Carrickmines-Shanganagh River Flood Relief Scheme

EIAR – Volume 1 Non-Technical Summary

Final Report

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This report relates to the Carrickmines-Shanganagh River Flood Relief Scheme commissioned by Dun 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 Volume 2, Chapter 1.

Purpose

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Abbreviations

AA	Appropriate Assessment
AEP	Annual Exceedance Probability
CEMP	Construction Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
CTMP	Construction Traffic Management Plan
DLRCC	Dun Laoghaire Rathdown County Council
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FRS	Flood Relief Scheme
GII	Ground Investigations Ireland
HGV	Heavy Goods Vehicle
INNS	Invasive Non-Native Species
MCA	Multi-Criteria Assessment
NBHS	National Built Heritage Service
NHA	Natural Heritage Area
NSO	National Strategic Outcome
OPW	Office of Public Works
pNHA	Proposed Natural Heritage Area
QI	Qualifying Interest
RMP	Record of Monuments and Places
RWMP	Resource Waste Management Plan
SAC	Special Areas of Conservation
SPA	Special Protection Areas
WFD	Water Framework Directive

1 Introduction

This document provides a non-technical summary for the Environmental Impact Assessment Report (EIAR) for the proposed Carrickmines-Shanganagh River Flood Relief Scheme (FRS), which has been prepared on behalf of Dún Laoghaire-Rathdown County Council (DLRCC) and the Office of Public Works (OPW).

The Carrickmines-Shanganagh River originates near Kilternan village and flows through Sandyford, Leopardstown, Loughlinstown, and Shankill, exiting into the Irish Sea at Killiney Bay. Surrounding areas have been frequently impacted by fluvial flooding in areas such as Shankill, Carrickmines and the nearby M50 and N11 roads, including a significant flooding event in October 2011. The proposed development aims to provide flood relief to minimise the risks currently posed to people, the community, social amenity, environment, and landscape.

Schedule 5 of the Planning and Development Regulations 2001 (as amended, hereafter the '2001 Regulations') sets out a wide range of development categories with associated thresholds for which an EIA is required. Part 2 of Schedule 5 of the 2001 Regulations includes "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 of 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". As the proposed FRS has an immediate contributing sub-catchment of approx. 139 hectares and the total river channel length is 2.06 km, the proposed development is above the threshold, and an EIAR is required.

The EIAR comprises three volumes as follows:

- Volume 1: Non-Technical Summary (this document);
- Volume 2: Environmental Impact Assessment Report; and
- Volume 3: Environmental Impact Assessment Report Appendices

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
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- 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 Impacts

The EIAR has been compiled by JBA Consulting with input from a team of experienced consultants. The 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). Where relevant, individual chapters also make reference to specific guidelines which are relevant to that discipline.

Need for the Proposed Development

The scheme is being developed primarily to protect affected areas against fluvial flooding. The surrounding area of the Carrickmines-Shanganagh River including Commons Road in Shankill and Glenamuck Road in Carrickmines are frequently impacted by fluvial flooding from the river system, as well as the critical transport routes of the M50 and N11 roads. The most recent significant flood event occurred in October 2011.

Outline of the Proposed Development

Generally, the FRS will comprise 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.

Reinforced concrete flood relief walls will be constructed in the following places. The defences referred to in brackets are shown in Figure 1.1:

- The southeastern part of Clon Brugh (Defence 1.A and 1.B);
- The north of Belarmine Park (Defence 2.D);
- At Kilgobbin Road Bridge and Kilgobbin House (a protected structure) (Defence 2.E);
- At Ballyogan Grove, Castle View, Glenamuck Road North, and Priorsland House (Defence 3.A);
- The northern bank of the Brides Glen River on Cherrywood Road (Defence 4.A);
- The eastern bank of the Carrickmines River on Bray Road (Defence 5.D);
- Waterfall Cottage at Lower Brides Glen (Defence 4.B);
- Both sides of the Shanganagh River on Commons Road (Defence 5.A);
- The existing greenfield space at Brookdene (Defence 5.A); and
- To the rear of houses in Bayview (Defence 5.D).

The following works will also be needed:

- Partial demolition of existing masonry walls and realignment of footpath at Clon Brugh (Defence 1.A and 1.B).
- Upgrade of the existing culvert inlet at the downstream end of Belarmine Park and south of that, a new flood defence wall and railing (Defence 2.B and 2.D).
- A flow control structure (weir) at the entrance to a new overflow pipe traversing under Kilgobbin Road to a point downstream will increase the hydraulic capacity of the system (Defence 2.G).
- Construction of a new overflow culvert underneath the N11 along with an overtopping weir structure upstream of the existing culvert (Defence 4.C)
- Partial realignment of the western side of the river channel at Bray Road to accommodate installation of flood relief walls (Defence 5.D).
- An upgrade of the bridge parapet at Shanganagh Road Bridge (Defence 5.A).

A full detailed description of the proposed development is included in Chapter 3 of the EIAR.

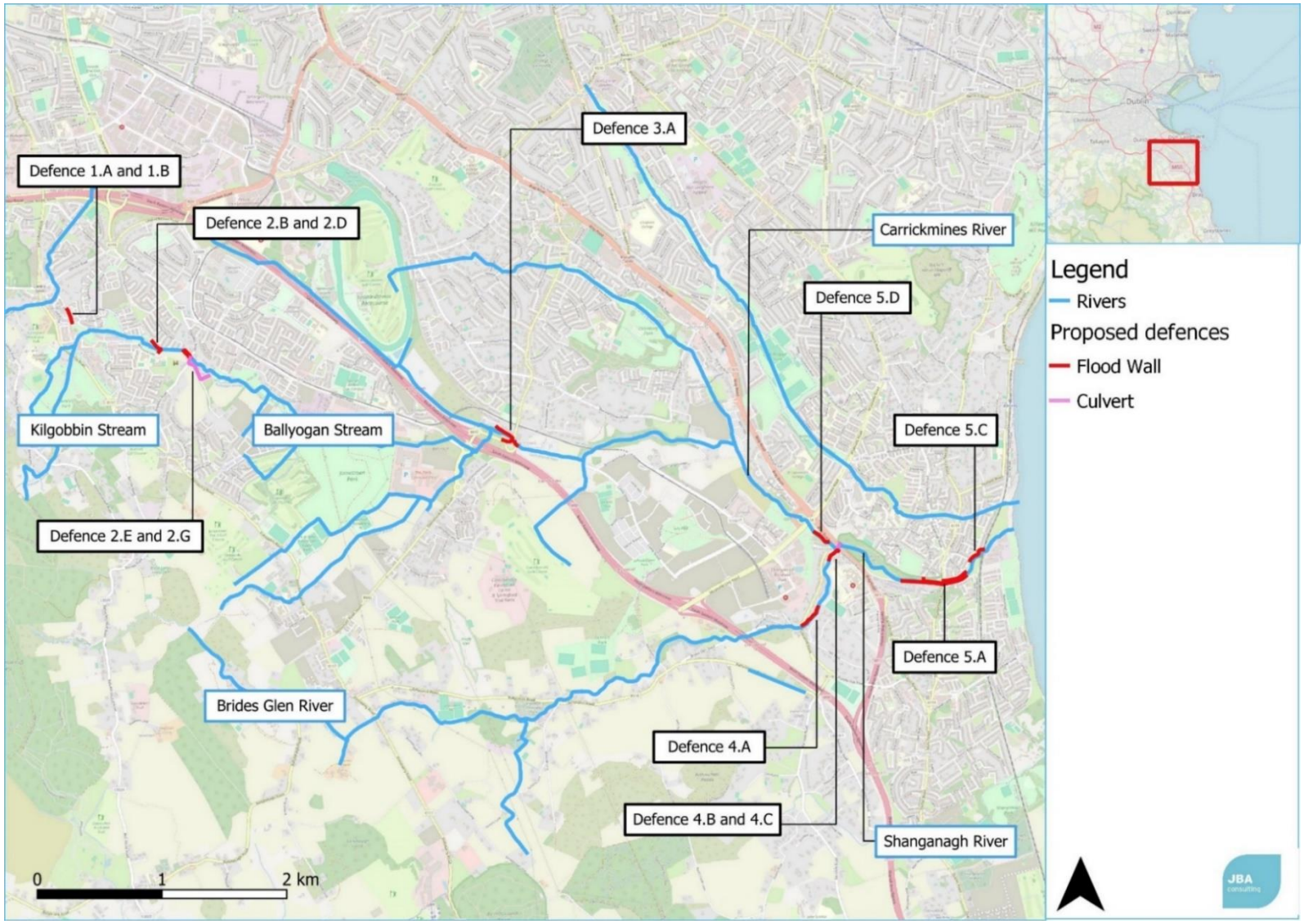

Figure 1.1: Carrickmines-Shanganagh FRS Overview

2 Examination of Alternatives

Prior to the preparation of the EIAR, several studies were undertaken to inform the option design and scoping of the EIAR.

The alternatives for the scheme were evaluated in the early stages in a two-stage approach. First, potential measures were screened based on hydraulic performance to ensure that only measures which provide adequate flood protection were taken forward. This stage included eight Flood Risk Management approaches, with suitable or viable measures taken forward for further assessment. The initial screening considered different scales of implementation and benefits: individual flood cell and settlement scale (individual residences or groups of residences with the same flood risk), FRS area scale, and whole catchment scale. Interactions arising from the flood measures and potential impacts upstream and downstream on hydrology and flood responses were considered. Measures were initially 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.

A set of potential measures was developed based on the initial screening of Flood Risk Management approaches. Due to the characteristics of the catchment (a rural mountainous setting in the upper parts of the catchment, and a highly urbanised lower catchment), opportunities for nature-based solutions (NBS) to provide flood protection are limited. As part of the initial screening, 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.

The second stage assessed the different potential measures based on their applicability, economic feasibility, and their likely environmental, social, and cultural impact. The results are provided in the Options Report. The measures considered at this stage were:

- Raising and installation of reinforced concrete walls;
- Installation and upgrade of flood relief culverts;
- Storage of flood waters;

Following combined testing of viable measures, it was determined that a combination of flood management approaches was required, with no single measure or mechanism proving the necessary standard of protection. Multiple measures were tested in each of the five flood cells. The number of potentially viable solutions in each flood cell was limited to only one, meaning there was a single possible combination of measures from the Carrickmines-Shanganagh River FRS which was viable and which provided the necessary standard of protection for the entire area. There were 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 it is a product of the constraints on the system: steep tributaries, urban runoff, and a narrow floodplain which forces flood flows into a channel with very limited capacity before it discharges to the sea. As only one option was developed, a multi-criteria analysis (MCA),

which ordinarily would have taken place in order to assess and decide between different options, was not carried out.

Following the arrival at a single scheme option, a Scoping Report was developed, which was the first stage in the preparation of the EIAR. The Scoping Report introduced the proposed development, defined the location and extent of works, identified the key environmental issues and receptors in the vicinity, the potential impacts of the proposal, and identifies the likely environmental studies that are required to inform the full EIAR. The Scoping Report was distributed to statutory consultees as part of the consultation phase.

3 Description of Proposed Development

The proposed development is positioned in several locations in the Carrickmines-Shanganagh River catchment, generally along the banks of the river, as it flows from the R117 Enniskerry Road towards the Irish Sea between Killiney and Shankill. The Carrickmines-Shanganagh River catchment is approximately 36km^2 and has several significant tributaries, including the Brides Glen River, the Cabinteely Stream, and the Racecourse Stream. The west of the catchment is primarily mountainous land while the east is dominated by urban residential areas.

The proposed development is shown in 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 20108-JBB-00-XX-DR-Z-02942_Bayview_Proposed Site Layout
- 20108-JBB-00-XX-DR-Z-02943_Bayview_Proposed Sections and Elevation

The proposed development comprises the following:

Table 3.1: Summary of proposed development locations

Area	Proposed Design
Clon Brugh – 1.A and 1.B	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.
Belarmine Park – 2.B and 2.D	Replacement of c. 100m of the Sandyford Hall boundary wall with a concrete flood defence wall up to 2.6m high. Construction of c. 36m of new flood defence wall in Belarmine Park up to 1.65m high to tie into the existing culvert inlet. Minor upgrade works to the existing culvert inlet structure.
Kilgobbin Road – 2.E and 2.G	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.
Glenamuck Road North Roundabout – 3.A	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.
Cherrywood Road – 4.A	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).
Bray Road – 5.D	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. C. 75m of river channel realignment, replacement of the existing access bridge and strengthening works to the existing masonry arch.
Lower Brides Glen – 4.B	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 Bridges 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 railings.
N11 Overflow Culvert – 4.C	Installation of c. 53m of new 2.4m diameter overflow pipe beneath the N11 dual carriageway including an inlet structure upstream of the N11 and an outlet structure in Loughlinstown Park.
Commons Road, River Lane and Brookdene – 5.A	Installation of c. 209m of flood defence walls, up to 2.4m high on Commons Road adjoining the Shanganagh 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 an overall height of up to c. 1.8m. Construction of c. 185m of stone finished flood defence wall to a height of c. 1.2m in the green area in Brookdene.
Bayview – 5.C	Construction of c. 95m stone finished flood defence walls up to 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 wall tying into the culvert under the railway with a concrete flood defence wall.

Construction of the proposed development will take place over c. 18-24 months. As part of construction, instream works will take place at Belarmine Park, Kilgobbin Road, Bray Road, the N11 Culvert, Shanganagh Road Bridge, and Bayview. This is to accommodate the installation of new flood defences and will consist of installing temporary protections prior to works commencing, installing various flood defences, and removing temporary works following construction. Works will take place near water throughout the scheme, with mitigation measures for instream works and works near water detailed in Chapter 10 of the EIAR.

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.

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. The Carrickmines-Shanganagh River network will be regularly inspected and any maintenance to manage the overgrowth that may affect conveyance in the channel will be carried out.

4 Legislation and Planning Policy

This section of the Environmental Impact Assessment Report considers the proposed development in the context of national, regional, and local planning policy, and the legislation governing the proposed works. The principal guiding national, regional and local documents are listed below in addition to the governing legislation:

- EU 'Floods' Directive 2007
- The Planning and Development Act 2000 (as amended)
- The Planning and Development Regulations 2001, as amended
- National Planning Framework (NPF)
- 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
- Climate Action Plan 2024
- Eastern and Midland Regional Assembly, Regional Spatial and Economic Strategy 2019
- Eastern Flood Risk Management Plan (CFRAM)
- Dún Laoghaire-Rathdown County Development Plan 2022-2028

The National Planning Framework 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 identifies National Strategic Outcomes (NSOs) which seek to guide future development.

National Strategic Outcome 9 Sustainable Management of Water and other Environmental Resources outlines the urgency of upgrading and investing in water management and environmental resources. Strategic Outcome 9 seeks to ensure investment in water infrastructure nationally while also ensuring the protection of our watercourses. With regards to flooding and flood risk management, NSO 9 seeks to *'implement the recommendations of the CFRAM programme will ensure that flood risk management policies and infrastructure are progressively implemented'.*

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. As such, the proposed development is fully supported by the National Planning Framework.

Further to this, the scheme was assessed in relation to the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region which 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.

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, noting that flooding is identified as a key challenge facing cities and towns in the region.

The RSES outlines a number of policies which seek to ensure that there is investment in flood relief works, and infrastructure which will mitigate against the risk of climate change. The RSES concludes that flood risk poses a significant risk to existing settlements and future development.

It is concluded that the proposed Flood Relief Scheme is in line with the regional planning policy for the Eastern and Midland Region.

The Dún Laoghaire-Rathdown County Development 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 proposed development aligns with the Development Plan objectives in the following ways:

- Will aide in mitigating against future climate change related flood events
- Will contribute to the future mitigation of flood risk in the settlement
- Will provide for the development of Flood Relief Schemes as identified in the CFRAM 10 Year Investment Programme
- Will provide flood protection measures and reduce flood risk as far as possible
- Will aide in the implementation of the EU Flood Risk Directive (2001/60/EC) on the assessment and management of flood risks

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.

Further to this, the proposed work falls within a number of land use zoning objectives identified within the Plan. These objectives are as follows:

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

A manner of different development types are identified as being permitted under these land use zonings. The proposed works, which are the subject of this EIAR will allow for Dún Laoghaire-Rathdown County Council to meet the objectives of these land use zonings in accordance with the objectives set out in the Dún Laoghaire-Rathdown 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

Public and statutory consultation are a requirement of projects undergoing EIAR. Statutory consultees include government bodies, regulatory bodies, non-governmental organisations and others who have an interest or responsibility in some respect to a part of the development. These consultees were identified in the Scoping stage of the EIAR. The second avenue is to consult with the public including local residents and business owners who may be impacted by the development or any member of the public who wants to provide input.

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. Responses were received from the following:

- Geological Survey Ireland
- Uisce Éireann
- Inland Fisheries Ireland
- Transport Infrastructure Ireland
- Nation Transport Authority
- HSE National Environmental Health Service
- National Monuments Service – Development Applications Unit (DAU)

Responses were considered in the preparation of the EIAR and were passed onto the design team where amendments to the design were required.

To date there have been two public consultation days on the Carrickmines-Shanganagh River FRS:

- Initial Public Consultation Event 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;
- Preferred Option Public Consultation Day on 13th December 2023, at the Rathmichael Parish National School, Shankill. Public opinion on the preferred option was sought and how this would be implemented in reality. Representatives from the project steering group were present throughout the day, and 43 attendees were recorded on the sign-in sheet.

Additional consultation meetings took place between members of the EIAR team and certain consultees, in order to ensure that environmental issues were fully assessed.

A meeting took place with the Department of Housing, Local Government and Heritage's National Monuments Service and Built Heritage Policy Team on the 9th of February 2024. The purpose of the meeting was to discuss the cultural heritage assessment of the proposed FRS. This was followed by a second consultation held as a site walkover on the 30th of April 2024. Following these meetings, additional cultural heritage testing and mitigation measures were developed and implemented.

A meeting with the National Park and Wildlife Services' Divisional Ecologist for Dublin and the District Conservation Ranger took place on the 12th of March 2024. The purpose of this meeting was to discuss the project's ecological sensitivities and survey efforts as well as the proposed FRS design. Following this discussion, additional surveys were agreed to be carried out along with an investigation for biodiversity enhancement opportunities. These opportunities include the creation of an additional connection under the N11 which will benefit Otter and other mammals looking to navigate safely under the road, and installation of bat boxes as described in detail in the Biodiversity Chapter of Volume 2 of the EIAR.

An on-site meeting with an Inland Fisheries Ireland representative took place on the 30th of July 2024. The purpose of this meeting was to discuss the fisheries, water and hydromorphology assessment to date, the proposed measures and their potential impact, and proposed mitigation measures. No major concerns were raised as a result of the meeting.

6 Construction Impacts

Air Quality and Dust Impact Assessment

The air quality and dust impact assessment has been prepared to assess the potential air quality impact of the FRS on the sensitive receptors in the vicinity of the proposed FRS.

The construction activities of the proposed FRS have been examined to identify those that have the potential to give rise to dust and air pollutant emissions and a suitable construction impact assessment has been undertaken. As appropriate, Construction Phase mitigation measures have been outlined.

The air quality impact assessment was undertaken with reference to Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) & CAFE Directive 2008/50/EC. 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 FRS has been assessed in accordance with the "Guidance on the Assessment of Dust from Demolition and Construction (IAQM) January 2024 (Version 2.2). This 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.

There are two EPA air quality monitoring stations located within the proximity of the proposed development. One station is located on the Glenageary Road, Dún Laoghaire approximately 2km northeast of the proposed FRS, which provides results for $PM_{10.}$, $PM_{2.5.}$ and NO_2. The second is in Bray, Co. Wicklow approximately 6km southeast of the proposed FRS and provides results for $PM_{10.}$, $PM_{2.5.}$ and O_3. This data indicates 'Good' air quality in the area, although the monitoring station in Dún Laoghaire has been out of commission since 16th May 2024.

An assessment of the potential impact on air quality during construction has been undertaken. Approximately 85 residential properties have been noted within 20m of the proposed construction works, with an additional approx. 95 dwellings within 50m. Using the IAQM methodology for the assessment of impacts from construction activities, the following is indicated;

- The risk of dust soiling impacts is medium for demolition and earthworks, and low for construction and trackout
- The impacts on human health are negligible for demolition, construction and trackout, and low for earthworks
- The ecological impacts are low for demolition, construction and trackout, and medium for earthworks.

In accordance with the IAQM Guidance for proposed mitigation measures, the highest risk category should be applied. Therefore, appropriate recommended construction phase mitigation measures to a Medium Risk Site, in terms of dust soiling and ecological impacts, have been recommended. The mitigation measures include effective communication with concerned parties, effective site management and maintenance, and safe operation of machinery, with other specific measures to be put in place during demolition, earthworks, construction, and movement of machinery. During the construction phase of the project, with the proposed mitigation measures in place, the residual impact to dust soiling and ecology will be negligible. There will be no air quality and dust impact during the operational phase.

Noise Impact Assessment

The noise impact assessment has been prepared to assess the potential noise and vibration impact of the proposed FRS on the nearest residential properties and noise sensitive receptors in the vicinity of the proposed FRS.

The construction activities of the proposed FRS have been examined to identify those that have the potential to give rise to noise and vibration and a suitable construction impact assessment has been undertaken. As appropriate, Construction Phase mitigation measures have been outlined.

The noise impact assessment and evaluation of the noise impact arising from the proposed FRS involved the completion of a baseline noise survey at sensitive receiver locations in proximity to the specific areas of the proposed FRS in accordance with suitable guidelines methodology. This established the current baseline conditions. The baseline noise measurement data indicates that there is a very wide variation in noise levels across the area of the proposed FRS for the Carrickmines-Shanganagh River within Dún 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.

There is the potential for temporary and intermittent increases in noise levels during the Construction Phase of the proposed FRS at the nearest residential properties. The worst-case construction noise levels at specific locations in proximity to the expected main areas of construction activity have been predicted using the methods of predicting construction noise levels set out in BS 5228-1:2009+A1:2014. The construction practices that have the potential to produce intermittent and temporary noise impacts include site clearance & excavation, infilling / levelling, wall removal & construction and general construction. The recommended daytime construction noise limit of 65 – 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, as the works are most likely to occur in any one specific works area for less than a 1-month period. Appropriate construction mitigation measures have been outlined and once implemented, the residual impacts from the construction period will not be significant.

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-Shanganagh River FRS.

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

Climate Impact Assessment

The climate impact assessment has been prepared to assess the potential impact of increased carbon emissions due to the proposed FRS.

The construction activities of the proposed FRS have been examined to identify those that have the potential to give rise to increased carbon emissions and a construction impact assessment has been undertaken.

The assessment and evaluation of the potential climate impact arising from the proposed FRS was based on reference to the relevant Transport Infrastructure Ireland (TII) Publications and TII Carbon Tool. In accordance with the TII Guidelines, the climate impact assessment included a Greenhouse Gas (GHG) Assessment Process to quantify available GHG data using the TII Carbon Assessment Tool. A Climate Change Risk (CCR) Assessment Process has been undertaken elsewhere in the EIAR in the form of a detailed flood risk assessment.

During the construction phase of the proposed FRS, GHG emissions will potentially be generated by site preparation works, excavation, infilling works, construction activities, energy usage, etc. The Total GHG Emissions due to the construction phase of the proposed Carrickmines-Shanganagh River FRS as predicted using the TII Carbon Tool have been compared to the 2022 Annual Carbon Emissions of 69,448.1 kt CO_2 for Ireland. The proposed Carrickmines-Shanganagh River FRS will account for 0.0033% of Irish annual CO_2 emissions. This represents a negligible impact.

During the operational phase for the proposed FRS, no climate impacts will result from carbon emissions. 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. Potential emissions from the short-term and infrequent use of vehicles and pumps during periodic flood events is not possible to quantify accurately and will be miniscule. Therefore, the potential climate impacts in terms of carbon emissions (tCO_{2e}) during the operational phase have not been considered for the proposed Carrickmines-Shanganagh River FRS and are expected to be insignificant.

7 Population and Human Health

This chapter assessed impacts to population and human health including residential dwellings and people living in the areas surrounding the proposed works, as well as a number of businesses, schools, childcare facilities, medical facilities, social, community and recreational facilities.

Information was sourced from the Central Statistics Office (CSO), including their 2022 and 2016 Census data, as well as from the Dún Laoghaire-Rathdown Socio-economic Statement 2023-2028. As the proposed measures do not fall within a single area or townland, no Local Area Plan could be used to derive statistics. Several electoral districts (EDs) were used as areas to collect statistics on population relevant to the scheme. The group of EDs used for statistical analysis are herein referred to as 'Scheme EDs'.

The proposed development spans several sites in the Dún-Laoghaire Rathdown County Council area. There is a variety of major transport links serving the proposed development area including the M50 Southeastern Motorway, the N11, the Luas Green Line, the DART, and various bus services. The Dublin Mountains lie to the south of the proposed development, the Irish sea lies to the east, and Dublin suburbs including Killiney, Dalkey, Lucan and Dún Laoghaire lie to the north. According to the CSO, population growth across the Scheme EDs between 2016 and 2022 is higher than the national or regional averages (+12.71%). 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.

The area across the Scheme EDs is largely comprised of pockets of residential areas interspersed with industrial areas or large green spaces. To the north of the proposed development lands are increasingly urban and to the south, lands are increasingly rural. The proposed development will protect existing residential, educational and recreational properties, from flood events up to the 1% annual exceedance probability (AEP). Following completion of the proposed development, a number of properties that were previously at risk from 1% AEP flood events will be protected from such events occurring.

The proposed development is expected to have the greatest impact to population and human health during the construction phase of the project. These impacts are predicted to be secondary impacts as a result of disruptions to traffic, noise, air quality, and visual amenity. These impacts are addressed in their respective chapters of the EIAR, and are not expected to be significant.

There will be temporary, slight, negative impacts to residential amenity lasting only for the duration of the construction phase. Mitigation measures include a Construction Environmental Management Plan (CEMP), which will limit the effects on human beings with regards to traffic, noise, air, dust, access, and visual amenity. The residual impact of the construction phase with proposed mitigation measures in place is predicted to be temporary, slight, negative.

When the FRS is operational, the effect on population and human health will be long-term positive, due to the greater protection from flooding. Temporary and intermittent impacts are expected during periods of flooding where existing green spaces, such as Belarmine Park and Loughlinstown Woods, remain as overspill areas. This may result in intermittent loss of these amenities during flood events. This would be a slight, temporary and intermittent negative impact. As this may only occur during a flood event, and are needed for the FRS to provide the required scheme standard of protection, the negative impact associated with their operation will be outweighed by the positive impact of the scheme as a whole.

8 Biodiversity

The chapter concerning biodiversity assessed potential impacts to sensitive receptors in the Carrickmines-Shanganagh FRS area. The proposed works are 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 Special Area of Conservation (SAC) (1.8km downstream) and Dalkey Islands Special Protection Area (SPA) (3.4km downstream).

A separate Appropriate Assessment (AA) Screening 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 Qualifying Interests (QI) of the Natura 2000 sites arising from the proposed scheme, either alone or in-combination with other plans or projects.

Species present within the scheme area include Badger, Hedgehog, Pine Marten, Pygmy Shrew, Red Squirrel, Otter, Peregrine Falcon, Red Grouse and Snowy Owl. The Shanganagh River provides an important linear waterway for commuting and foraging bats in the local area of Carrickmines. Local rivers and streams may be impacted during construction which would result in water quality and disturbance impacts to fish species such as European Eel, River Lamprey, Sea Trout and Brown Trout. Habitats that will be impacted include Dry meadows and grassy verges, Wet grassland, Broadleaved woodland and Scrub, and Hedgerows. Invasive Non-native Species (INNS) present within or immediately adjacent to the study area include Giant Hogweed, Giant Knotweed, Rhododendron and Japanese Knotweed.

Construction impacts on ecological features of international, national and local level have been identified and relate to potential disturbance on present habitats and species:

- Otters are at risk of accidental trapping or injury due to inappropriate work practices, such as leaving excavations open or leaving un-secured materials on site;
- Bats could be indirectly impacted by pollution incidents in the river channel or surrounding habitats through the loss of insect populations or foraging resources;
- Spread of Third Schedule species Giant Hogweed, American Skunk Cabbage and Three-cornered Garlic
- Construction of a new bypass culvert under Bray Road requires a small cluster of Ash and Willow trees in the Loughlinstown Woods pNHA to be felled;
- In-stream works may impact aquatic habitats through direct disturbance or through the release of pollutants and silt mobilisation during construction;
- Aquatic habitats and local vegetation may be impacted by surface water polluting events due to works along the banks and near watercourses including the construction of walls adjacent to watercourses located at Belarmine Park and Glenamuck Road, new walls located along Kilgobbin Road and Commons Road;
- The dry ditch running through Clon Brugh is adjacent to land where demolition of an existing masonry wall, and construction of a new flood defence wall will occur, making it vulnerable to contamination through excavation and construction efforts;
- Meadow grasslands along Bray Road may be impacted by surface water run-off polluting events e.g., leaking or spilled hydrocarbons; and
- Woodlands along Clon Brugh and Glenamuck Road will be susceptible to the creation of dust during demolition of an existing wall, the minor removal of vegetation along the banks and the release of excavated materials during construction, along with spill occurring during accidental pollutant events. Additionally, the removal of several trees, including some mature Ash and Willows, will result in loss of habitat for local fauna including birds and bats.

The realignment of the scheme is not anticipated to lead to any negative 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.

Positive impacts of the proposed development have been assessed and include:

- Increased connectivity of the river corridor and safer means of crossing under the N11 road for the local Otter population through the inclusion of the new bypass channel; and
- Installation of bat boxes on site would enhance the site of the proposed development and make it more bat friendly. Number and location of bat boxes will follow the recommendations of a bat specialist.

Mitigation measures 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 have been proposed. Toolbox talks will be given to all site staff on the identification of, and protected status of Badger and Otter. 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. Additionally, any active nests will be safeguarded until the chicks have fledged. 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 to allow for any amphibians to displace to other habitats and reduce any risk of injury. Due to the high risk of spreading INNS during the construction phase, an INNS management plan will be written and included with the CEMP. Movement of lamprey ammocoetes via translocation and electrofishing will follow guidelines for standard electrofishing surveys as set out in Harvey and Cowx (2003).

For operation of the FRS, measures include reseeding of flora in areas where grassy verges are damaged from the access of machinery, using locally sourced grass and wildflower mixes. 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, to enhance floral diversity within the site and improve the area for terrestrial invertebrates, mammals, bats and birds. To determine the effectiveness of proposed measures, the site will be monitored prior to and during for at least five years post construction.

In conclusion, it is expected that with mitigation measures in place there will be imperceptible, negative impact to habitats and species present at the proposed development. No other negative impacts are anticipated. Positive impacts include improved travel corridor for Otter populations and environment enhancement for Bats. Therefore, the proposed Carrickmines-Shanganagh River FRS will not have a significant effect on the ecological features identified.

9 Land and Soil

The potential effects on land, soil, and geology during the construction and operational phases of the proposed development have been assessed in this chapter. This assessment is based on a desktop study, site visits, and site investigations conducted by Ground Investigations Ireland (GII). The assessment methodology adheres to the EPA (2022) Guidelines and follows the guidance set out in the Institute of Geologists of Ireland (IGI) Guidelines for the Preparation of Soils, Geology, and Hydrogeology Chapters of Environmental Impact Statements (2013).

The desktop study and ground investigation revealed that the proposed development is underlain by granite bedrock which was produced during 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.

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.

The Carrickmines-Shanganagh River catchment 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. The proposed development works will take place in suburban areas, often along riparian corridors or roads. Cherrywood has been designated as a Strategic Development Zone (SDZ) with plans to convert the land into a self-contained locality with a town and village centre, and educational, recreational and commercial facilities, and residential zones.

During construction and operation, several activities have potential for effects on land, soil and geology at the site. These are associated with the establishment and operation of site compounds, including storage of potential pollutants such as fuels and oils, the excavation of topsoil and subsoils, import of materials, and export of excavated material off-site. Without mitigation measures in place, the potential effects range from significant to imperceptible/neutral.

Mitigation measures, including the preparation of a Construction Environmental Management Plan (CEMP) and measures for the preparation of site compounds and safe management of excavations, are outlined in Chapter 9 of the EIAR Main Report. These measures cover:

- Safe storage of soil stockpiles, oils and fuels;
- Prevention of spills and leaks; and
- Safe pouring of concrete.

The mitigation measures also outline that the contractor must carry out a waste characterisation of soil material to be taken off site for disposal, which will include a waste acceptance criteria (WAC) analysis and measurement of asbestos levels. These will classify any material to be disposed of off-site and ensure that waste is properly segregated and disposed of at the correct facilities.

During construction, with the proposed mitigation measures in place, the residual impact to land and soils will be reduced to short-term, imperceptible, neutral. The design of the scheme has been such that there are no predicted effects on land and soils during the operational phase.

10 Water – Surface and Groundwater

The potential effects on surface water and groundwater during the construction and operational phases of the proposed development are assessed in this chapter. The assessment methodology adheres to the EPA's 2022 Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

The proposed FRS includes measures to be situated on several stretches of watercourse within the Carrickmines-Shanganagh River network. Several streams and tributaries flow within the area including Kilgobbin Stream, Ballyogan Stream, Carrickmines River, Shanganagh River, Ticknock Stream, Glenamuck River, Brides Glen River, Cabinteely River, and Racecourse Stream.

The Carrickmines-Shanganagh River and contributing streams and tributaries also includes inputs from the existing stormwater network. 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 Wicklow groundwater body 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. Groundwater vulnerability underlying Carrickmines-Shanganagh 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.

Construction activities have the potential to negatively affect surface waterbodies via increased silt and sediment runoff, groundwater pumping, instream works and accidental spills and leaks from chemicals such as hydrocarbons and lubricants. These pollutants could reach the Carrickmines-Shanganagh River and its tributaries via overland drainage or surface water drainage. Changes to runoff and flow pathways could also occur due to excavation activities during construction. Impacts to hydromorphology are expected to be temporary as the river will adjust once the works are completed and the pressure is removed.

Construction works will be carried out in accordance with the CEMP. The CEMP will include standard best practice guidance for the protection of water quality, and specific mitigation measures such as the control, treatment and monitoring of surface water runoff, and pollution prevention measures, such as bunding, spill management and inspection procedures.

During construction, with the proposed mitigation measures in place, the residual impact to surface water and groundwater bodies will be reduced to temporary, slight negative to imperceptible.

During the operation phase of the project, the residual impact will be long-term and imperceptible, with a neutral effect on quality of surface and groundwater bodies. This is as the scheme elements are static in terms of their interaction with water, with the instream elements designed in compliance with Inland Fisheries Ireland guidance. Several opportunities to improve hydromorphology in particular were also identified and included in the design, such as improved culvert design at Belarmine Park and channel realignment at Bray Road.

11 Material Assets – Traffic and Transport

The potential effects on traffic and transport during the construction and operational phases of the proposed development are assessed in this chapter. This includes the likely impact of the construction and operational generated traffic on the surrounding road network.

The existing infrastructure in the proposed development area includes:

- National Roads N11, M50 Motorway and M11 Motorway;
- Regional Roads R113, R117, R842, R118, R116, and R119;
- Numerous bus routes serving areas including Enniskerry, City Centre, Wexford, Dublin Airport, Newcastle, Bray, Ballymun, Glendalough and Greystones; and
- LUAS providing transport south towards Bride Glen and north, towards Parnell or Broombridge

During construction, which is predicted to take approximately 18-24 months, it is estimated that maximum daily construction trip generation per site will not be greater than 7 Heavy Goods Vehicles (HGV) arrivals and 7 HGV departures and will evenly distribute throughout a day. Impacts are predicted from the HGV movements and temporary road closures. Roads affected include parts of Clon Brugh, Kilgobbin Road, Ballyogan Grove, Castle View, N11, Bray Road, Commons Road and Shanganagh Road. Pedestrian access along Clon Brugh, Kilgobbin Road, Glenamuck Road North, N11, Bray Road and Commons Road will be temporarily closed during construction works. Additionally, temporary closure of a portion of the cycle track at Glenamuck Road North, N11 and Bray Road will be required to facilitate the construction of the proposed development.

The proposed works at the N11 will require excavations across the carriageway width, to accommodate the new overflow culvert. 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 on the N11 and the adjacent Bray Road, and provision of a temporary footway to maintain pedestrian/cyclist movements. Cyclists will dismount and use the temporary footway to pass through the site. At least one live traffic lane shall be provided in each direction of the N11 during construction. The N11 is a busy main road, used by multiple bus services, emergency vehicles, cyclists, pedestrians and general traffic. Therefore, a reduction of any traffic lanes at the N11 in daytime will cause significant traffic impacts to the public. To minimise the traffic impact to public during construction, all construction works at the N11 crossing shall be carried out at night-time (i.e. 20:00-05:00) only. The temporary closure of traffic lanes on the N11 and Bray Road will re-open for public use outside the working hours.

Construction works will be carried out in accordance with a Construction Traffic Management Plan (CTMP) that will be prepared by the appointed contractor to mitigate impacts. The CTMP will adhere to traffic regulation, permitting and licensing, environmental regulation, health and safety standards, local authority requirements, emergency response plan and public consultation. Mitigation measures to reduce impacts from road closures and access disturbance will include appropriate phasing of construction and private access facilitation.

During construction, with the proposed mitigation measures in place, the residual impact to road, traffic and transport will be temporary, slight, negative.

During the operational phase, no long-term impacts are expected on roads, traffic and transport.

12 Material Assets – Utilities and Waste

The potential effects on material assets during the construction and operational phases of the proposed development are assessed in this chapter. Material assets, as described in the EPA Guidelines (2022) covers three separate aspects: roads, traffic and transport, built services or utilities, and waste management. Utilities and waste management are assessed in Chapter 12, with traffic and transport assessed in Chapter 11. The assessment methodology adheres to the EPA's Guidelines. The assessment is based on a desktop study. Test trenching will be carried out on site by the appointed contractor prior to works commencing to accurately locate services in proximity to the proposed works sites.

Site Compounds

During construction several site compounds will be needed due to the proposed works areas being spread over a large area. Individual construction compounds will be provided for Clon Brugh, Belarmine Park, Kilgobbin Road and Glenamuck Road North. For the remaining sites, some sites will share use of one construction compound as follows:

- Lower Brides Glen, Bray Road, the N11 Overflow Culvert and Cherrywood Road will share use of one construction compound; and
- Commons Road Site, Brookdene and Bayview will share use of one construction compound.

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.

During construction, there is a risk of flooding in the compound areas. This could release potentially polluting materials and substances stored there, leading to indirect negative impacts on water, biodiversity, and human health. To mitigate this risk, best practices will be implemented for managing the compounds and the materials stored within them. Additionally, 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.

During construction with the proposed mitigation measures in place, the residual impacts due to site compounds will be temporary, imperceptible, negative.

Utilities

The existing utilities present and serving the Carrickmines-Shanganagh River FRS area are:

- Surface water drainage
- Foul sewers
- Watermains
- ESB overhead and underground lines
- ESB overhead low voltage lines
- ESB medium voltage underground lines
- Gas Networks Ireland (GNI) gas mains
- Public lighting
- Telecommunications infrastructure

During construction temporary disruption to utilities is predicted due to diversions and upgrades that will be required. Impacts to electrical and water services are expected to occur at the N11 Overflow Culvert section to accommodate the overflow installation and expediate the main construction works. Indirect impacts to water infrastructure could occur during construction if a leak or spill happens on-site, which then discharges to existing drainage infrastructure.

To mitigate impacts on utilities during construction, any disruption of services will be agreed with the relevant service providers and will be communicated in advance to the relevant property owners. The appointed

contractor will liaise with the utility companies in order to determine the exact locations of utilities in relation to the proposed works.

With the mitigation measures in place, residual impacts during construction will be reduced to temporary, imperceptible, negative. No operational impacts are expected on utilities.

Waste Management

This section assessed the amount of waste expected to be generated by the construction works of the proposed development. It is estimated by the design team that approx. 596m^3 of materials from demolition and 12,438m^3 of excavated material will be generated. The waste generated will be reused on another site as a by-product while adhering to Article 27 of the EC (Waste Directive) Regulations (2011) or will be removed from the site as waste to an appropriate licenced soil recovery facility.

A Resource Waste Management Plan (RWMP) will be produced by the appointed contractor to help manage, reduce and dispose of waste generated during construction phase. All construction waste will be segregated and removed to an approved location. A key waste reduction strategy will be reuse of material where feasible.

With the CEMP and RWMP in place the residual impacts on waste during the construction phase will be temporary, imperceptible, negative. No operational impacts on waste are expected.

13 Cultural Heritage

The cultural heritage assessment was based on a desk-study, with a detailed documentary and cartographical review. This was supported by a site inspection, an underwater wade and metal detection survey and a geophysical survey of the compound area associated with the Bray Road North measure.

Archaeological Heritage

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). These RMP sites however 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 measure is within the Zone of Notification (ZoN) of the historic settlement of Kilgobbin Village (RMP DU025-017/DU026-121). Within the ZoN there are a number of recorded monuments, none of these will be subject to either direct or indirect effects. Archaeological investigations within the proposed compound area for the measure however has revealed a substantial medieval and early post-medieval activity associated with the settlement of Kilgobbin. These features will be impacted by the FRS Measure (AP2).

The linear earthwork, associated with the Pale boundary (RMP DU026-087), is c. 5m from the eastern end of the proposed overflow pipeline for the Kilgobbin flood measure, this boundary would have continued northwest towards Kilgobbin. 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 works proposed for the overflow pipeline in the Kilgobbin flood measure is considered to have the potential to uncover subsurface archaeological sites associated with the development of Kilgobbin or features associated with the continuation of the Pale ditch boundary. All earthmoving works associated with this measure is considered to be an Area of Archaeological Potential (AP3).

The Carrickmines flood measure is within the ZoN of Carrickmines Castle (RMP DU0026-005001-005, treated as a National Monument) and settlement. The excavations at Carrickmines Castle in advance of the M50 construction were extensive, however the proposed flood measure lies within the undisturbed area of the site. 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).

Nothing of archaeological significance was identified in the geophysical survey for the compound for the Bray Road North measure. In addition, the monitoring of site investigation works in various locations in the vicinity of the FRS measures did not reveal any features or finds of archaeological significance.

Rivers and their environs have been the focal point for settlement, transport, resources, and trade since the earliest of times. In addition, riverscapes in the vicinity of settlements (such as in Kilgobbin and Carrickmines) possess a significant potential to uncover a diverse range of archaeological heritage. The dredged soil from a river can also be rich in archaeological materials and objects, including organic materials. Any instream activity in a river should consider the potential to reveal archaeological sites or industrial heritage features, such as sites from early prehistoric fish traps to medieval mills or remnants of bridges, etc. Riverine environments and the adjacent undisturbed greenfield environment are considered to be of archaeological potential. Except for the Clon Brugh measure, which has already had archaeological monitoring done, the proposed construction work for each flood relief measure could reveal previously

unknown subsurface archaeological sites, soils, features, or artefacts during any earthmoving activities related to the measures (AP1–AP9).

The underwater archaeological assessment identified several built heritage features outside on the riverbanks which are discussed in relation to the built/cultural heritage. Two features within the rivers will be subject to impacts a boundary wall (ADCO7) and a footbridge (UAIA Ref U182) from the Bray Road North measure.

Architectural and Cultural Heritage

There are no protected structures listed in the Record of Protected Structures (RPS) located within 100m of the Clon Brugh, Belarmine Park or Bayview Measures. There are 20 RPS sites within 100m of the remaining proposed flood relief measures, of these, 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 affect Shanganagh Bridge and site of a ford (RPS 1772 and 1773). 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. Shanganagh Bridge (RPS 1773) is part of the Commons Road measure, repair and strengthening works proposed for the bridge.

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 (refer to Chapter 13 of Volume 2 of the EIAR, CH1–CH8); 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. The 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. The retention of Kilgobbin House (RPS 1684) curving wall, the low river wall (CH2), the bridge and the use of stone cladding in the new flood walls will retain the countryside character of the road. Other undesignated cultural heritage features within the measures will be retained in situ i.e., CH3 (granite slab), CH4 (access ramp) and CH5 (Kilgobbin Bridge).

Field inspections and underwater archaeological assessments have also identified a number of undesignated sites cultural heritage sites within the flood measures. These include a river wall in Carrickmines (CH9), a riverine boundary wall at Waterfall Cottage (CH11) which will be replaced by a cladded stone wall and an arched boundary wall (CH10) crossing the Carrickmines Stream which will be strengthened and repaired.

Mitigation Measures

Designed-in mitigation measures include the retention where possible of historic walls/features (CH2, CH4 and CH5) and sections of curving wall (CH1, RPS Ref: 1684), the maintenance of river access points from properties facilitated by flood gates/foot bridges, the proposals to clad the new flood walls and the repair and strengthening of structures such as an arched wall boundary (CH10) and Shanganagh Bridge (RPS Ref: 1773).

A Project Archaeologist (PA) will be retained to advise on the archaeological aspects of the FRS. 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 will be preserved by record through archaeological excavation. Archaeological excavation should be carried out in well in advance of the construction at the Kilgobbin Measure. The excavated area should be cordoned off and the remainder of the field be excluded from all activities including parking, storage etc.

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 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. 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 detailed design and construction stage programme and will allow for the appropriate timing of the archaeological resolution (excavation) to take place in advance of construction.

All earthmoving activities (AP1-AP9) will be subject to archaeological monitoring under licence from the National Monuments Service of the Department of Housing, Local Government and Heritage. Programming will allow for appropriate monitoring and any subsequent mitigation required. This could be in the form of preservation in-situ or full archaeological excavation (preservation by record).

An archaeological assessment of dredged/excavated spoil that is removed from riverbeds, streambeds, alluvial environments, and other waterways will be carried out as they can be very rich in archaeological material and objects.

All 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. As recommended by the National Built Heritage Service (NBHS) a project conservation engineer/conservation architect will be retained during the detail design, construction and reinstatement stages of the FRS scheme.

In addition to mitigation measures, the overall effect of the proposed FRS will be a reduction in flood extents, which will have a positive effect on cultural heritage receptors.

General

All recommendations are subject to approval from the National Monuments Service of the Department of Housing, Local Government and Heritage, and the local authority.

14 Landscape and Visual Impact Assessment

The potential impact of the proposed development on landscape and visual amenity was assessed in this chapter. A set of photomontages (shown in Volume 3, Appendix 14.1) was prepared which contributes to the assessment carried out in this chapter. A Zone of Theoretical Visibility (ZTV) map was produced using GIS, proposed height of structures, and a Digital Terrain Model (DTM).

The Landscape and Visual Impact Assessment (LVIA) chapter examines the potential effects of the proposed development on views from receptors within the ZTV including residential properties and nearby open spaces, in terms of visual intrusion and visual obstruction. It also examines the impact on landscape character areas from the permanent physical changes to the site brought about by the development. This chapter was prepared with reference to the EPA's 2022 Guidelines, the 2013 Guidelines for Landscape and Visual Impact Assessment (GLVIA) from the Landscape Institute (UK) and the Institute of Environmental Management and Assessment, and the Dún Laoghaire-Rathdown County Development Plan 2022-2028 Landscape Character Assessment. Additionally, Ordnance Survey Ireland historical maps were used to help identify past land uses, landscape components and historic landscape evolution. The potential impacts have been assessed based on landscape character sensitivity, magnitude of the likely impacts and significance of landscape effects.

The study sites for the proposed FRS cover several areas of Dún Laoghaire-Rathdown and are described in the DLR County Development Plan (CDP) 2022-2028. The County is framed by its coastal and upland landscapes, and the diverse range of landscape character 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.

Regarding visual amenity, there are no designated protected views within the proposed development area. Visual amenity is primarily on a local or household scale, with residences in the area having short distance views, enclosed to each specific housing estate or individual property.

To identify the locations where visual receptors might experiences 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 on 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.

As the proposed defences are spread throughout the scheme and are placed in areas which already contain similar built features, the effect on landscape character is low. The proposed defences such as walls and culverts are 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. The predicted landscape impact of the proposed development along the Carrickmines-Shanganagh River corridor is on balance, temporary, negative, slight during construction and long-term, negative, slight to imperceptible during the operational phase, due to the small scale and strategic siting of the proposed works.

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 having short distance views. For most receptor groups, the impacts expected are moderate, slight, negligible, neutral or imperceptible in both construction and operational phases. Permanent, moderate, negative impacts are expected at some locations where proposed walls will face towards residential

receptors. This will be partially mitigated by proposed hedge planting in front of the walls, and the proposed walls are not a wholly new visual feature in the highly built-up area, meaning the visual impact will not be significant. Despite the permanent impacts, the affected residents will benefit from the protection provided by the wall.

No significant landscape or visual impacts are expected during the construction or operational phases. However, to mitigate minor visual disturbance during construction, the use of hoarding where appropriate, will reduce visibility of moving plant from outside the site whilst allowing for visual connectivity when required. 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.

15 Interactions

Interactions occur when a predicted impact causes interaction or dependency with other environmental aspects. This section assessed the interactions as positive, negative, or neutral. The interactions of environmental effects were considered throughout the EIA process for the proposed development. Where an interaction was identified it was marked with a check mark as shown in Table 15.1 below and was considered for assessment. Necessary adjustments were made to the design of the layout to mitigate impacts arising from these interactions.

In terms of residual impact resulting from interactions, with implementation of mitigation measures in place, these interactions are not expected to be significant.

The interaction of these effects was assessed to be temporary, with a slight negative to negligible impact during construction.

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																				

16 Cumulative Impacts

This chapter assessed the potential cumulative effects of the proposed development in combination with other relevant existing, planned and permitted projects. These were assessed to determine whether they would give rise to significant effects on the environment.

The projects assessed included larger projects in the area with permission durations that overlap the likely construction period of the proposed development. Smaller projects such as house extensions and alterations have been excluded as they are unlikely to have significant impacts, even cumulatively with the proposed FRS. The projects considered are listed below and shown in Figures 16-1, 16-2 and 16-3:

- Bray to City Centre BusConnects project
- East Coast Railway Infrastructure Protection Projects (ECRIPP)
- Cherrywood to Rathmichael Manor Rapid Build Cycle Scheme
- Planning Application ABP31332122 – Construction of 101 no. residential units and a creche at Balally and Woodside
- Planning Application D20A/0698 – Retention and completion of a retaining wall at Dun Gaoithe in Aikens Village
- Planning Application D24A/0341 and ABP32049124 – Construction of 89 no. residential units at Oldtown House, Kilgobbin Road
- Planning Application ABP31334122 – Construction of 118 no. residential apartment units at Glenamuck Road North, Carrickmines
- Planning Application ABP31332222 – Construction of a mixed-use Village Centre and residential development including 402 no. apartments, 41 no. houses, 7 no. retail services units, gym, crèche and office space at Priorsland, Carrickmines
- Planning Application ABP31328122 – Construction of 534 no. apartments, crèche and associated site works at Brennanstown Road
- Planning Application DZ24A/0017 – Construction of 200 no. residential apartment units at Laughanstown and Cherrywood
- Planning Application D23A/0583 – Demolition of existing single-storey extensions and construction of two smaller single storey extensions at Riverwood, Cherrywood Road
- Planning Application D21A/1082 – Construction of 32 no. apartments at Conna, Abingdon Park on Shanganagh Road
- Planning Application D24A/0492 – Retention and alterations to two-storey dwelling Roseville Cottage, Commons Road

Potential cumulative impacts have been identified for some of the projects with the proposed FRS. The magnitude of these impacts is assessed below.

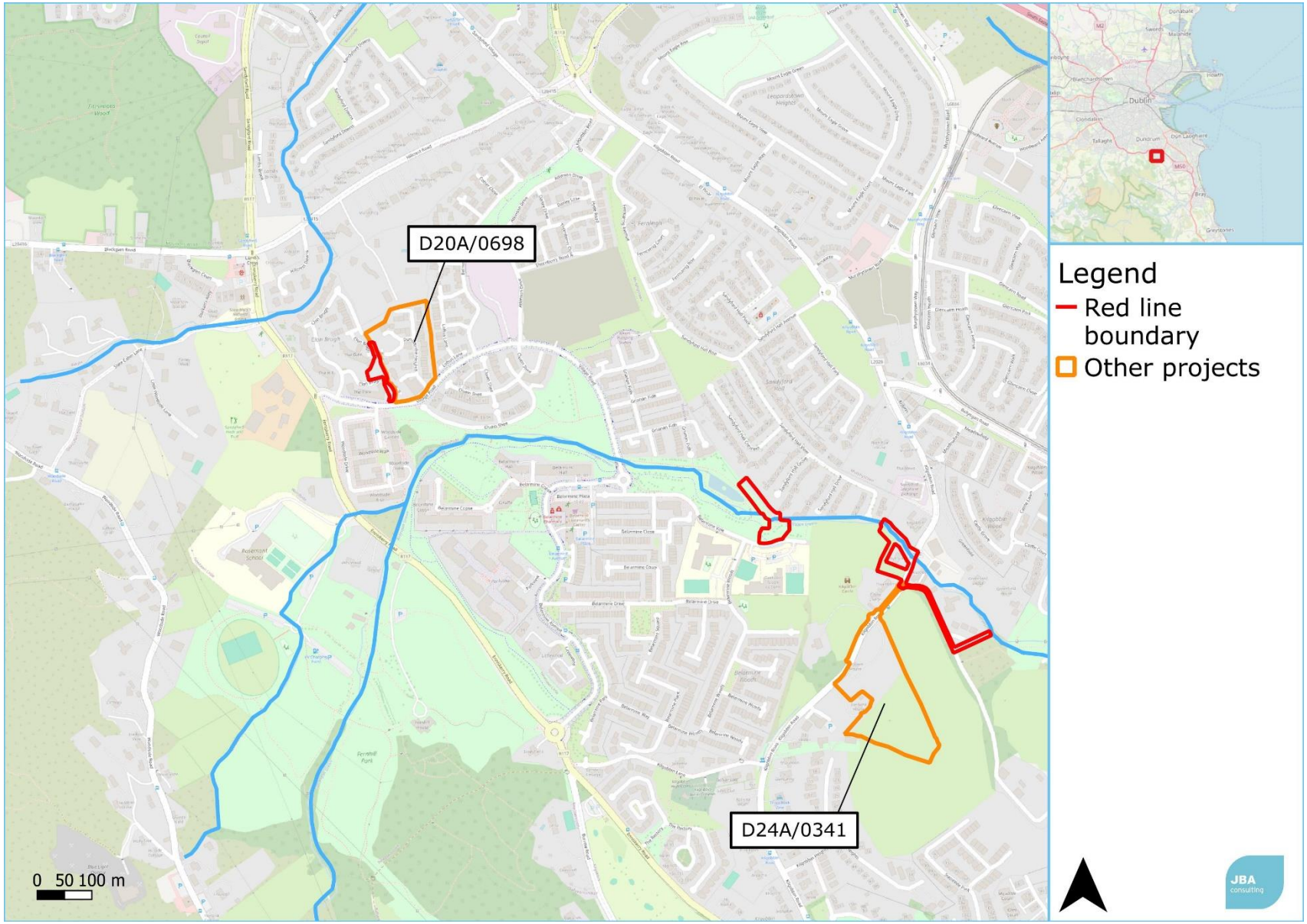

Figure 16.1: Other projects considered, Clon Brugh to Kilgobbin Road

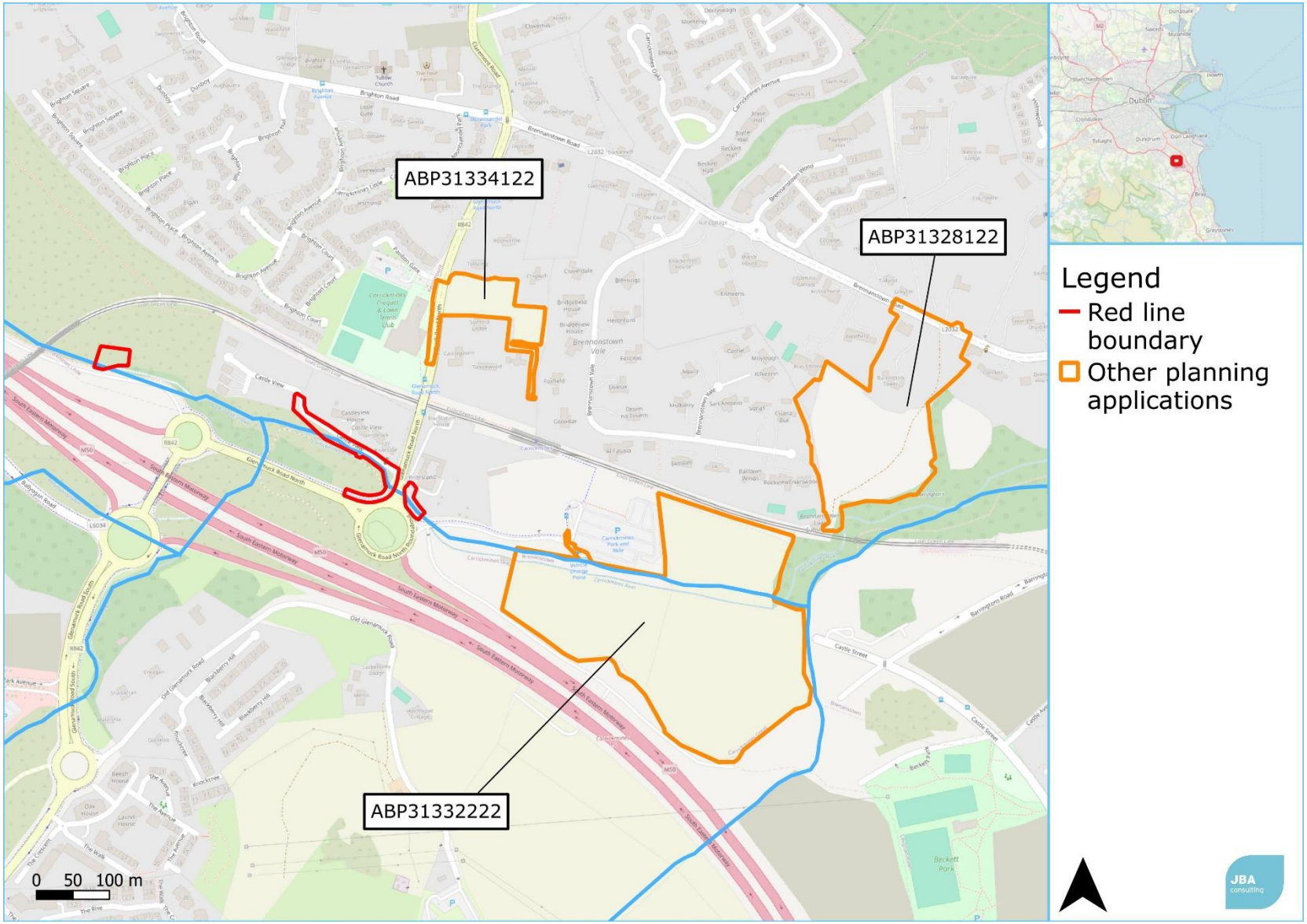

Figure 16.2: Other projects considered, Glenamuck Road North Roundabout

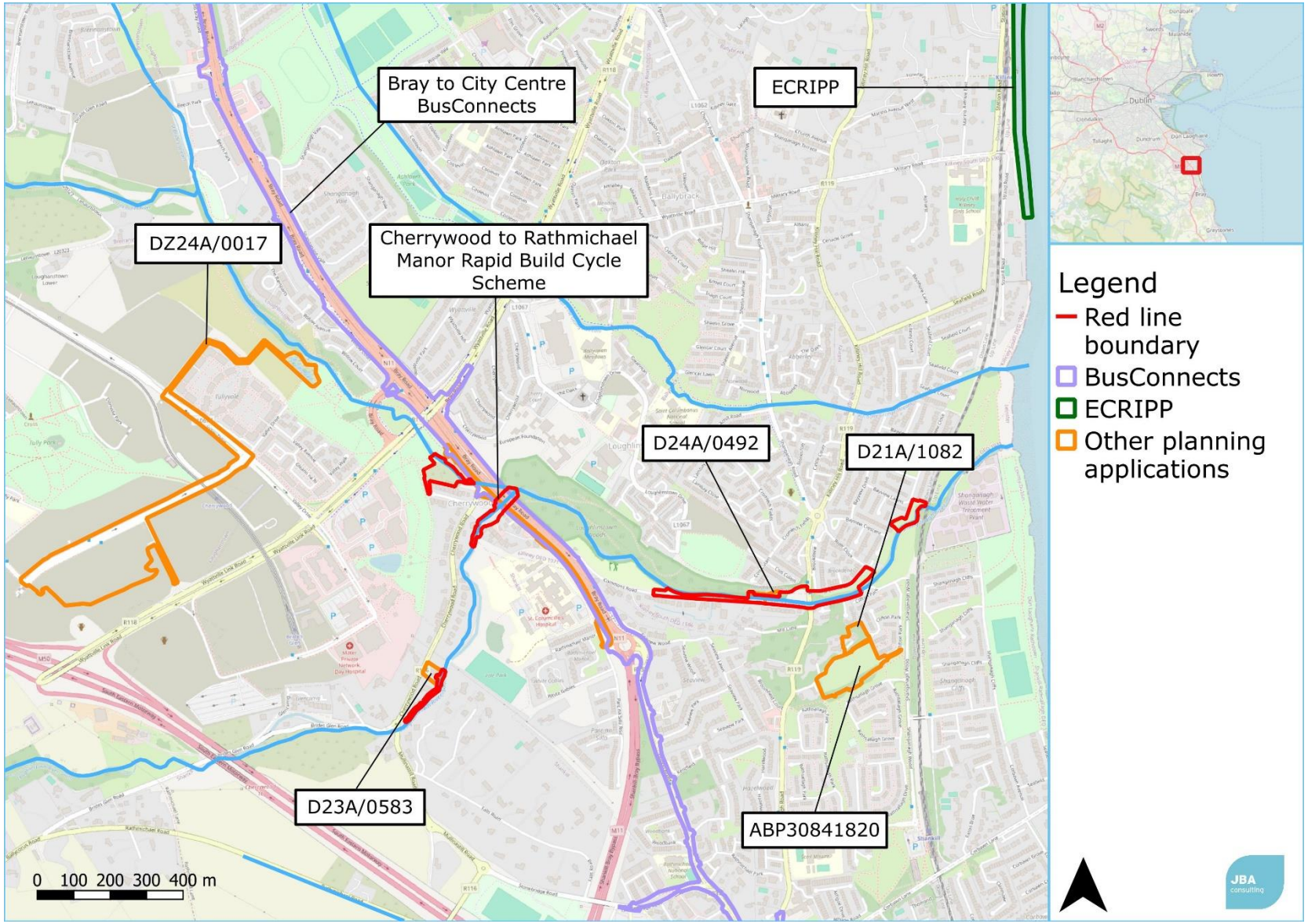

Figure 16.3: Other projects considered, Cherrywood to Bayview

Air Quality and Dust

Regarding the cumulative impacts of the above projects with the proposed development during construction, no significant additional impacts are expected. However, the mitigation measures propose regular liaison meetings with other high risk construction sites. The aim of these is to ensure that plans are coordinated, and dust and particulate matter are minimised.

The following developments are considered as high risk due to the nature of the works. Regular liaison meetings should be held if the construction periods overlap:

- ABP31332122
- ABP31334122
- ABP31332222
- ABP30841820
- D24A/0341
- D21A/1082
- Bray to City Centre Core Bus Corridor Scheme

Population and Human Health

If the construction periods of these projects 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.

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

Water

The Dublin Array wind farm project has the potential for negative 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.

Material Assets – Traffic and Transport

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 the public, a Traffic Management Plan would be prepared in consultation and agreement with the relevant project developers to minimise 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 negative temporary impact during the construction phase.

Material Assets – Utilities and Waste

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.

Landscape and Visual Impact

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 negative 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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