public consultation is rock revetments and concrete walls with walkway. The main advantages identified with the Emerging Preferred Scheme are: • Non-complex and comparatively low-cost construction; • Minimal maintenance burden and expenditure; • Robust solution; • Low material consumption and waste; • Preferable option for carbon management; and • Low impact on noise, vibration and air quality. **Rock revetment** • A rock revetment will be constructed on the beach at the toe of the cliffs in front of existing structures at Whiterock (south of Whiterock Beach). The rock revetment will comprise a minimum of two layers of natural rock boulders. The rock size has been selected to provide long-term stability and to allow for climate change. This rock will be of high quality to ensure that it has a long lifespan. • The rock revetment will absorb wave energy, reduce wave run up and overtopping and stabilise the shoreline. • Where required, the height of the existing walls behind the revetments will be raised to manage the overtopping risk. **Walkways** • At Killiney Beach, there are existing walkways along the rear of some sections of the beach. These walkways will be extended to the south and will provide continuous access along the rear of the beach with access down onto the beach provided at regular intervals. These new structures will prevent waves eroding the slopes that sit under the railway corridor at this location. • Buried rock will be placed at the toe of these new structures to prevent any undermining if the beach levels lower in the future.	Public Consultation open, due to close on 4th December 2024.
Cherrywood to Rathmichael Manor Rapid	Bray Road, Cherrywood Park	The Cherrywood to Rathmichael Manor Rapid Build Cycle Scheme is approximately 720 metres long. The scheme commences at the Cherrywood Park access, routing along Bray Road on the western side	**Due to go to construction Q2 2025. Construction expected**

Build Cycle Scheme	to Rathmichael Manor	of the N11 as far as Rathmichael Manor. Access will be maintained to all existing properties along the route. A 'cycle street' design is proposed along the Bray Road (slip road from N11) which utilises the low-traffic nature of the Bray Road. The 'cycle street' transitions briefly into a shared path where the N11/Bray Road slip lane merges onto the cycle street. A two-way cycle track and footpath is proposed south of the N11/Bray Road slip road. The two-way cycle track and footpath lead to a new pedestrian and cycle crossing at Rathmichael Manor. The works will include ancillary upgrade works to the public footpath, modifying the St Columcille's Hospital bus stop (stop 3143) to an island-style bus stop together with a pedestrian crossing of the cycle lane at that point. A 3-metre-wide shared path will link the footpath and cycle track with the Loughlinstown pedestrian bridge. The scheme will include additional traffic calming measures including new road markings, signage and two raised tables along the Bray Road.	**to be finished before FRS construction begins.**
D20A/0698	Dun Gaoithe at Aikens Village, Village Road, Sandyford, Dublin 18, to the west of 29 Dun Gaoithe Heights, 40-43 Dun Gaoithe Heights and to the southwest of Dun Gaoithe Hall	Retention and completion of a retaining wall in the residential development, permitted under planning reg. ref. D16A/0393, and subsequent planning reg. ref. D18A/0509. Permission is sought to retain and complete a partially built retaining wall along the western part of the site, along with all associated site works.	Permission granted 30/07/2021.
D24A/0341 ABP-320491-24	Site at Oldtown House, Kilgobbin road, Dublin 18.	The proposed development provides for the construction of 89 no. residential units, comprising 39 no. houses and 50 no. apartments, to be provided as follows: 1 no. single storey, 3 bed (Type H3D) house; 12 no. 2 storey, 3 bed (Types H3B, H3B1, H3BL, and H3BR) houses; 3 no. 2 storey, 3 bed (Types H3C, H3CL, and H3CR) houses; 4 no. 2 storey, 4 bed (Types H4A1 and H4A2) houses; 4 no. 2 storey, 4 bed (Type H4B) houses; 1 no. 2 storey, 4 bed (Type H4C) house; 14 no. 3 storey, 4 bed (Types H4D, H4D1, H4DL, and H4DR) houses; 4 no. 1 bed apartments; 45 no. 2 bed apartments; and 1 no. 3 bed apartment.	Refused by DLRCC. Appeal lodged with ABP

		The 50 no. apartments are proposed to be provided within 1 no. part 4 and part 5-storey apartment block, over a lower ground floor level. Balconies are provided for all apartments on the western and eastern elevations. The houses consist of 2 and 3 storey terraced, semi-detached and detached dwellings and one single storey dwelling. An ESB substation, plant rooms, external apartment storage, and bin and cycle storage areas are proposed within the lower ground floor of the apartment block, and bin and bicycle stores are proposed for the houses. The proposed development includes for the removal of part of an existing wall fronting Kilgobbin Road to facilitate the proposed new vehicular access from Kilgobbin Road, alterations to and the use of the existing entrance for a pedestrian and cyclist access only, provision of a new pedestrian ramp connection to Kilgobbin Road from the proposed public open space adjacent to the Kilgobbin Road boundary wall in front of Oldtown House, and associated alterations and conservation works within the setting of and to Oldtown House (RPS Ref.: 1700), including new boundary treatments, with the house remaining in residential use. The application includes the site of an Inn (Recorded Monument Ref. No. DU025-017002) which is incorporated into Oldtown House, and the ruins of structures associated with the Inn will be retained as part of the private open space for Oldtown House, with public open space located to the south and east of the ruins and Oldtown House. The proposed development also includes a single storey dwelling within the former kitchen garden area associated with the Inn site, situated to the west of the protected structure. A total of 133 no. car parking spaces, 173 no. cycle parking spaces and 2 no. motorcycle spaces are proposed. The proposal includes associated internal roads, pedestrian and cycle paths, and the provision of the proposed infrastructure up to the application site boundary to facilitate future connections to adjoining lands. The associated site and infrastructural works include site clearance, foul and surface water drainage, including attenuation system, provision of public and communal open space, cycle stores / spaces, boundary treatment, lighting, landscaping and PV panels at roof level. The proposal incorporates alterations and improvements to Kilgobbin Road, including relocation of a bus stop, 2 no. pedestrian crossings, and raised tables/ramps for the purpose of traffic calming.	
ABP31334122	Glenamuck Road North, Carrickmines, Dublin 18, (Bounded by 'Tullybeg to the north, 'Chigwell to the northeast, 'Stafford Lodge' to the south, and	Permission for a strategic housing development shall provide for the construction of (a) 118 no. residential apartment units in the form of 3 no. residential blocks of apartments ranging in height from 4 storey's and transitioning to 6-7 storeys overall. The overall development proposal shall provide for the following: Block A (7 storeys) comprising 44 no. units (13 n0. 1 bed units, 28 no. 2 bed. units and 3 no. 3 bed units); Block B (6-7 storeys overall) comprising 38 no. units (11 no. 1 bed units, 26 no. 2 bed units and 1 no. 3 bed units); and Block C (6 storeys overall) comprising 36 units (10 no. 1 bed units; 22 no. 2 bed units and 4 no. 3 bed units); Each new residential unit has an associated area of private open space in the form of balcony / terrace area and set back upper floor levels; Open space (approx. 2,071 sqm) is provided by one major centrally located public open space (1158.4 sqm) between blocks A and B which include a play area of 63.2 sqm, two further communal open space areas are provided adjoining Blocks	**Case is due to be decided by 03/08/2022** **Note: no further updates available on ABP website**

	'Carricail' to the southeast)	B (471.8 sqm) & Block C (440.8 sqm); Communal Area located at the ground floor of Block B (approx. 161.3 sqm) comprising of a shared working space (35.6 sqm), meeting rooms (42.2 sqm.), a gym (36.6 sqm) and changing/tea stations (46.7 sqm) is also proposed; 2 no. basement level areas (approx. 2,340.9 sqm) are also proposed at lower ground / ground floor level of Blocks A, B (1,470.0 sqm) and C (834.9 sqm) and include car parking, bicycle parking, refuse storage areas, plant areas and ESB Substation which is located between Block B and C; A total of 103 no. car parking spaces (67 no. at basement level and 36 no. at surface level to include 17 no. electric power points and 5 no. accessible parking spaces) are proposed. In addition, 5 no. motorcycle parking spaces (3 no. at basement level A and B, and 2 no. at basement level C). A total of 280 no. bicycle parking spaces (254 no. at basement level and 26 no. at surface level) are also proposed; Proposals for vehicular and pedestrian access comprise via Glenamuck Road North and all associated upgrade works; The access point to the south (via Carricáil) is for pedestrians and cyclists only; Associated site and infrastructural works including the provision for water services, foul and surface water drainage and connections; attenuation proposals; permeable paving; all landscaping works to include new tree and hedge planting; green roofs; boundary treatments; internal roads and footpaths; and electrical services. The application contains a statement setting out how the proposal will be consistent with the objectives of the Dún Laoghaire Rathdown County Development Plan 2016-2022. The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act, 2000, as amended, notwithstanding that the proposed development may materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land.	
ABP31332222	Priorsland, Within the Townsland of Carrickmines Great and Brennanstown, Dublin 18	Permission for development at this site. The site comprises land adjacent the Carrickmmines Stream and Carrickmines Luas Park & Ride. The application relates to development within the Cherrywood Strategic Development Zone (SDZ) and is subject to the Cherrywood Planning Scheme, 2014 (as amended). The development will comprise a mixed-use Village Centre and residential development as follows: 402 no. apartments (comprising 146 no. 1-beds; 218 no. 2-beds and 38 no.3-beds) within 6 no. blocks (Blocks A-F) ranging in height up to 5 storeys with basement/undercroft parking areas. 41 no. terraced/semi-detached/detached houses (comprising 19 no. 3-beds and 22 no. 4-beds). A supermarket (c.1,306 sq.m), 7 no. retail/retail services units (c.715 sq.m total gross floor area); 2 no. non retail/commercial units (c.213 sq.m total gross floor area); creche (c.513 sq.m), gym (c.155 sq.m), community space (c.252 sq.m) residential facilities (c551.8 sq.m total gross floor area), office/high intensity employment use (c.708 sq.m). Provision of car/bicycle/motorcycle parking at basement/undercroft/ground level. ESB sub-stations/switchrooms/kiosks, waste storage areas, plant areas. Provision of the first phase of Priorsland Public Park along the Carrickmines Stream and additional public and communal spaces. Provision of an acoustic barrier along the southern/ south-western edge of the site adjacent to the M50. Construction of Castle Street on the subject lands and two road bridges across the Carrickmines Stream, one to serve a future school site, the second to provide interim pedestrian and cyclist access to the Carrickmines Luas Station and future Transport Interchange.	**Case is due to be decided by 02/08/2022** **Note: no further updates available on ABP website**

		Provision of a pedestrian bridge from the Village Centre to Priorsland Park. The proposed development includes for all associated site development works landscaping, boundary treatments and service provision. The application contains a statement setting out how the proposal will be consistent with the Dun Laoghaire -Rathdown County Development Plan 2016-2022 (currently in force) and the Dun Laoghaire - Rathdown County Development Plan 2022-2028 (adopted, not yet in force), and the Cherrywood SDZ Planning Scheme, 2014 (as amended). An Environmental Impact Assessment Report and a Natura Impact Statement have been prepared in respect of the proposed development	
ABP31328122	'Winterbrook' and 'Barrington Tower', Brennanstown Road, Dublin 18	Planning permission for a strategic housing development consisting of the demolition of an existing habitable dwelling 'Winterbrook', and the derelict, former dwelling attached to Barrington Tower protected structure. 'Barrington Tower' itself will be retained and restored. It is also proposed to demolish the existing boundary wall to the north of the site along Brennanstown Road. The development will provide a 'Build to Rent' (BTR) apartment development consisting of 8 no. blocks ranging in height up to 10 storeys (including lower ground floor) providing a total of 534 no. apartments. This will comprise of: 30 no. studio, 135 no. 1 -beds, 318 no. 2-beds & 51 no. 3-beds. All residential units provided with associated private balconies/terraces to the north/south/east/west elevations. Resident Support Facilities & Resident Services & Amenities (total floor area c.1,496 sq.m) including flexible spaces including entertainment rooms, meeting rooms, parcel rooms, media rooms, lounge and workspaces, gyms and studio, chef's kitchen and dining area. A creche (c.356.5 sq.m), and a retail unit (c.336.8 sq.m). Car and cycle parking at basement (2 levels) and at ground level. This will provide 419 no. car parking spaces, 1,266 no. cycle parking spaces and 17 no. motorcycle spaces. All associated site development works, open spaces and landscaping, boundary treatments, plant areas, waste management areas, cycle parking areas, and services provision (including ESB substations). Vehicular/pedestrian/cyclist access from Brennanstown Road will be provided along with improvement works to the Brennanstown Road including a new junction and pedestrian crossing facilities. Pedestrian/cyclist access through the site to the Brennanstown Luas Stop will also be provided. The application contains a statement setting out how the proposal will be consistent with the objectives of the relevant Dun Laoghaire Rathdown County Development Plan 2016-2022 (currently in force), the Dun Laoghaire Rathdown County Development Plan 2022 – 2028 (adopted, due to come into force on the 21st April 2022) and the Cherrywood Planning Scheme 2014 Strategic Development Zone. The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act, 2000, as amended, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land. An Environmental Impact Assessment Report and a Natura Impact Assessment have been prepared in respect of the proposed development.	Permission refused by ABP on 12/09/2024
DZ24A/0017	Townlands of Laughanstown		Permission granted 11/06/2024

	and Cherrywood, Macnebury - Development Area 7 - Cherrywood, Dublin 18	The site of the development proposed is generally bound by Bishop Street to the north, Cherrywood Avenue to the east, the M50 to the west and development permitted under Reg. Ref. DZ22A/1021 and the Wyattvile Link Road to the south. The development proposed consists of a residential development consisting of 200 no. residential apartment units (total c. 27,308 sqm GFA) accommodated in 3no. blocks, ranging in height from 4-5 storeys on a net development area of approximately 0.89 ha. The overall development proposed comprises of the following: • 200 no. apartment units in 3no. blocks comprising: o Block A1 – 68no. units (12no. 1-bed, 41no. 2-bed and 15no. 3-bed) o Block A2 – 54no. units (14no. 1-bed, 39no. 2-bed and 1no. 3-bed) o Block A3 – 78no. units (14no. 1-bed, 49no. 2-bed and 15no. 3-bed) • Provision of 241no. car parking spaces allocated to the proposed development. The lower ground floor accommodates 139 no. car parking spaces and 102 no. spaces are accommodated at basement level. 10 no. of these spaces are accessible and 48 no. are for Electric Vehicles. • Provision of 264 no. bicycle parking spaces, of which 220 no. are long stay and 44 no. are short stay and 10 no. motorcycle parking spaces are provided. • The provision of c. 1,645 sqm of courtyard gardens of which c.1,456 sqm is private communal amenity space; • Vehicular Access serving the proposed development is via Cherrywood Avenue; • all associated and ancillary site development and infrastructural works, including the provision of bike stores and bin stores, ESB sub-stations / switch room, public lighting, private amenity space, hard and soft landscaping and boundary treatment works. The proposed development also consists of minor revisions to the Phase 1 development permitted under Reg. Ref. DZ22A/1021 comprising of landscaping amendments to civic park, relocation of the foul water outfall from Bishop Street to Cherrywood Avenue together with all ancillary works, minor relocation of attenuation tanks located in the civic park and relocation of car share spaces (5no.) from surface level within the permitted Phase 1 development to the basement of the proposed Phase 2A development.	
D23A/0583	Riverwood, Cherrywood Road, Shankill, Dublin 18, D18R2V5	The demolition of two existing single-storey extensions to the rear of the property. 2) Construction of two smaller, single-storey extensions to the rear of the property. 3) Construction of an internal single storey corridor to replace an existing outdoor courtyard. 4) Construction of anew two storey element to facilitate a new entrance area and first floor bedroom. 5) Remodelling of existing windows to various elevations. 6) Construction of a new carport beside an existing garage. 7) Construction of a new integrated shed structure as part of an extended existing roof. 8) Adjustments to the existing roof profiles to the side and rear of the property. 9) Adjustments to the width and height of an existing vehicular entrance to include new vehicular gates, a new pedestrian gate, new gate posts and higher walls to match the height of the existing boundary walls, together with all associated landscaping/site works.	Permission granted 11/04/2024

ABP30841820	1.4 ha site to the south of Abingdon, Shanganagh Road, Shankill, Dublin 18	Permission for a Build To Rent Strategic Housing Development comprise a Build to Rent (BTR) residential scheme comprising 193 no. apartments within 4 no. blocks ranging in height from 5 to 8 storeys. The apartment mix will comprise: 193 no. units as follows: 12 no. studios; 110 no. 1 bed; 1 no. 2 bed (3 persons); 70 no. 2 bed (4 persons). All apartments will be provided with associated private balconies/terraces facing north/ south/ east/ west. The development will include a pavilion, open spaces, tree houses, meeting rooms and flexible work space, BBQ facilities, resident's gym, and residential amenities areas. The development will include for a total of 120 no. car parking spaces including accessible spaces at undercroft and surface level,372 no. bicycle parking spaces and 6 no. motocycle spaces. Vehicular connection will be via Clifton Park. Additional pedestrian/cyclist accesses to the south (leading to Shankill Dart station to the south) is also proposed. The development also includes for all associated site development works and services provisions including bin storage areas, substations/switch rooms, plant rooms, boundary treatments and landscaping. The application contains a statement setting out how the proposal will be consistent with the objectives of the relevant Dun Laoghaire Rathdown County Development Plan 2016-2022. The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act, 2000, as amended, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land. A Natura Impact Statement has been prepared in respect of the proposed development.	Permission granted 11/02/2021.
D21A/1082 ABP-315449-23	Conna, Abingdon Park, Shanganagh Road, Shanganagh, Shankill. Co. Dublin, D18WF54	Permission sought for development consisting of A) 32 number apartments comprising of three number three-bedroom, fourteen number two-bedroom, thirteen number one-bedroom and two number studio units on three floors to rear with a floor area of 1,121.5 sq.m., with balconies on East, West and South sides and an overall height of 14.1m from basement level, connected to and along with four floors to front with a floor area of 1,563sq.m, with balconies on West, East and South sides, with an overall height of 15.2m from basement level. Ground floor car parking for No. 13 cars including one disabled space. Basement car parking with an overall floor area of 849.7sq.m. consists of No. 24 car parking spaces to include No. 2 spaces for disabled and three electric charge points along with No. 2 motor bike spaces and No.17 bicycle spaces to include one cycle bicycle space. No. 26 bicycle spaces located at ground level. Bin storage with an area of 25 sq.m, located at basement level externally to North-East corner of site. Plant and services with a floor area of 21.9 sq. are located at roof level and meter services with a floor area of 15.3 sq. at basement level. Total gross floor area of the proposed development to be 3,556sq.m. Solar panels of the area of 40sq.m.to be provided on West roof. New 5.0m. wide vehicular access and 1.2m. wide vehicular access and 1.2 m. wide pedestrian access are to be provided onto Clifton Park, with gates 2.0 meters high, all on a site area of 3,380 sqm. The suite works include landscaping, screening, with common open space of 1,385.25 sq.m. along with new Sewage and Surface water drainage and an area of 7 sq.m. for siting 2m. high heat pumps at North boundary, new water connection to be connected to existing services at Clifton Park. New 2m. high wall to be provided along the South boundary and 2m high wall to be re-instated to East boundary of the site. All enabling and site development works, landscaping, boundary treatment, lighting, services and connections, waste	**Case is due to be decided by 08/05/2023** **Note: no further updates available on ABP website**

		management and all other ancillary works. B) Demolition of the existing two storey dwelling house 'Conna' with a floor area if 432.00 sq.m, and a height of 8.46 meters, along with demolition of single storey corrugated metal roofed sheds at Northwestern boundary, retaining existing access, as a pedestrian access onto Shanganagh Road, which boundary and curtilage partially meets the attendant grounds of Abingdon House, a protected structure.	
D24A/0492	60, Roseville Cottage, Commons Road, Dublin 18, D18NXR6	Planning permission is being sought for retention and alterations to development of part dormer dwelling with two storey extension to north rear side and single story extension on west side with open canopy over entrance door. Permission for Demolition and removal of the second storey rear north elevation wall and flat roof and its replacement with a reduced height pitched roof, demolition and removal of the flat roof and roof garden to the ground floor extension to the west side of the building and its replacement with a pitched roof and pergola. Installation of new ground floor bedroom window to the east wall and a new rooflight over the master bedroom. Execution of new flood defence works including installation of flood protection gates.	**Refuse permission for retention**
Bray to City Centre Core Bus Corridor Scheme	Bray to Dublin City Centre	The Bray to City Centre Core Bus Corridor Scheme (the Proposed Scheme) will support integrated sustainable transport usage through infrastructure improvements for active travel (both walking and cycling), and the provision of enhanced bus priority measures for existing (both public and private) and all future services who will use the corridor. The Proposed Scheme has an overall length of approximately 18.5km and in addition, the section of Stonebridge Road included in the design measures approximately 200m. The Proposed Scheme is routed along R138 and commences at the junction of Leeson Street Lower and Earlsfort Terrace on St. Stephen's Green. It runs along Leeson Street Lower and Upper, and Sussex Road. It continues along Morehampton Road and Donnybrook Road, through Donnybrook Village and on to the Stillorgan Road, serving the UCD Interchange via the Stillorgan Road Overbridge at Belfield. The route then continues on the Stillorgan Road (N11), which carries on to the Bray Road to Loughlinstown Roundabout. From Loughlinstown Roundabout it runs along the Dublin Road (R837) to St. Anne's Church and then continues south through Shankill village along the R119. It then passes through Wilford Junction and along the Dublin Road until it terminates on Castle Street in Bray, on the north side of the River Dargle crossing. The aim of the Proposed Scheme is to provide improved walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The Proposed Scheme is a key measure that delivers on commitments within the National Development Plan (2021-2030), the Transport Strategy for the Greater Dublin Area (2022-2042) the Climate Action Plan (2023) and the National Planning Framework 2040.	**Application lodged to ABP 04/08/2023. Further consideration required by ABP.**

16.1 Air Quality and Dust

In relation to the in-combination construction and/or operational impact of the proposed development with other proposed schemes in the area, the list of schemes in Table 16-1 has been reviewed. In Section 6.1.5 Mitigation Measures above it states:

- If applicable, hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

The list of projects above was consulted in relation to Air Quality and Dust. The following is noted in Chapter 6 and repeated here:

- **Planning Ref: D24A/0341 –** Site at Oldtown House, Kilgobbin road, Dublin 18**.** Permission to construct 89 no. residential units. The proposal includes associated internal roads, pedestrian and cycle paths, and the provision of the proposed infrastructure up to the application site boundary to facilitate future connections to adjoining lands. The proposal also incorporates alterations and improvements to Kilgobbin Road, including relocation of a bus stop, 2 no. pedestrian crossings, and raised tables/ramps for the purpose of traffic calming. Permission was refused 09/07/2024 and an appeal was lodged on 6.8.2024 (Ref; ABP-320491-24). If granted permission, this development would be considered a high-risk site. If the construction period of this development is to overlap with the proposed FRS, there is a potential to impact on air quality in the area, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.
- **Planning Ref: ABP31334122** – At Glenamuck Road North, Carrickmines, Dublin 18. Permission for a strategic housing development comprising 118 no. residential apartment units. A decision was due on this development on 3.8.2022 but no such decision has been made. This development is approximately 235m away from the proposed FRS works at Glenamuck Road North Roundabout. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a high-risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development if granted permission will be required to make suitable provision for dust minimisation during construction works, in accordance with its own planning conditions including implementation of the dust control measures, as outlined within the Preliminary Construction Management Plan (Preliminary CMP), by Waterman Moylan Consulting Engineers Limited, (February 2022) for the proposed site.
- **Planning Ref: ABP31332222** – At Priorsland, Within the Townsland of Carrickmines Great and Brennanstown, Dublin 18. Permission sought to develop a mixed-use Village Centre and residential development. A decision was due on this development on 2.8.2022 but no such decision has been made. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a high-risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development if granted permission, will be required to make suitable provision for dust minimisation during construction works, in accordance with its own planning conditions.
- **Planning Ref: ABP30841820** – On a 1.4 ha site to the south of Abingdon, Shanganagh Road, Shankill, Dublin 18. Permission granted to construct a Build to Rent (BTR) residential scheme comprising 193 no. apartments. Permission granted 11/02/2021. This development is located <100m from proposed Flood Walls and compound along Commons Road/River Lane. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a high-risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development as part of their planning conditions has been required to make suitable provision for dust minimisation during construction works, including submitting a Construction Management Plan to the local authority pre-construction.

- **Planning Ref: D21A/1082** – At Conna, Abingdon Park, Shanganagh Road, Shanganagh, Shankill. Co. Dublin, D18WF54. Permission sought for construction of 32 apartments with all relevant associated site works. The case was due to be decided by 08/05/2023. It is unclear if a decision has been made with the Board regarding this appeal. This development is located adjacent to the development **(**Planning Ref: ABP30841820) listed above. If granted permission and the construction period of this development overlaps with the proposed FRS, there is a potential to impact on air quality in the area. This development is considered a medium/high risk site, cumulatively with the development south of it, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.
- **Bray to City Centre Core Bus Corridor Scheme** - This development is considered a high-risk site and if the construction period of this development overlaps with the proposed FRS regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. This development is required to make suitable provision for dust minimisation during construction works in accordance with its own planning conditions.

16.2 Climate

No potential cumulative impacts were identified with regard to climate.

16.3 Noise and Vibration

No potential cumulative impacts were identified with regard to noise and vibration.

16.4 Population and Human Health

If the construction periods of the developments shown in Table 16-1 are to overlap with the proposed development, there is a potential to impact on population and human health through additional disruptions. These effects would be temporary while the construction phase progresses and will not be significant.

Planning Application D24A/0341, on appeal with An Bord Pleanála ABP-320493-24, has proposed the construction of 89 no. residential units on Kilgobbin Road, just south of the proposed development. If this project goes to construction at the same time as the proposed development, impacts on Kilgobbin Road with regard to construction traffic and disruption to residents using the road could be significant. The proposed flood defence works at Kilgobbin Road will need to be carefully sequenced with the above project. The relevant contractors will be required to liaise on sequencing and traffic management measures should construction occur at the same time.

No other projects nearby are expected to lead to cumulative impacts with the proposed development.

Once operational, the proposed FRS, when considered cumulatively with the above developments, will have a positive impact on population and human health.

16.5 Biodiversity

Potential impacts that may arise as a result of relationships between sensitive receptors within and outside of the site have been addressed in this EIAR and the AA Screening. Guidance for the assessment of indirect and cumulative impacts, as well as impact interactions has been taken from the European Commission document ‘Guidelines for the Assessment of Indirect and Cumulative Impacts’ as well as ‘Impact Interactions’ (Walker and Johnston 1999) and ‘Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland’ (CIEEM 2016 and 2006).

The list of projects above has been consulted. With the implementation of mitigation measures outlined in this chapter, no significant cumulative impacts are considered likely with regard to biodiversity.

16.6 Land and Soil

Several residential developments are planned in the area. Due to the size and nature of these developments they are not expected to result in significant cumulative effects on soils and geology. Overall, ensuring relevant legislation and proposed mitigation measures are adhered to and implemented, the cumulative effects associated with developments in the area are long-term with an imperceptible impact on land, soils, and geology.

No cumulative impacts on land and soils are expected due to the Dublin Array project.

16.7 Water

The Dublin Array wind farm project has the potential for adverse effects on water in the Irish Sea due to its offshore elements, and on the Carrickmines-Shanganagh river network due to its onshore elements. The proposed wind farm will undergo full environmental assessment in the form of an EIAR. Any potential impacts to surface water quality as a result of the wind farm would have appropriate mitigation measures in place.

Other projects outlined in Chapter 16 will not have a significant cumulative impact with the proposed development, due to their small size and lack of complex likely effects.

16.8 Material Assets – Traffic and Transport

The cumulative impact assessment for Traffic was informed by the scoping exercise undertaken in the development of this EIAR. For the construction phase, construction vehicles for the proposed Scheme will be restricted to 10:00-16:00 on weekday and 10:00-13:00 on Saturday. Additionally, temporary traffic management at some roads (i.e., Kilgobbin Road, Glenamuck Road North, Commons Road, Shanganagh Road, etc.) will be implemented during the off-peak hour (i.e., 10:00-16:00), and temporary traffic management at N11 and Bray Road will be only implemented at night-time (i.e., 20:00-05:00) subject to the agreement with the relevant Authorities. To further minimise the traffic impacts to public, a Traffic Management Plan would be prepared in consultation and agreement with the local authority to minimize peak construction traffic flows. Additionally, where necessary the Contractor shall carry out co-ordination meetings with Contractors working on other nearby projects and/or public transport operators to resolve the interface issues related to the temporary traffic management. Therefore, the cumulative impact is considered to be slight adverse temporary impact during the construction phase.

After completion of the proposed Scheme, the roads impacted by the works will be reinstated to their pre-construction condition with no changes to the road network or permitted direction of travel. Therefore, no cumulative effects were identified during the operational phase.

16.9 Material Assets – Utilities and Waste

The list of projects outlined in Table 16-1 has been consulted; no significant adverse impacts on Utilities and Waste are expected.

If construction of the Dublin Array happens at the same time as the construction phase for the proposed development, there could be disruptions due to the proximity of the schemes. DLRCC and the Dublin Array project team are liaising closely, which will ensure that programming and potential interactions are managed closely. No significant cumulative impacts are expected.

16.10 Cultural Heritage

No potential cumulative impacts were identified with regard to cultural heritage.

16.11 Landscape and Visual Impact

The projects listed in Table 16-1 were considered and assessed in terms of their potential impact on landscape and visual amenity and their potential to be experienced cumulatively with the proposed development.

It is possible that the construction period of the proposed development will overlap with that of several developments in the area. This would result in a temporary slight adverse cumulative effect on the local visual amenity and landscape for the duration of the overlapping construction period. A significant impact would not occur in this scenario.

Due to the nature of the proposed development and the nature of the other projects listed, cumulative effects during the operational phase are expected to be imperceptible.

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