

AtkinsRéalis



**Environmental Impact
Assessment Report,
Volume 2 - Main EIAR**

Shankill Property Investments Ltd

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SEA GARDENS PHASE 2

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Appendices (See Volume 3 – EIAR Appendices)

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Appendix 1.2 – Planning and Engineering Drawings Register

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Appendix 2.2 – Scoping Correspondences

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Appendix 2.4 – Wind Microclimate Modelling Report

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Appendix 5.1 – Tree survey report

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Appendix 6.1 – River Quarter Bray Ground Investigation Report – Factual 2024 (IGSL)

Appendix 6.2 – Harbour Point Bray (Phase 1) Ground Investigation 2021 (IGSL)

Appendix 7.1 – Flood Risk Assessment documents (ARUP)

Appendix 11.1 – Verified Photomontages

Appendix 13.1 – Telecommunications Report

Appendix 14.1 – Photographic Record

Appendix 14.2 – Geophysical survey

Appendix 14.3 – ASI Inventory

Appendix 14.4 – Database of excavations

Appendix 14.5 – Test Trenching

1. Introduction & Methodology

1.1 The Proposal

Shankill Property Investments Limited (the applicant) is seeking permission from Wicklow County Council (WCC) for a proposed development on a site of approximately 11 hectares, located largely within the former Bray Golf Club lands off the Dublin Road (Regional Road R761), off Ravenswell Road, west of Harbour Road, and south of Northern Access Road, in Bray, County Wicklow. This proposed development pertains to Sea Gardens Phase 2, which is part of the Sea Gardens Masterplan (previously known as the Harbour Point Masterplan). The Masterplan has been developed by the applicant in collaboration with a multidisciplinary team.

In summary, the application for Sea Gardens Phase 2 proposes a mixed-use development comprising residential (c. 41,013 sq.m), retail/retail services (c. 8,155 sq.m), and commercial (c. 10,778 sq.m) spaces. The residential component will comprise 341 residential units (94 houses, 106 duplex units, and 141 apartments located in Blocks E and H). In addition, a hotel is proposed in Block I, a public house in Block E, a childcare facility and a medical centre in Block H, and retail/retail services units distributed in Blocks E, G, H and I. The proposed development will also provide private, communal, and public open spaces, along with car and bicycle parking for residents and visitors. An internal road network for vehicles, cyclists, and pedestrians will connect to the existing transport networks. All associated development infrastructure will also be provided, including public lighting, hard and soft landscaping, utilities, drainage, and clearance, demolition and removal of existing structures on site.

The proposed heights are as follows: houses will be 2-3 storeys, duplex units will be 2-3 storeys, Block E will be 3-15 storeys, Block G will be 1-2 storeys, Block H will be 3-4 storeys and Block I will be 3-7 storeys.

Sea Gardens Phase 2 will complement the permitted Sea Gardens Phase 1A (construction of which is nearing completion) and Phase 1B, as well as the future Phase 3, which will be the subject of a separate application. Phase 3, located adjacent to the River Dargle, is expected to accommodate approximately 362 residential units above a podium, including approximately 14,000 sq.m of retail and other uses. This area has been included in the current application for Sea Gardens Phase 2 to allow for temporary use during construction for storing materials and site facilities.

1.2 Need for the EIAR

The proposed development has been screened against the types of development, various processes and activities listed in Schedule 5 Part 1 of the Planning and Development Regulations as amended (2001-2025), including S.I. No. 296 of 2018 – European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which came into operation on 1st September 2018. The proposed development is not a category of project which requires and EIAR in accordance with Schedule 5 Part 1.

The proposed development has been screened against the types of development, various processes and activities listed in Schedule 5 Part 2 of the Planning and Development Regulations. In accordance with Section 10(b)(i) of Schedule 5 Part 2, an Environmental Impact Assessment Report (EIAR) is required if the proposed development is for more than 500 dwelling units or has an area of more than 20 hectares.

In accordance with Section 13. Changes, extensions, development and testing, of Schedule 5 Part 2, an EIAR is required if 'Any change or extension of development already authorised, executed or in the process of being executed (not being a change or extension referred to in Part 1) which would:-

- i. result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and

- ii. result in an increase in size greater than –
 - 25 per cent, or
 - an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.’

In accordance with Section 15 of Schedule 5 Part 2, an EIAR is required if: ‘Any project listed in this Part which does not exceed a quantity, area or other limit specified in this Part in respect of the relevant class of development, but which would be likely to have significant effects on the environment, having regard to the criteria set out in Schedule 7’.

Although the Proposed Development is below the relevant threshold i.e. below the threshold of 500 dwelling units in Section 10(b)(i), Schedule 5 Part 2 of the Planning and Development Regulations, 2001 as amended, it is considered that an EIAR is required for the following reasons:

- In accordance with Section 13(i) the proposed development, in combination with Phases 1 and 3 of the development (detailed further above) would result in the development of a housing development comprising more than 500 dwellings units, and therefore a development of Class 10(b)(i);
- In accordance with Section 13(ii) the proposed development would result in an increase in the size of an existing development by more than 25%; and
- In accordance with Section 15, based on the nature and scale of the proposed development, the potential for significant environmental impacts cannot be ruled out at the EIA Screening stage.

1.3 Contributors

This EIAR has been prepared by competent experts. The following table clearly sets out a list of the experts who have contributed to this EIAR, showing which parts of the EIAR they have worked on, their qualifications, experience and any other relevant credentials.

Name	Company	Area Expertise	of	Relevant Chapter / Input	Relevant Qualifications / Professional Accreditation	Relevant Experience
Nerita Venketasen	AtkinsRéalis	EIAR ordinator	Co-	Chapter 1 Introduction and Methodology Chapter 2 – Description of Project Chapter 3 - Alternatives Chapter 4 - Population and Human Health Chapter 13 – Material Assets Chapter 15– Risk of Major Accidents and Incidents	BSc Environmental Sciences	8 years
Deirdre Larkin	AtkinsRéalis	Geology, Hydrogeology, Hydrology, Human Health Risk Assessment		Chapter 4 - Population and Human Health (Review) Chapter 6 - Land, Soils & Geology Chapter 7 – Water Chapter 13 – Material Assets (Review)	BSc. (Hons) Geology (2003) UCC MSc Applied Hydrogeology (2012) University of Newcastle. IGI PGeo No. 223 EurGeol No 1064	21 years

Daniel Mulligan	Howells	Architecture	Chapter 2 - Project Description (Design Inputs)	BA(Hons) Architecture BArch - Bachelor of Architecture PGDip - Professional Practice in Architecture ARB, RIBA, RIAI	20 years
Stephen Jackson	Howells	Architecture	Chapter 2 – Description of Project (Design Inputs)	BA(Hons) Architecture MArch - Master of Architecture PGDip – Architectural Practice ARB, RIBA	10 years
Donagh Kelly	BSLA	Landscape Architecture	Chapter 2 – Description of Project (Landscape and Design Inputs)	B.Sc. (Hons) Landscape architecture, University College Dublin	5 years
Melanie Sharkey	BSLA	Landscape Architecture	Chapter 2 – Description of Project (Landscape and Design Inputs)	B.A. (Hons) Landscape Architecture, (University of Gloucester). PG Dip Landscape Architecture (University of Gloucester). CMLI Landscape Institute (UK)	15 years
Helena Gavin	RPS Ltd	Group Planning	Chapter 4 - Population and Human Health with input from AtkinsRéalis on the Human Health Assessment	BA. (Hons) Economics and Geography (1995) UCD, MSc Town & Country Planning (1997) Queens University Belfast, PG Dip Env Eng (2000) Trinity College Dublin, MIPI	25 years
Michael Higgins	RPS Ltd	Group Planning	Chapter 4 - Population and Human Health with input from AtkinsRéalis on the Human Health Assessment	BA, MSc Reg & Urb Planning, H Dip Edu, MIPI, CIHT, TPP	17 years

Colin Wilson	AtkinsRéalis	Biodiversity Ecology	/ Chapter 5 – Biodiversity Chapter 2 – Description of Project Chapter 3 – Alternatives	B.Sc. (Hons) Environmental Science (Middlesex University 1992)	19 years
Daniel Blake	AtkinsRéalis	Ecology	Chapter 5 – Biodiversity (Bat Surveys)	BSc Wildlife Biology	6 years
Garry Hanratty	AtkinsRéalis	Civil Engineer Services / Utilities Hydrology (Surface Water)	Chapter 6 – Land, Soils and Geology (soil volume estimates) Chapter 7 – Water (water demand and waste water design) Chapter 13 – Material Assets (Drainage Inputs)	CEng MIEI Postgraduate Certificate, Management for Sustainable Development (2022) Bachelor of Engineering Technology in Civil/Structural Engineering (2012) Higher Certificate Civil/Structural Engineering (2010)	25 years
Rodoula Gregoriou	ARUP	Civil Engineer/ Flood Risk	Flood Risk Assessment and Flood Emergency Management Plan (Appendices to Chapter 7 of EIAR)	CEng MICE Professional Diploma in Project Management, UCD (2022) Masters in Engineering, Civil Engineering, Cardiff University (2013)	12 years
Ciara Nolan	AWN	Air Quality and Climate	Chapter 8 – Air Quality and Chapter - 9 Climate Change	BSc Energy Systems Engineering UCD (2014) MSc in Applied Environmental Science UCD (2016). Member of the Institute of Air Quality Management (MIAQM) and Institution of Environmental Sciences (MIEnvSc)	8 years

Alistair Maclaurin	AWN	Noise	Chapter 10 – Noise and Vibration	BSc Creative Music and Sound Technology, PgDip Acoustics and Noise Control, Member of the Institute of Acoustics	11 years
Richard Butler	Model Works Ltd	Landscape and Visual Specialist	Chapter 11 – Landscape and Visual Assessment	BSc Landscape Architecture (1995, University of Pretoria) MSc Spatial Planning (2007, Dublin Institute of Technology) Member of the Irish Landscape Institute Member of the Irish Planning Institute	25 years
John Morgan	Independent Tree Surveys	Arboricultural Consultant	Tree Surveys	BSc (Hons) Forestry, Tech Cert (Arbor A) M Arbor A	16 years
Nick Polley	3D Design Bureau	3D planning Solutions	Verified View Montages	BSc (Eng) Dip Eng	21 years
Peter Foley	AtkinsRéalís	Traffic & Transportation	Chapter 12 - Traffic (Review)	MSc in Urban & Regional Planning, Herriot Watt University, Edinburgh 2007 Higher Diploma in Computer Science, University College Cork 2002 BSc Earth Science, University College Cork 1997	17 years
Nicole Marais	AtkinsRéalís	Traffic & Transportation	Chapter 12 - Traffic	N Dip. Civil Engineering (2012) Durban University of Technology BTech Urban Planning (2015) Durban University of Technology Masters Sustainable	12 years

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Barry Dunne	Metec	Mechanical Engineering	Chapter 13 – Material Assets (Utilities Input)	Bachelor of 13 years Engineering, Building Services Engineering Bachelor of Engineering Technology, Building Services Engineering
Edward Power	Metec	Electrical Engineering	Chapter 13 – Material Assets (Utilities Input)	Bachelor of 9 years Engineering Technology, Electrical Services Engineering Trade of Electrician, FETAC Level 6 Advanced Certificate
John Cronin	John Cronin & Associates	Built Heritage & Archaeology	Chapter 14 – Cultural Heritage	B.A. (UCC), 1991, 31 years MRUP (UCD) 1993, MUBC (UCD), 1999.
Camilla Brännström	John Cronin and Associates	Archaeology	Chapter 14 – Cultural Heritage	Filosofie magister 20 years (MA) Prehistoric archaeology (2004) University of Umeå, Sweden
Tony Cummins	John Cronin and Associates		Chapter 14 – Cultural Heritage	BA in Archaeology, 30 years (UCC 1992) MA in Archaeology (UCC 1994).

1.4 EIAR Scoping

As part of the assessment process, an environmental scoping exercise was carried out. The purpose of the exercise was to define the scope of the EIAR. The environmental factors assessed within this EIAR are detailed in Chapter 4 to Chapter 15. The EIAR scoping report is presented in Appendix 1.1. Consultation was undertaken with relevant statutory organisations as part of the assessment process, as detailed further in Chapter 2.

1.5 Appropriate Assessment

Natura 2000 Sites, which comprise Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), are a network of Sites designated across Europe in order to protect biodiversity within the EU. SACs are designated under the EU Habitats Directive (92/43/EEC), as transcribed into Irish law by the European Communities (Birds & Natural Habitats) Regulations, 2011 [S.I. 477 of 2011], while SPAs are designated under the EU Birds Directive (79/4089/EEC and amendments as consolidated in 2009/47/EC).

Article 6(3) of the EU Habitats Directive states that: *'Any plan or project not directly connected with or necessary to the management of the [Natura 2000] Site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the Site in view of the Site's conservation objectives.'* Such an assessment is known as an Appropriate Assessment or a Habitats Directive Assessment. Further guidance on this process is provided by the European Commission (2000) and DEHLG (2009¹).

A Natura Impact Statement was undertaken as part of this application to consider the potential impacts of the proposed development on the conservation interests of surrounding Natura 2000 Sites (AtkinsRéalis, 2025 Document reference 0089313DG0022). The project does not lie within any European Site. There are 14 no. European Sites within the potential zone of influence (Zoi) of the development project; 9 no. SACs and 5 no. SPAs. The nearest European Site is Bray Head SAC (Site Code: 000714) which is located along the coastline ca. 1.7km south of the Site. There is no direct connectivity from the Site to Bray Head SAC or any other European Site via hedgerows or treelines.

When considering the zone of influence, consideration was also given to species which may occur at a distance from the SAC or SPA for which they are a Qualifying Interest (QI). Harbour porpoise and otter, which are QI species of Rockabill to Dalkey Island SAC and Wicklow Mountains SAC respectively, can cover significant distances are examples of such mobile species. Therefore, the mobility of QI species and their potential to range outside of the delineated boundaries of their respective European sites has also been considered as part of the assessment.

The assessment determined that QI species Harbour porpoise of Rockabill to Dalkey Island SAC and QI species otter of Wicklow Mountains SAC are the only qualifying interests of any European site within the zone of influence of the proposed development.

The NIS (AtkinsRéalis, 2025; Document reference 0089313DG0022) considers the following in regard to Rockabill to Dalkey Island SAC during the construction phase;

Direct Impacts

The proposed development does not occur within or directly adjacent to the Rockabill to Dalkey Island SAC and as such there will be no direct impacts with this SAC; i.e. no displacement of species, or the permanent removal of habitat supporting qualifying interest and ecological features of the designated site.

Indirect Impacts

Indirect impacts via surface water run-off during construction phase:

¹ Note: DEHLG (2009) guidance was updated in 2010, by replacing the term "Statement for Appropriate Assessment" with "Natura Impact Statement" or "NIS".

During wet conditions sediment can mobilise in the form of over-ground run-off during excavations and/or movement of heavy machinery through the proposed development. Sediment is of particular concern for aquatic species within receiving water bodies.

However, the only works near the River Dargle are those involving the installation of the surface water drainage outfall for the proposed development. All other construction activities are remote from the watercourse and there is the physical barrier of the flood defence walls and public promenade separating the proposed development from the watercourse. Given the physical barrier the flood defence walls and promenade present and the distance between the residential development works areas and the watercourse, the potential for large volumes of sediment to reach the River Dargle as a result of construction activities is very limited.

Whilst the potential for construction related impacts upon the surface water quality of the River Dargle is considered to be low, in the absence of mitigation measures, potential impacts to the surface water quality of the River Dargle, which could in turn affect QI species Harbour porpoise, cannot be entirely ruled out.

Thus, given the potential impacts posed by the proposed works, mitigation measures are set out in Section 6.4 AtkinsRéalis, 2025; Document reference 0089313DG0022).

Indirect Impacts during construction phase via groundwater (hydrogeological pathway):

'A review of groundwater vulnerability datasets identifies the proposed development is within an area of moderate groundwater vulnerability and low groundwater vulnerability. Inferred groundwater flow is expected to follow topography in general southerly, and south easterly directions, primarily towards the River Dargle (in the south) and to the Irish Sea (in the east / south east).

Excavation works on the proposed development site can interact with groundwater and have the potential to expose groundwater to contamination by concrete, hydrocarbons and other chemicals used in construction. Temporary dewatering will likely be required during excavation in portions of the proposed development, however there will be no discharge to the River Dargle from any dewatering activities. Significant impacts to groundwater quality or flow during the construction phase are not likely. Any potential impacts on groundwater as a result of construction activities will not likely affect the surface water quality in the River Dargle or the coastal water quality in the Irish Sea.

Given the location, nature and scale of the proposed development, potential impacts through groundwater pathways and then onwards via the Irish Sea which could affect the conservation objectives of QI species Harbour porpoise are not considered likely.

Indirect noise and vibration impacts during construction phase (piling works):

Piling works are necessitated for the construction of the proposed apartment blocks. These percussive works will not occur near the coastline or near the coastal waterbody (minimum c. 100m distance). As such piling works will not result in noise and/or vibration related disturbance impacts to QI species Harbour porpoise.'

The NIS (AtkinsRéalis, 2025; Document reference 0089313DG0022) considers the following with regards to Rockabill to Dalkey Island SAC during the operational phase;

Direct Impacts

The proposed development does not occur within or directly adjacent to the Rockabill to Dalkey Island SAC and as such during usage of the development there will be no direct impacts with this SAC; i.e. no displacement of species, or the permanent removal of habitat supporting qualifying interest and ecological features of the designated site.

Indirect Impacts

Indirect impacts from discharge of storm water / surface water during operational phase:

Following completion of construction, storm water / surface water (SW) drainage from the development is proposed to discharge to the River Dargle which outfalls to the Irish Sea. The SW drainage design includes for a Sustainable Drainage Design (SuDS) with permeable paving, swales, filter drains to rear gardens, modular underground attenuation, a bypass interceptor and flow control devices. SuDS measures will reduce the potential for contaminants, such as silts and hydrocarbons etc., to impact the River Dargle through the treatment process (swales / filter drains / attenuation / bypass interceptor) employed prior to discharge and will also reduce volumes of surface water run-off from the proposed development site.

With or without the use of SuDS it is considered that rainfall / surface water run-off from the project site will not result in adverse water quality impacts to the River Dargle. As such likely significant effects to the QI harbour porpoise of Rockabill to Dalkey Island SAC from operational phase surface water drainage will not occur.

Indirect impacts from discharge of treated foul effluent during operational phase:

During the operational phase of the proposed development the foul water generated from the proposed development will discharge into the local foul water network. The local foul water network is connected to the Shanganagh WwTP which has been upgraded and as such can accommodate the additional load to the network. Treated outfall from Shanganagh WwTP is to the Irish Sea and as such the potential for the treated effluent from the proposed development to impact Rockabill to Dalkey Island SAC has been considered.

The Shanganagh WwTP has been subject to the Appropriate Assessment process. The Irish Water Report; Natura Impact Statement as part of the Shanganagh-Bray Discharge Licence Review (D0038-01 & D005-01) concluding statements are summarised as follows: -

“There are no effects anticipated to the Rockabill to Dalkey Island SAC or Dalkey Island SPA as the treated effluent from the primary discharge is compliant with licence ELV's and the closest bathing and surface water monitoring stations to the discharge point achieve good high status.”

“There was no obvious effects of any of the agglomeration discharges within nearby intertidal habitats (single shore) or on the surface of the water, nor were there any foul odours. The designated ‘Reef’ habitat is included as an Annex 1 habitat under consideration. The primary discharge is the closest discharge to this designated habitat. Given the quality of the effluent and the dilution and dispersal available in coastal waters, the ongoing primary discharge is not expected to affect the favourable conservation status of ‘Reefs’ habitat in the Rockabill to Dalkey Island SAC. The additional dilution offered in intervening coastal waters means there is no potential for overflows inshore and in local streams to affect the favourable conservation status of this habitat.”

“The only Annex II species under consideration is the Harbour Porpoise. Data suggests there is a healthy population of porpoise in the SAC. Any minor eutrophication effects within the mixing/dilution zones of the primary discharge or overflows are not expected to impact the favourable conservation status of this species. The primary discharge comprises treated effluent and is effectively dispersed, while the worst effects of the overflows will be within freshwater or shallow intertidal waters to the coast which would not be used by this species.”

“...it is envisaged there will be no significant adverse effects on the integrity of Rockabill to Dalkey Island SAC or Dalkey Island SPA, in view of these sites conservation objectives and the conservation status of the Annex I habitat, Annex II species and protected bird species will not be compromised by the WwTP discharge either directly, indirectly or cumulatively.”

No impacts are anticipated on the qualifying interests of Rockabill to Dalkey Island SAC from foul discharge from the operational phase of the proposed development given effluent will be treated at Shanganagh WwTP prior to discharge and given the dilution and dispersal which will occur within the Irish Sea.

The NIS (AtkinsRéalis, 2025; Document reference 0089313DG0022) considers the following in regard to Wicklow Mountains SAC during the construction phase;

Direct Impacts

The proposed development does not occur within or adjacent to the Wicklow Mountains SAC and as such there will be no direct impacts with this SAC; i.e. no displacement of species, or the permanent removal of habitat supporting qualifying interest and ecological features of the designated site.

Indirect Impacts

Indirect Impacts to Otters via surface water run-off during the construction phase:

Otters are a mobile QI species associated with this SAC. In light of the 'proceedings' (Refer to Table 5-1 of the NIS (AtkinsRéalis, 2025) (Document reference 0089313DG0022) it has been assumed on a precautionary basis that there is potential for ex-situ otters from the SAC to use the stretch of River Dargle next to the proposed development site. Note; this is done without prejudice to any arguments made in opposition to the grounds pleaded by the Applicant in the 'proceedings' and is done without prejudice to the conclusions reached in the Appropriate Assessment Screening and NIS carried out in respect of the Coastal Quarter Phase 1B development. The assessment that follows should be read in that context. It is noted that Site surveys determined there are no otter holts along the riverbanks near the proposed development site, nor was any evidence of otter activity noted, and the entirety of the riverbanks in the area of the proposed development are man-made structures (flood defence walls, promenade and reinforced rock).

The potential for the works to affect the aquatic environment has been considered. As detailed above, the only potential for construction works to affect the water quality of the River Dargle is from the installation of the surface water drainage outfall. Whilst the potential for significant construction related impacts upon the surface water quality of the River Dargle is considered to be low, in the absence of mitigation measures, potential impacts to the surface water quality of the River Dargle, which could in turn affect QI species Otter, cannot be entirely ruled out.

Thus, given the potential impacts posed by the proposed works, mitigation measures are set out in Section 6.4 of the NIS (AtkinsRéalis, 2025). (Document reference 0089313DG0022)

Indirect noise and vibration impacts during construction phase (piling works):

Piling works are necessitated for the construction of the proposed apartment blocks. These percussive works will only occur during normal working hours i.e. during daylight hours. Given that otters are predominantly nocturnal species, and considering the busy urban setting of the project site, any noise or vibration generated from works during the day will not result in likely significant disturbance or displacement effects to ex-situ SAC otters.'

The NIS (Document reference 0089313DG0022) considers the following in regard to Wicklow Mountains SAC during the operational phase;

Direct Impacts

'The proposed development does not occur within or directly adjacent to the Wicklow Mountains SAC and as such, during the usage of the development, there will be no direct impacts with this SAC; i.e. no displacement of species, or the permanent removal of habitat supporting qualifying interest and ecological features of the designated site.

Indirect Impacts

Indirect impacts from discharge of storm water / surface water during operational phase:

During usage of the development, storm water / surface water (SW) drainage is proposed to discharge to the River Dargle which outfalls to the Irish Sea. As detailed above, rainfall run-off from the proposed development site will be treated (swales / filter drains / bypass interceptor) and attenuated prior to discharge and as such will not result in any significant water quality impacts to the river. Given no adverse water quality impacts are anticipated from rainfall / surface water run-off from the development site there will be no likely significant effects to otters, or their prey species, whilst the development is occupied and in use.

Indirect impacts from discharge of treated foul effluent during operational phase:

Foul water will be discharged to the local network which connects to Shanganagh WwTP. Following treatment waters will outfall to the Irish Sea ca. 4km north of the River Dargle. As such, there is no potential for any effects to the aquatic environment of the River Dargle or otters within the river.'

Based on the findings of the Natura Impact Statement (AtkinsRéalis, 2025; Document reference 0089313DG0022) the following conclusions have been made;

'Given the full and proper implementation of the mitigation measures detailed in this NIS, the quality of the storm water / surface water / treated foul water from the proposed development, either during construction or operation, will not have a significant impact on water quality within the River Dargle or Irish Sea. As such there will be no significant effects on the Rockabill to Dalkey Island SAC, Wicklow Mountains SAC or any other European site, from either the construction or operation of the proposed development via hydrological pathways.

This NIS provides the competent authority with supporting information to undertake the Appropriate Assessment in relation to the proposed Sea Gardens Phase 2 development project and its potential for direct, and indirect and in-combination effects on the Rockabill to Dalkey Island SAC and Wicklow Mountains SAC.

The NIS has examined the potential impacts of the proposed project on the integrity of the two SACs, alone and in combination with other plans and projects, considering the site's structure, function and conservation objectives. Where impacts potentially constituting adverse effects on the site were identified, mitigation measures have been prescribed to avoid or minimise those impacts such that they no longer constitute adverse effects on the integrity of the site.

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests of Rockabill to Dalkey Island SAC and Wicklow Mountains SAC and the implementation of the proposed mitigation measures, it has been concluded by the authors of this report that there will be no residual impacts and the proposed project will not have an adverse effect on the integrity of the Rockabill to Dalkey Island SAC, Wicklow Mountains SAC or any other European site.'

1.6 Methodology & Structure of this Report

This EIAR has been prepared in accordance with Planning and Development Regulations as amended 2001-2025, and with due regard to the following EIAR guidance;

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Government of Ireland, 2018);
- 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' published in 2022 (EPA, 2022);

- 'Environmental Impact Assessment of Projects Guidance on Scoping' (Directive 2011/92/EU as amended by 2014/52/EU); and,
- '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), published by the European Commission.'

Additionally, discipline specific best practice guidance has been consulted by each specialist for each of the relevant topics (Population & Human Health; Biodiversity; Landscape and Visual; Air Quality; Climate; Noise & Vibration; Traffic; Land, Soils & Geology; Water; Cultural Heritage; Material Assets and Risk of Major Accidents and Disasters) during the preparation of the EIAR.

This EIAR includes all necessary technical studies to address the likely environmental impacts of the construction and operation of the proposed residential development. The disciplines identified for inclusion in this EIAR, along with the technical content, were determined based on various Site walkover surveys, completion of an environmental scoping exercise (to inform the content and extent of matters covered in the environmental information) and consultation with statutory bodies.

The EIAR is presented in three volumes as follows;

- Volume 1 - Non-Technical Summary;
- Volume 2 - EIAR;
- Volume 3 - EIAR Appendices.

Within the main body of the EIAR (Volume 2), Chapter 1 sets out the introduction and methodology, Chapter 2 describes the project and identifies the information required in an EIAR and Chapter 3 assesses the alternatives. The environmental topics where there is potential for significant impacts to arise are addressed in Chapters 4 to 15 as follows;

- Chapter 4 Population and Human Health;
- Chapter 5 Biodiversity;
- Chapter 6 Land, Soils & Geology;
- Chapter 7 Water;
- Chapter 8 Air Quality
- Chapter 9 Climate Change;
- Chapter 10 Noise & Vibration;
- Chapter 11 Landscape and Visual Impact Assessment;
- Chapter 12 Traffic Impact Assessment;
- Chapter 13 Material Assets (Waste and Utilities);
- Chapter 14 Cultural Heritage (Architectural and Archaeological Heritage); and,
- Chapter 15 Risk Management (Major Accidents & Disasters)

Culmulative impacts for all relevant disciplines are addressed in Chapter 16 and interactions between disciplines are addressed in Chapter 17. The Schedule of Commitments are presented in Chapter 18 and a summary of residual effects are presented in Chapter 19.

Where appropriate, each of the main sections of this report are structured in the same general format, as follows:

- An introduction describing the purpose of the section;
- A description of the methodology used in the section;
- A description of the aspects of the existing environment relevant to the environmental topic under consideration;

- Characteristics of the proposed development under consideration;
- An assessment of the impact of the proposed development on the environmental topic;
- Recommendations for mitigation measures to reduce or eliminate any significant negative impacts identified; and,
- An assessment of the residual impact that will remain, assuming that recommended mitigation measures are fully and successfully implemented.

Further details of the methodology and discipline specific best practice and guidance are presented in the relevant Chapters included within this report. A register of all Planning and Engineering Drawings included in this planning application are presented in Appendix 1.2.

Sources of information mentioned in the text are either i) listed in full in the bibliography (Chapter 20 – References) or ii) are referenced in full in the text.

The full planning application pack, including this EIAR will be available for public viewing via. Wicklow County Council Office.

1.7 Need for the Project

Shankill Property Investments Limited is seeking a 5-year grant of planning permission for the development of a proposed mixed-use development on the former Bray Golf Course lands in Bray, County Wicklow. The proposed development will include residential, retail/retail services and commercial uses, as well as ancillary supporting amenities and facilities. The application is submitted to Wicklow County Council (WCC) following the provisions of section 34 of the Planning and Development Act 2000, as amended, and the Planning and Development Regulations 2001-2025.

The application site is entirely within WCC's administrative boundary, meaning the *Wicklow County Development Plan 2022-2028* (Wicklow CDP) and the *Bray Municipal District Local Area Plan 2018-2024* (Bray LAP) are relevant. The Bray LAP zones the lands as Mixed Use (MU).

The proposed development relates to Phase 2 of the Sea Gardens Masterplan (previously referred to as the Harbour Point Masterplan). Phase 1a of the Masterplan is nearing completion, and planning permission for Phase 1b has recently been granted. Phase 3, which will be located adjacent to the River Dargle, will be subject to a separate application in the future.

Bray's location is ideal for individuals and families looking to live in a coastal setting with convenient access to Dublin City and other nearby areas. If planning permission is granted, various housing types will be developed, along with residential amenities catering to households of all ages and needs, while contributing to Bray's sustainable growth and consolidation as a place to live, work and visit. A range of educational, healthcare, and community services are situated adjacent and/or near the application site, which will be complemented by open spaces and other supporting social and community facilities included in the proposed development, such as a childcare facility, a medical centre, retail services, commercial units, and a large public park.

Various policies and objectives regarding housing development in general and the development of lands in Bray are set under the *National Planning Framework*, the *Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region* and the Wicklow CDP. A summary (i.e., a non-exhaustive list) of some of the most relevant to the proposed development is presented below:

- National Policy Objective 33: "*Prioritise the provision of new homes at locations that can support sustainable development and at an appropriate scale of provision relative to location.*"
- National Policy Objective 35: "*Increase residential density in settlements, through a range of measures including reductions in vacancy, re-use of existing buildings, infill development schemes, area or site-based regeneration and increased building heights.*"
- Regional Policy Objective 4.37: "*Support the continued development of Bray including the enhancement of town centre functions, development of major schemes at the former Bray golf course and Bray harbour, along*

with increased employment opportunities and co-ordination between Wicklow County Council, Dún Laoghaire-Rathdown County Council, and the transport agencies to facilitate the delivery of key infrastructure required for the westward extension of the town, including Bray-Fassaroe public transport links and road improvements.”

- Regional Policy Objective 4.38: *“Support the development of Bray as a strategic employment location with a particular focus on attracting high value investment in ‘people’ based industries at accessible locations, in order to increase the number of local jobs”*
- CPO 4.2 of the Wicklow CDP: *“To secure compact growth through the delivery of at least 30% of all new homes within the built-up footprint of existing settlements by prioritising development on infill, brownfield and regeneration sites and redeveloping underutilised land in preference to greenfield sites.”*
- CPO 5.21 of the Wicklow CDP: *“To strengthen the urban structure of towns and villages by ensuring that any new development contributes to a coherent urban form, focused on a high quality built environment of distinct character. New development shall incorporate a legible and permeable urban form that protects and complements the character of the street or area in which it is set in terms of proportion, enclosure, building line, design and by the marrying of new modern architecture with historic structures.”*
- CPO 5.6 of the Wicklow CDP: *“(…) Bray - Harness the potential of the former Bray golf course, Bray harbour and key town centre development sites to deliver compact growth, prioritising sustainable mobility, expand employment opportunities and strengthen the viability and vibrancy of the town centre (…)”*
- CPO 6.17 of the Wicklow CDP: *“To facilitate development incorporating higher buildings (i.e. buildings that exceed the contextual prevailing height) where it has been adequately demonstrated that the development complies with the assessment criteria set out in Section 3.2 of the Urban Development and Building Heights Guidelines for Planning Authorities (DHPLG 2018) or any subsequent height guidelines (…)”*

The need for this Project and its consistency with planning policy is discussed in greater detail within the Planning Report (RPS, 2025) submitted as part of this planning application.

2. Project Description

2.1 Nature and Extent of the proposed development

Sea Gardens Phase 2, which is the subject of this planning application, forms part of the Sea Gardens Masterplan (previously known as the Harbour Point Masterplan) located on the former Bray Golf Club Lands off Ravenswell Road and the Dublin Road, Bray, Country Wicklow (here after referred to as the 'proposed development' or 'the Site').

The Site is bound by the permitted Phase 1 Coastal Quarter SHD (Phase 1A: Reference ABP-311181-21 & Phase 1B: ABP-314686-22) part of which is currently under construction in the North, by the Irish Rail Dublin-Rosslare main rail line in the East, by the River Dargle in the South and by existing residential developments to the West.

Refer to Figure 2-1 (also included in the planning pack; BRA-HWS-02-ZZ-D-A-10100_P01).

The Site is within Wicklow County Council (WCC) bounds.

Most of the proposed development lands are located within a former golf course, Bray Golf Club, first established in the late nineteenth century and characterised by open ground covered by short grass with mature trees and scrub in places. The southern and eastern portions of the Site are located on low-lying level ground, while the ground rises slightly towards the north elsewhere. A temporary construction compound and car park occupy the centre of the Site while the northern portion of the Site contains some stockpiled soil. The western extent of the Site is located within the former garden of Ravenswell House as depicted on the historic OS maps. An existing road orientated north-south divides the eastern and western portion of the development Site. The southeast margin of the Site, adjacent to the River Dargle, is occupied by a car park and access road (now closed). The boundary to the river is defined by a modern concrete flood relief wall and drainage ditch.

There is significant existing foul drainage infrastructure present within Site. A foul rising main and a trunk foul sewer enter the Site at the northern boundary of the Phase 1 lands and turns east then south along the Site boundary where it finally crosses the River Dargle at the south of the Site. There are also two gravity foul sewers to the south of the Site. These sewers run from west to east across the Site where they outfall to the trunk sewers previously discussed.

There is an existing Uisce Éireann underground foul water storage tank close to the western boundary of the proposed development Site. The existing tank was constructed by Dun Laoghaire Rathdown County Council in 2007 – 2008 and is a critical piece of infrastructure associated with the Bray Pumping Station to the south of the River Dargle. As confirmed by Shankill Property Investments Ltd., this tank was installed under a 999-year subterranean lease allowing the surface area above to be incorporated into the future build out of the lands including capacity to accommodate substantial fill and an Uisce Éireann service vehicle driving above it.

The purpose of the existing Uisce Éireann underground foul water storage tank is to store foul and/or storm water during exceedance events at Bray Pumping Station. During storm events, the tank and its associated infrastructure are utilised to limit the expected incidence of discharge from the Bray Pumping Station storm overflow to the Irish Sea to 3no. times per bathing season and if practical via. the foul outfall to 7no. times per bathing season.

While the Site is private with no formal public access, it is currently used as a car park/site compound for the current construction works for the permitted Phase 1 development.

The proposed demolition works includes 1no. derelict cottage and associated outbuildings, and the removal of existing roads and hard standing surfaces / base slab associated with the now demolished golf clubhouse.

Sea Gardens Phase 2 proposes a mixed-use development comprising residential (c. 41,013 sq.m), retail/retail services (c. 8,155 sq.m), and commercial (c. 10,778 sq.m) spaces. The residential component will comprise 341 residential units (94 houses, 106 duplex units, and 141 apartments located in Blocks E and H). In addition, a 3-5 star hotel with 150 bedrooms is proposed in Block I, a public house in Block E, a childcare facility and a medical centre in Block H, and retail/retail services units distributed in Blocks E, G, H and I. The proposed development will also provide private, communal, and public open spaces, along with car and bicycle parking for residents and visitors. An internal road network for vehicles, cyclists, and pedestrians will connect to the existing transport networks. All associated development infrastructure will also be provided, including public lighting, hard and soft landscaping, utilities, drainage, and clearance, demolition and removal of existing structures on site. Building heights proposed are as follows: houses will be 2-3 storeys, duplex units will be 2-3 storeys, Block E will be 3-15 storeys, Block G will be 1-2 storeys, Block H will be 3-4 storeys and Block I will be 3-7 storeys.

The proposed development also includes the closure of vehicle access to the Ravenswell Road from the R761 and seeks to amend previously permitted development under Reg. Ref. WCC Ref. 2460455 to include the construction of a new vehicle access at Dublin Road/Upper Dargle Road Junction and modifications to the associated permitted landscaped area.

Sea Gardens Phase 2 will complement the permitted Sea Gardens Phase 1A (construction of which is nearing completion) and Phase 1B, as well as the future Phase 3, which will be the subject of a separate application. Phase 3, located adjacent to the River Dargle, is expected to accommodate approximately 362 residential units above a podium, including approximately 14,000 sq.m of retail and other uses. The building heights in Phase 3 will range from 6-9 storeys. This area has been included in the current application for Sea Gardens Phase 2 to allow for temporary use during construction for storing materials and Site facilities.

For Sea Gardens Phase 2, the proposed houses and duplexes range in height from 2 to 3 storeys (8.9m to 11.7m), with the proposed Block E ranging in height from 3 to 15 storeys (57.9m), Block G ranging from 1 to 2 storeys (11.5m), Block H ranging from 3 to 4 storeys (21.5m) and Block I ranging from 3-7 storeys (35.4m).

The application Site is 11 hectares (ha), of which ca. 10.9ha is being developed as the proposed residential development with the remaining 840m² being utilised to facilitate utility connections to the existing watermain network along Upper Dargle road (refer to the Engineering Planning Report (Doc. Ref: 0088726DG0005) for further details). A (NET) developable area of 5.6ha results from the deduction of the ca. 2.2ha open space from the gross site area and 3.1ha commercial plots and non-developable land; and residential densities of 66 units per hectare are achieved through the use of a variety of housing typologies including apartments, duplexes and housing dwellings as shown in Figure 2-2.

It is proposed that the following existing access roads will be used for the proposed development:

- Access road to the school;
- Pedestrian link at the River Walk along the River Dargle;
- Access via the Fran O'Toole Bridge; and
- Vehicle and cycle access via the Harbour Road through the underpass

Various types of finishes and facades are proposed for the buildings within the development site which are detailed in the accompanying Architectural Design Statement (BRA-HWS-02-ZZ-R-A-05002). A Building Life-cycle Report conducted by Aramark (2025) included in this planning application guided the material selection.

Following the completion of tree surveys there are 302no. trees within the Site, 45no. trees will be retained and proposed works will require the felling of 257no. trees. Such trees will be compensated for, by extensive planting of over 1000no. trees, over 170,000 no. shrubs, over 600m of hedgerows, woodland screening, rain gardens, bulb planting and wildflower areas throughout the proposed development Site. Strong links are established through the Central Park and on to Coastal Gardens biodiversity corridor along the eastern boundary of the Masterplan lands. Refer to the Landscape Design Strategy (BSLA, 2025) submitted to support this application.

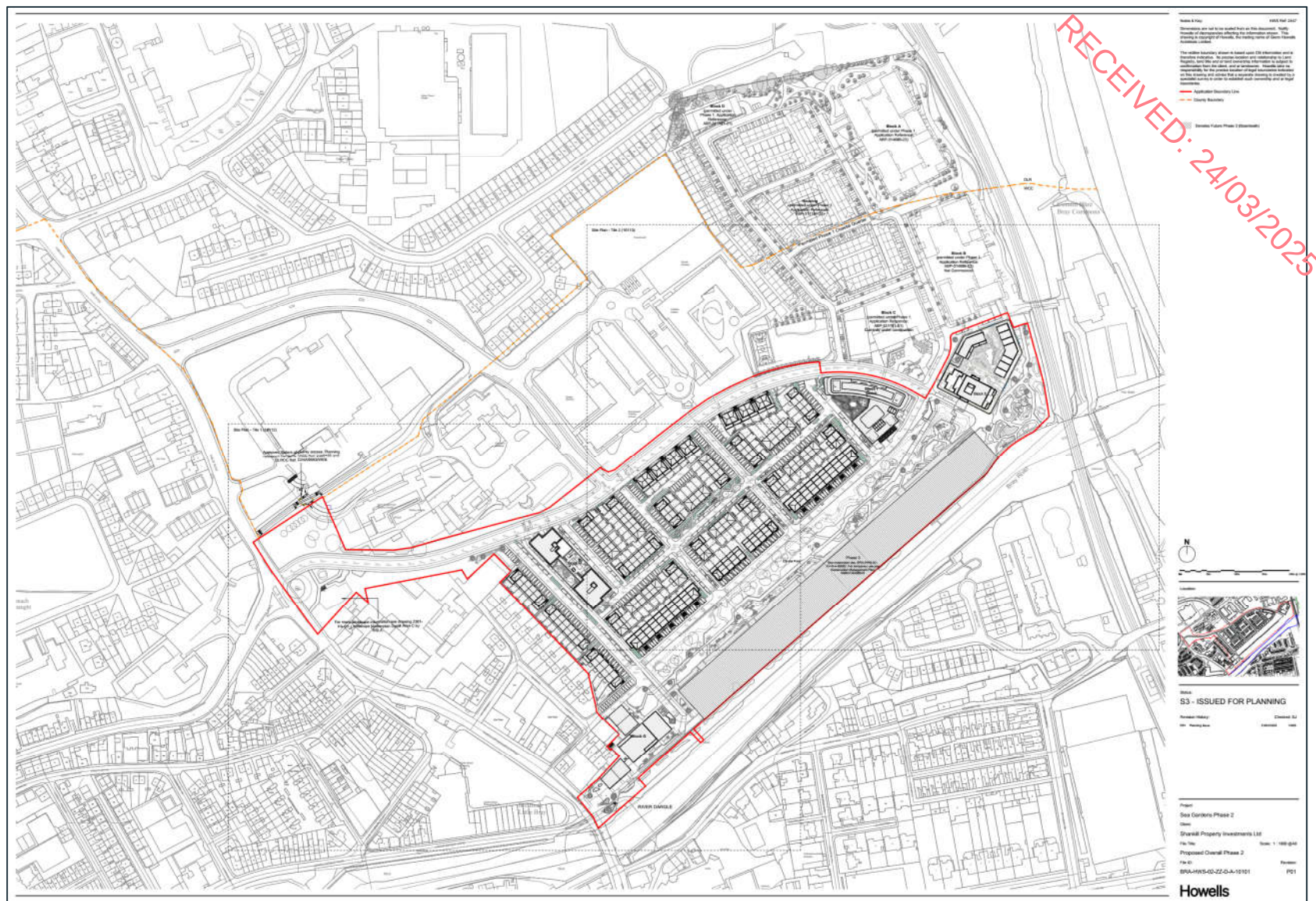


Figure 2-2 - Proposed Site Layout

The Wicklow Development Plan requires 15% of the Site area to be set aside for Public Open Space which is 16,478 sqm. Within the proposed design the Public Open Space allowance is 18,458 sqm.

The overall Landscape Masterplan features a number of key amenity areas each with its own character as summarised below and presented in Figure 2-3. All spaces have been considered and designed within the wider context of relevant policies and guidelines (Bray LDP and Wicklow Development Plan) aimed at preserving, enhancing and managing the county's natural and built landscapes. The landscape strategy promotes sustainable development, protecting biodiversity and enhancing the visual and environmental quality of the landscape.

1. Western Entrance: 2505.83 m²

Designed to link the proposed development to the wider public realm of Bray Main St, local shops and bus routes and therefore has important role in announcing the scheme. The plaza design aims to serve the wider community as well as residents of Sea Gardens - welcoming locals and visitors with a multi-use public space for daily activities such as coffee, seating areas and the occasional events space.

2. Central Park: 15952.29 m²

This significant open space links the east and western areas of the development and will provide for a large number of amenities to locals and visitors. The design proposal includes for the retention of some existing mature trees, proposed tree and shrub planting, open lawns and kick about areas, wildflower meadows, rain gardens intertwined with nature trails, stepping stones, climbing boulders, a large formal play area with climbing equipment, games tables and walking and cycling routes

3. Coastal Gardens: Not Included

Creates a strong link to the form a part of Phase 1a and Phase 1b Sea Gardens. The gardens provide an amenity space to the south east corner of the site, adjacent to the railway line and the River Dargle. The design proposals include proposed trees and shrub planting, screening to the rail line, connection to existing and proposed cycle routes, play area and seating areas. Coastal Gardens does not form part of the overall Public Open Space Calculations

4. Residential Areas including Community Garden: COS: Duplexes Amenity: 387.83 m² COS: Block H 387.83 m² / COS: Community Garden CG: 790.50 m

Residential streets are defined by street trees, planting pockets and seating areas and quieter home-zones. Green links are formed to the Community Garden. This is a smaller scale amenity space, the design includes fruit bearing tree and shrub planting, herbaceous and herb beds, small play elements for younger children, seating and lawn area.

5. Southern Access Street: Not included

Connection from Southern Cross road, this green connection does not form part of the overall Public Open Space Calculations but provides additional amenity. The proposed design includes, a small dog park (increasing public surveillance), retention and management of existing trees, woodland whip planting increasing age diversity to existing stock.

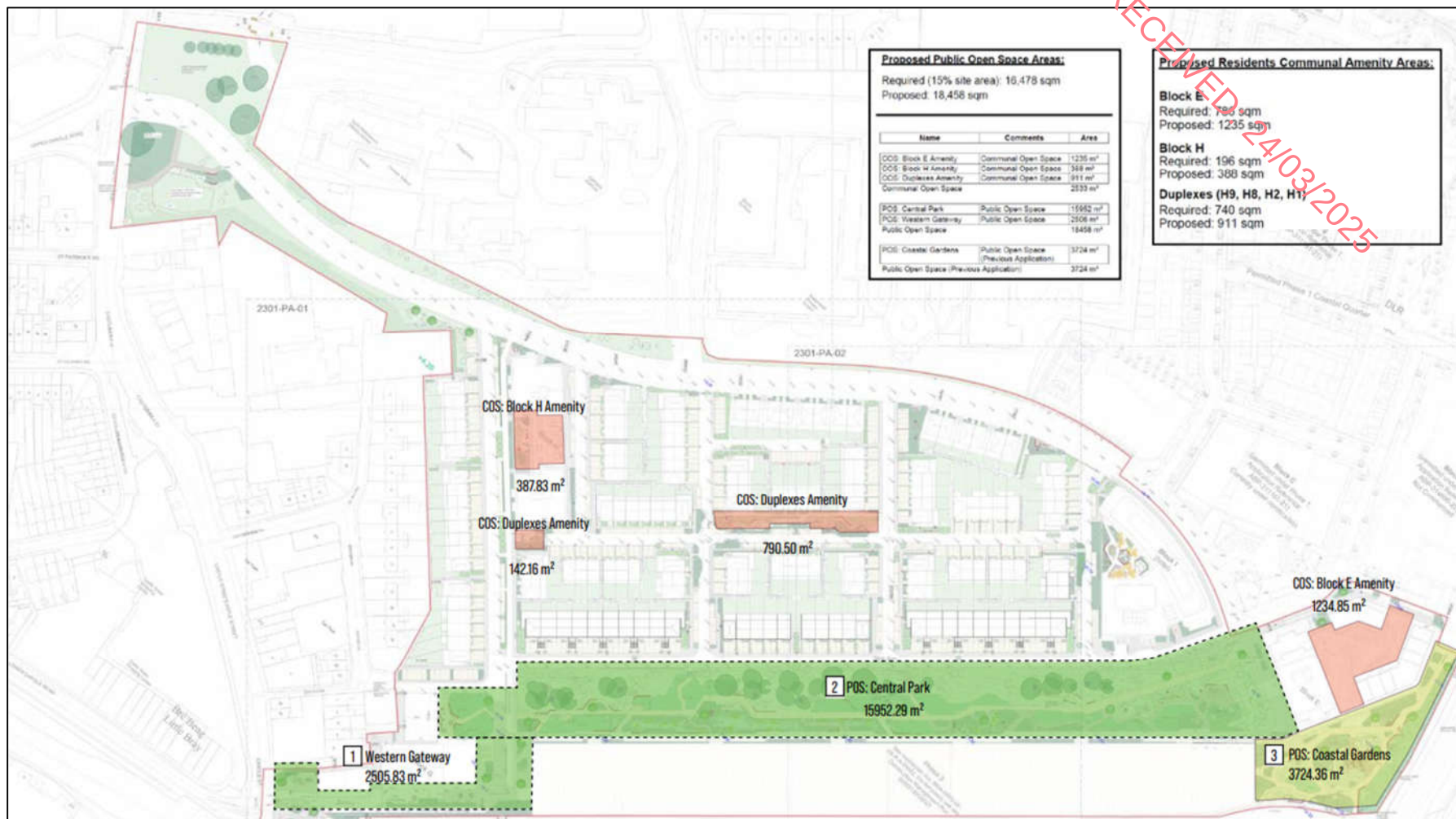


Figure 2-3 - Proposed Key Amenity Areas (Refer to the Landscape Design Strategy Report (BSLA) submitted as part of this planning application)

The proposed development is in line with the County Wicklow Play Policy as the open space provision provides opportunities for play areas within the residential, Central Park and Coastal Gardens of Sea Gardens Phase 2.



Figure 2-4 - Proposed Play Provision (Refer to the Landscape Design Strategy Report (BSLA) submitted as part of this planning application)

The landscape and engineering design of this development incorporates SuDS measures including modular permeable paving, swales, tree pits and underground storage capacity. Trees and other planting have been incorporated within the design so as to create an attractive streetscape.

A Daylight and Sunlight Assessment Report has been prepared by 3D Design Bureau (2025), and Wind Microclimate Modelling has been undertaken by B-Fluid Dynamic Consultants (2025), which are being submitted to support this planning application (and are included within Appendix 2, Volume 3 of this EIAR).

There are houses and duplex units within the proposed development as well as apartment blocks (Block E and H), mixed use areas (Block H) and a hotel (Block I). The houses, duplexes and apartment blocks have different dwelling typologies, as presented in Table 2-1. The housing mix and typologies are presented in Figure 2-6 below.

Table 2-1 - House, Duplex and Apartment Typologies

Houses, Duplexes and Apartments	Unit Type	Number of Units
Houses	RH1 3 Bed, 5 Person House	62
	RH2 4 Bed, 8 Person House	12
	RH3 4 Bed, 8 Person House	6
	RH4 4 Bed, 8 Person House	14
	94	
Duplexes	RD1 (Lower) 2 Bed, 4 Person Duplex	4
	RD1 (Upper) 3 Bed, 5 Person Duplex	4
	RD2 (Lower) 2 Bed, 4 Person Duplex	16
	RD2 (Upper) 3 Bed, 5 Person Duplex	16
	RD3 (Lower) 2 Bed, 4 Person Duplex	19
	RD3 (Upper) 3 Bed, 5 Person Duplex	19
	RD4a (Lower) 2 Bed, 4 Person Duplex	10
	RD4a (Upper) 3 Bed, 5 Person Duplex	10
	RD4b (Lower) 2 Bed, 4 Person Duplex	4
	RD4b (Upper) 3 Bed, 5 Person Duplex	4
	106	
Block Apartments	E 1 Bed, 2 Person Apartment	9
	2 Bed, 4 Person Apartment	83
	3 Bed, 5 Person Apartment	4
	3 Bed, 6 Person Apartment	5
	4 Bed, 8 Person Apartment	8
	109	
Block Apartments	H 1 Bed, 2 Person Apartment	18
	2 Bed, 4 Person Apartment	12
	3 Bed, 5 Person Apartment	2
	32	
Total	341	

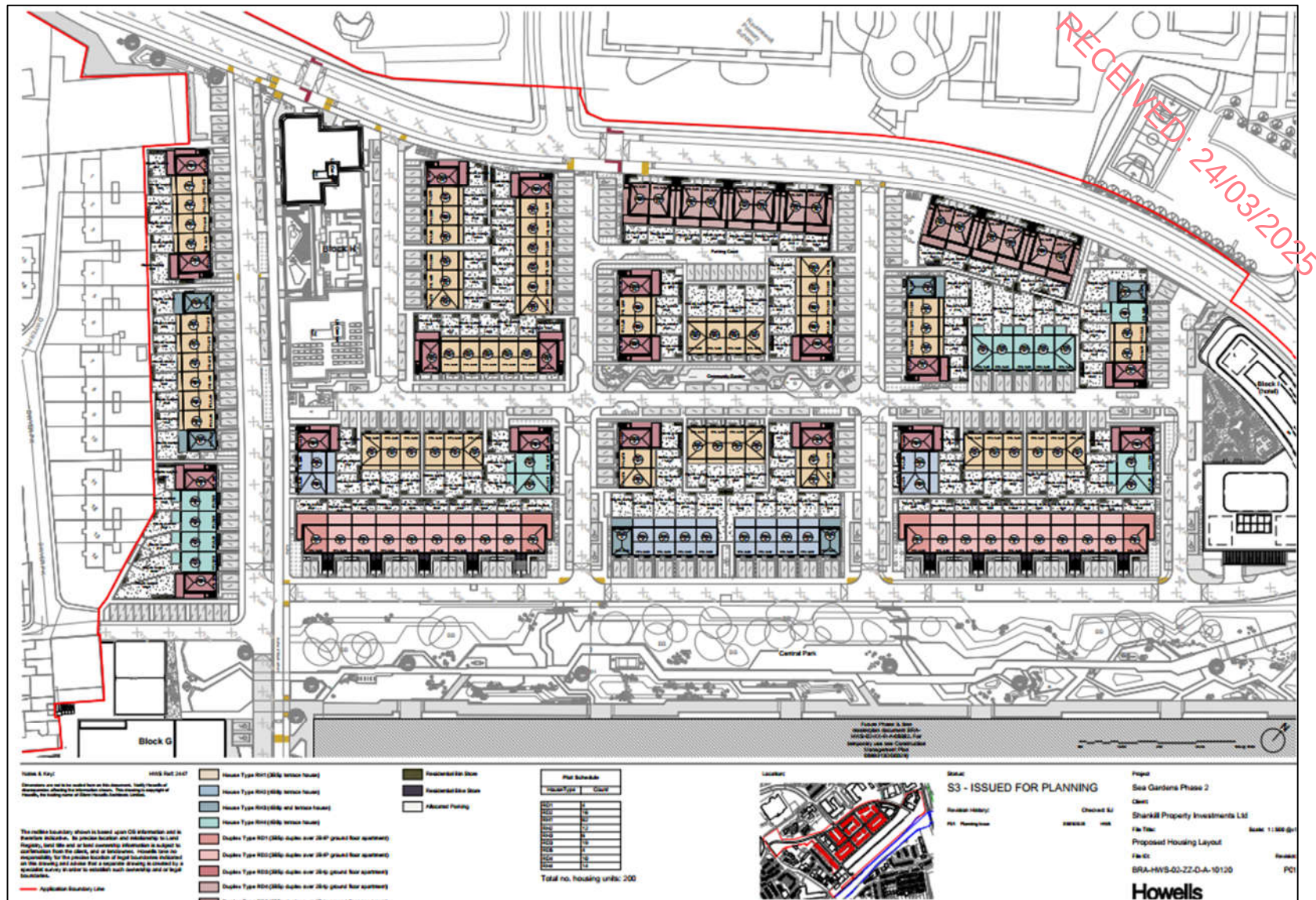


Figure 2-6 - Proposed Housing Layout

2.2 Preliminary Phasing

It is proposed that the construction of the proposed development will consist of two phases and is anticipated to run for four years between Quarter 3- 2025 and March 2029 as seen below and illustrated in Figure 2-7 and Figure 2-8:

- Phase A – Commence Q3-2025, Complete December 2027
- Phase B – Commence January 2026, Complete March 2029

It must be noted however that this phasing plan is preliminary and may be subject to revision at a later stage of the development.

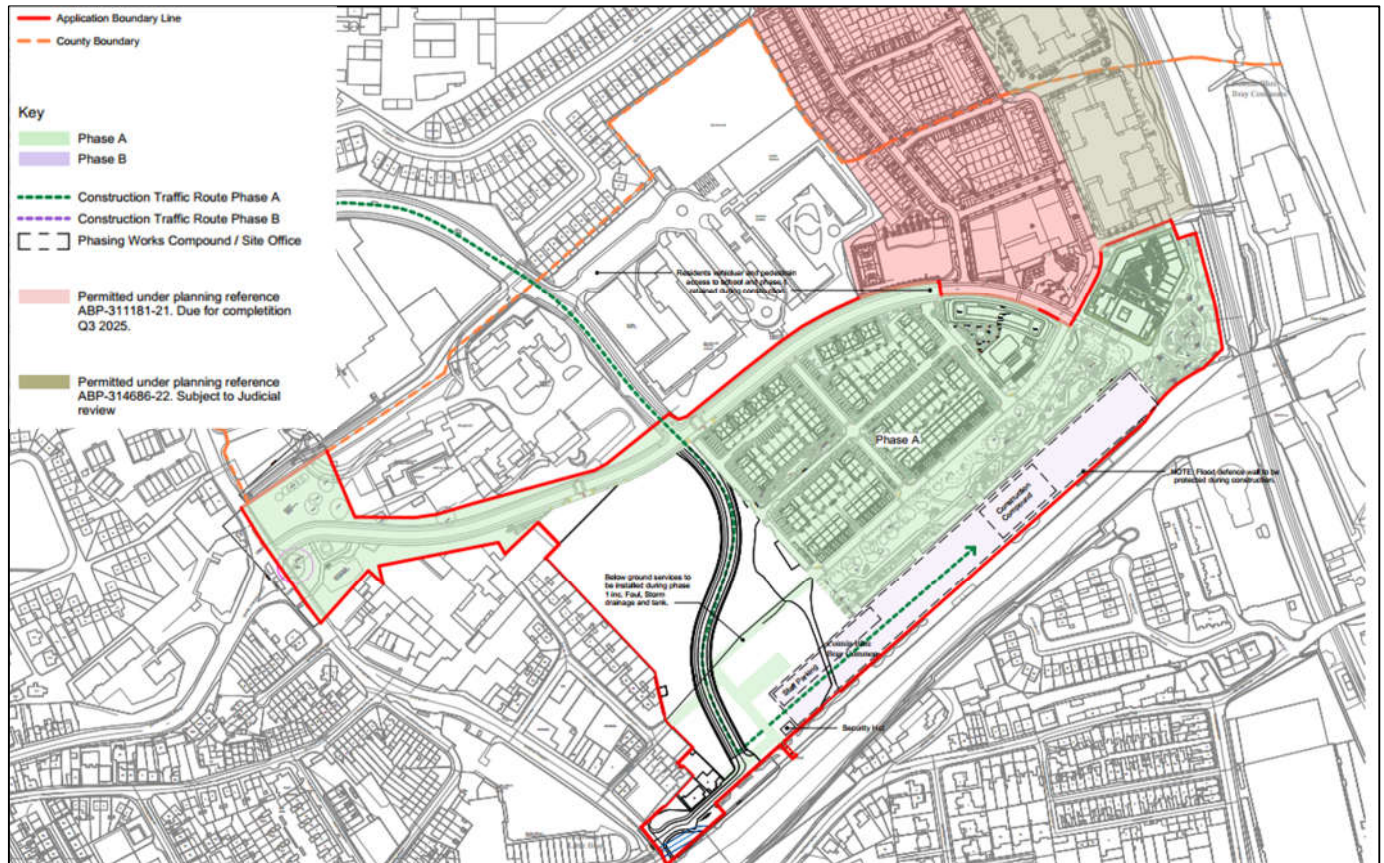


Figure 2-7 - Preliminary Construction Phasing - Phase A of the proposed development

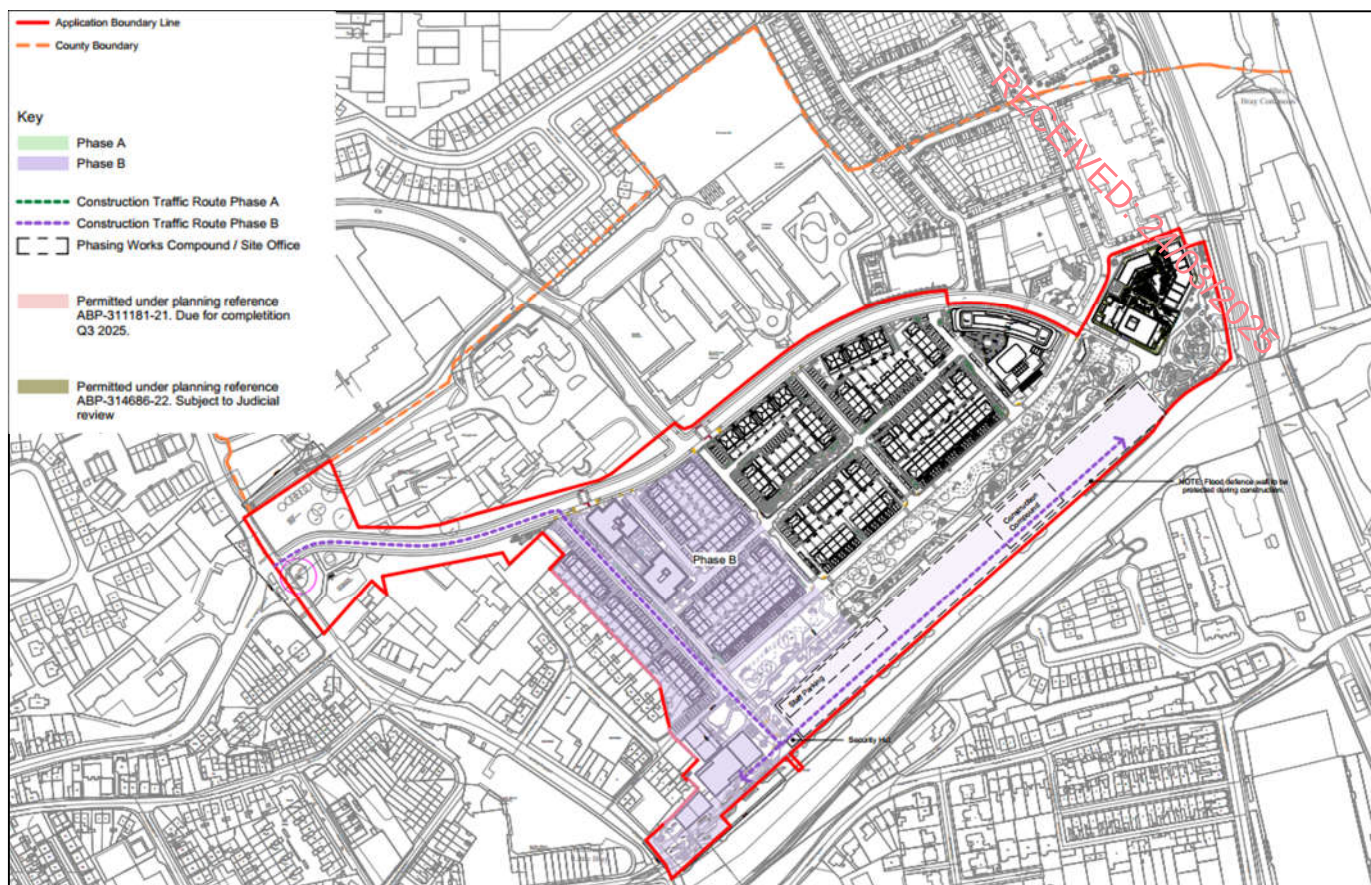


Figure 2-8 - Preliminary Construction Phasing - Phase B of the proposed development

2.3 Construction Aspects

Construction works will take place between 7am and 7pm Mondays to Fridays inclusive, and between 7am and 2pm on Saturdays, with no works taking place on Sundays or Public Holidays (unless agreed via. written approval from the planning authority in exceptional circumstances).

The general phasing of the construction stage will be as follows:-

- **Site Mobilisation:** Secure Site, establish Site access and Site compound (including parking, welfare facilities and canteen, Site offices, storage areas and temporary utilities / services), establish internal traffic routes and haul routes, establish all necessary environmental protection measures (tree, water course, well protection etc.), mobilise machinery, equipment and materials;
- **Site Clearance:** Remove existing topsoil and stockpile for reuse onsite or offsite removal (as required), survey and mark out various elements of the construction works as required;
- **Demolition:** Demolish existing house and remove existing hardstanding onsite and remove waste offsite.
- **Ground Improvements Works:** For the houses and apartments, install vertical drains into the ground below the proposed houses and rear gardens. Place reusable surcharge fill over the footprint of the proposed building structures. Monitor ground settlement through a series of survey points. Once settlement has stabilised, remove surcharge fill, and construct foundations.
- **For the roads,** install vertical drains into the ground below the proposed roads. Controlled Modulus Columns and Vibrostone Column to be installed to satisfy road and services design. Services to be installed within the vibrostone column area and then build up road to design levels.
- **Utilities diversions:** Existing rising main and gravity return drains that serve the storm holding tank will be diverted ca.30m southwards to avoid proposed structures;

- Develop Site Infrastructure: Install attenuation areas and drainage network, roads and services and key ancillary services;
- Construction: Construct the proposed development on a phased basis, as per the preliminary phasing plan presented in Figures 2-7 and 2-8. Phase A and Phase B will be delivered over a maximum period of ca. 48 months;
- Landscaping: Landscape each of the residential properties and establish public open space lands; and,
- Site Demobilisation: Removal of all machinery, equipment, materials and residual waste from Site, decommissioning of all temporary utilities/ services, removal of all temporary units from the Site compound, removal of Site fencing and signage, and final reinstatement.

Typical machinery used onsite during the construction phase will include mechanical excavators, dumper trucks, bull dozers, piling rigs³, concrete delivery trucks, mobile cranes, and mobile elevating work platforms (MEWP).

2.3.1 Site Compound/ Site Office

As depicted in Figures 2-7 and 2-8 above, the Site compound for each of the 2no. phases, and the Site office will be located in various strategic locations across the Site.

2.3.2 Traffic Management

The proposed transport routes of all machinery entering and egressing the Site, for the full duration of the ca. 48 month phased construction period shall be through the proposed entrance off the existing access route west of the main Site. All construction activities will be managed and informed by a Construction Traffic Management Plan (CTMP) which will be implemented by the Contractor. The details of the CTMP will be agreed with the roads department of the Local Authority in advance of construction activities commencing on-Site.

2.3.3 Environmental Management

The construction of the proposed development will be in accordance with the Construction Environmental Management Plan (CEMP) submitted as part of this planning application (which takes account of the Schedule of Environmental Commitments presented within this EIAR). This document will be further developed and added to within the project specific Detailed CEMP which will be prepared by the Contractor in advance of the construction phase and will be fully implemented onsite for the duration of the construction phase of the project. Environmental monitoring will be carried out during the construction phase as detailed in Chapter 18 - Schedule of Environmental Commitments.

2.3.4 Waste Management

The construction of the proposed development will be in accordance with the Construction Resource and Waste Management Plan (RWMP) (AtkinsRéalis, 2025) submitted as part of this planning application prepared in accordance with the relevant following guidance '*Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects*' (EPA, 2022). The Construction RWMP provides a mechanism for monitoring and auditing waste management performance and compliance for the duration of the project. The document also provides a detailed overview of key waste management considerations for the project at this preliminary stage, while also allowing for further enhancement as the project progresses through to the detailed design and construction stages. This document will be further developed and added to within the project specific Detailed Resource and Waste Management Plan which will be prepared by the Contractor in advance of the construction phase and will be fully implemented onsite for the duration of the construction phase of the project.

³ Based on the results of the geotechnical investigation it is likely that piling will be required.

2.4 Operational Aspects

2.4.1 Landscaping

A large number of existing (former golf course) trees will be removed from the Site to facilitate its redevelopment. This removal of woody vegetation from the lands, along with the reduction in permeable grassland area, would have biodiversity effects, specifically a reduction in habitat.

In compensation, it is proposed to retain existing trees where possible (specifically in the Central Park) – while allowing for the lands' use in accordance with the site's Strategic Site designation – and to supplement the retained trees with additional planting of trees, shrubs and ground covers to create a densely vegetated park. The species have been selected by the project landscape architect in consultation with the ecologist, for maximum habitat/biodiversity value.

2.4.2 Volume and Profile of Usage

This development will be used on an all-year round basis with the main users being the residents of the residential units, followed by the users and staff of the proposed hotel, crèche, medical centre, retail units and mixed use commercial units, communal open space and playground and pedestrians and cyclists who may utilise the proposed pedestrian / cyclist paths on a regular basis.

2.4.3 Waste Management

The operation of the proposed development will be in accordance with the Operational Waste Management Plan (WMP) (AtkinsRéalis, 2025) submitted as part of this planning application.

2.4.4 Surface Water Management System

Surface water generated from the proposed residential development will be conveyed through a proposed surface water network including SuDS. The surface water from a portion of the proposed development in the northeast, adjacent to Phase 1 of the development (permitted and currently under construction) will be connected to the surface water drainage network of Phase 1 and the remaining surface water will be attenuated on site prior to final discharge at Qbar greenfield run-off rates. The restricted discharge from the proposed site will be conveyed via a new surface water sewer within the site before discharge to the receiving River Dargle via a pump.

The proposed storm drainage network for the development is as indicated on the planning drawings BRA-ATK-ZZ-02-DR-C-52201 & BRA-ATK-ZZ-02-DR-C-52202. The proposed measures included within the design are as follows:

- Swales within Open Space / Park areas adjacent to roads
- Permeable paving in light traffic areas (parking bays)
- Green roofs to suitable apartment blocks
- Green courtyards to suitable apartment blocks
- Green corridors / park areas
- Sealed underground concrete attenuation tank
- Filter drains in rear gardens
- Tree pits

2.4.5 Foul Effluent

The proposed development will be catered by a proposed 225mm diameter foul sewer with a single outfall to the existing foul line at the Dargle Stream which finally discharges to the Uisce Éireann Pumping Station. A portion of the

proposed development will use the existing 225mm foul line north of the development and rest of the development will use the proposed foul network to discharge into the existing foul line near the River Dargle.

Foul water from the proposed development will connect to the local foul water network as detailed above, with final treatment to be at Shanganagh Waste Water Treatment Plant (WwTP). The Shanganagh WwTP has recently been subject to an upgrade and as such has the capacity to accept the additional foul water the proposed housing development would generate. Uisce Éireann has confirmed that the plant has capacity to adequately process the additional input from the operational demand presented by the proposed Sea Gardens Phase 2 development; refer to the Engineering Planning Report (document reference; 0088726DG0005) submitted with this application for Confirmation of Feasibility (COF) letter issued by Uisce Éireann on the 31/01/2025.

Each property will have a separate wastewater connection in accordance with Uisce Éireann requirements. The proposed foul drainage layouts are indicated on drawings BRA-ATK-ZZ-02-DR-C-52205 & BRA-ATK-ZZ-02- DR-C-52206.

2.4.6 Potable Water

Potable water supply for the site has been designed in accordance with the Irish Water (Uisce Éireann) Code of Practice for Water Infrastructure 'IW-CDS-5020-03' and Standard Construction Details 'IW-CDS-5020-01'. The proposed water supply layout is indicated on drawing BRA-ATK-ZZ-02-DR-C-53201/53203. The drawing displays the proposed water supply for the Sea Gardens Phase 2 development (to which this application applies) supplied off the recently constructed watermain within the permitted Phase 1 development. The entire existing Phase 1 water supply network has been designed and constructed to include a capacity allowance for the entire proposed Sea Gardens Phase 2 development. Each property will have its own separate supply off the proposed watermain along with a boundary box in accordance with Uisce Éireann standard construction details. For the proposed apartment blocks and commercial building, a manifold chamber will be used in accordance with IW- CDS-5020-03 section 3.14. In line Fire Hydrants will be located on the watermains in accordance with Uisce Éireann standard construction details and "2006 Building Regulations" (Part B Fire Safety), the system has been designed so that no Fire Hydrant is greater than 46m from any building. Requirements for internal dry risers or sprinkler systems will be carried out by the Fire Engineer and Mechanical engineer as set out in the Fire Cert Application.

Uisce Éireann has confirmed that water connection is feasible without infrastructure upgrade by Uisce Éireann and that an additional connection point will need to be looked at during application stage. Refer to the Engineering Planning Report (document reference; 0088726DG0005) submitted with this application for Confirmation of Feasibility (COF) letter issued by Uisce Éireann on the 31/01/2025.

2.5 Description of the Current Setting / Baseline Scenario

The former Bray Golf Club Lands offer strategically located development opportunities within the Greater Dublin Area circa 20km south of Dublin City Centre and with excellent transport connections. Bray is an established urban area with a significant population (of ca. 34,803) and catchment which is earmarked for further growth.

The Site is located immediately North of Bray Town Centre. Road access to the nearby M11 is via Dublin Road at the Bray North Motorway exit. The lands have previously been isolated from the harbour area and the Dart Station. A route through the town centre was the only link until the development of the Ravenswell schools campus opened up the area and facilitated access to the road underpass. The Dart station is only a few minutes' walk from the Site and bus routes to Dublin are available on the adjoining Dublin Road. The proposal has been developed to facilitate a future Luas / Public Transport corridor through the Site.

The Site is located north of the River Dargle and south of Ravenswell Primary School. The variety of views in and around the lands emphasise the unique quality of the Site and its setting. Regionally the town of Bray is almost

surrounded by hills and mountains that are in the middle distance to the south and stretch into the horizon to the west. The topography on the Site combined with the views and vistas of the surrounding landscape, the sea and Bray Town will provide a rich variety of visual experience at ground level as well as the residents in apartments at higher levels. The topography across the Site provides a variety of interesting views including Killiney and as far south as Bray Head.

The construction works for Phase 1A as permitted under ABP-311181-21 are underway while the works for Phase 1B as permitted under ABP Ref. ABP-314686-22 have not commenced. For the purposes of this EIAR the baseline scenario considered relates to the Site condition and receiving environment at the time of the preparation of this report.

The baseline scenario including a description of the relevant aspects of the current receiving environment has been considered as part of this EIAR through the collection and collation of baseline data including analytical data where relevant (traffic, air quality, noise levels, soil quality, and surface water and groundwater quality). A detailed description of the current receiving environment is presented in relevant sections for each environmental topic. The predicted changing baseline (i.e. the likely future receiving environment) that could arise as a result of committed development within the vicinity has also been addressed, where relevant, and is presented under the cumulative impacts section for each environmental topic assessed within this EIAR (Chapter 16 –Cumulative Impacts and Chapter 17 - Interactions)

2.6 Consultation

As part of the EIAR assessment process, consultation was undertaken with statutory organisations at various stages of the pre-planning process for both the original application, and the current application. All environmental consultees (except where noted) were consulted by letter or email in December 2023 and May 2024 (during the Environmental Scoping phase of EIAR) regarding any environmental or planning interests that they may have in relation to the Sea Gardens Phase 2 development. A full list of consultees consulted (2023-2024) including date and method of correspondence is presented in Appendix 2.1.

In addition, as part of the consultation process individual meetings were arranged with Wicklow County Council to effectively discuss the key potential issues of the project in accordance with Section 247 of the Planning and Development Act) as summarised in Section 2.7 below.

A summary of all relevant feedback in relation to the proposed development is presented below. A copy of all pre-application consultation correspondence received from statutory organisations as part of the EIAR process is presented in Appendix 2.2.

All relevant comments from the various consultees have been fully addressed as required within this EIAR and the accompanying Natura Impact Statement.

2.6.1 Wicklow County Council

In email correspondence dated 5th June 2024, a representative of Wicklow County Council responded to the circulation of the Scoping Report and requested a copy of the proposed site layout drawing which was provided for review. No further queries were received.

2.6.2 Department of Housing, Local Government and Heritage

In letter correspondence dated 30th January 2024, the Department noted the following:

Archaeology

'The proposed greenfield development site is located in a coastal location and north of the River Dargle in an area with potential for archaeological remains to survive. The discovery of a number of Romano-British burials in the area now occupied by Esplanade Terrace in the shoreline area of Bray town (RMP WI004-004 burial) demonstrates the potential for similar archaeological features to survive in the area. The development site is located south of Recorded Monuments DU026-068 church & graveyard (Cork Abbey) and DU026-069 holy well. Recorded Monuments WI004-001001 cross-slab, WI004-001006 castle – towerhouse, WI004-002 martello tower and DU026-070 martello tower are also located in the environs of the proposed development. It is recommended that the developer engage an archaeologist to carry out a detailed and field-based archaeological impact assessment and to prepare a comprehensive report to be included in the EIAR and submitted with any future planning application. The assessment will involve documentary and cartographic research, an analysis of all previous archaeological assessments carried out in the area and fieldwork including geophysical survey and archaeological testing within the proposed development site (licensed under the National Monuments Acts 1930-1994).'

'Following completion of the geophysical survey and archaeological testing, the archaeologist shall prepare a written report, including an archaeological impact statement, to form an integral part of any EIAR and future planning application. Where archaeological material/features are shown to be present, preservation in situ, preservation by record (archaeological excavation) or monitoring may be required. The establishment of a 'buffer area' surrounding and including any identified archaeological features, in which no development or groundworks would be considered, might be recommended pending the results of the archaeological assessment. Mitigatory measures to ensure the preservation in-situ and/or recording of archaeological material/features should be suggested in the archaeological assessment report and the Department of Housing, Local Government & Heritage will advise further with regard to any further archaeological requirements following receipt of the assessment.'

Framework and Principles for the Protection of the Archaeological Heritage

'The developer should have regard to the archaeological policy of the Department of Housing, Local Government & Heritage as outlined in the policy document entitled "Framework and Principles for the Protection of the Archaeological Heritage", (1999) and summarised below. With regard to the preservation in-situ of archaeological remains, it is stated in the Department's policy document that "there should always be a presumption in favour of avoiding developmental impacts on the archaeological heritage. Preservation in-situ must always be the preferred option to be considered rather than preservation by record in order to allow development to proceed, and preservation in-situ must also be presumed to be the preferred option." It should also be noted that "if preservation by record is to be applied the developer must accept responsibility for the costs of archaeological excavation to the extent necessitated by the development. Such costs include those arising from the preparation of a report on the excavation.'

Wicklow County Development Plan 2022-2028

'The developer should be aware of the archaeological objectives in the current County Wicklow Development Plan, including the following: CPO 8.1 - To secure the preservation of all archaeological monuments included in the Record of Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act, 1994, and of sites, features and objects of archaeological interest generally. In the development management process, there will be a presumption of 3 favour of preservation in-situ or, as a minimum, preservation by record. In securing such preservation, the Planning Authority will have regard to the advice and recommendations of the National Monuments Service of the Department of Housing, Local Government and Heritage. CPO 8.3 - Any development that may, due to its size, location or nature, have implications for archaeological heritage (including both sites and areas of archaeological potential / significance as identified in Schedules 08.01 & 08.02 and Maps 8.01 & 8.02 of this plan) shall be subject to an archaeological assessment.'

Nature Conservation

'The Department is not in a position to make specific comment on this particular referral at this time. No inference should be drawn from this that the Department is satisfied or otherwise with the proposed activity. The Department may submit observations/recommendations at a later stage in the process. The above observations and

recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority, in his role as statutory consultee under the Planning and Development Act 2000, as amended.'

The above comments from the Department of Housing, Local Government and Heritage have been addressed where relevant to the Site within Chapter 14 – Cultural Heritage.

2.6.3 Transport Infrastructure Ireland

In an email correspondence received on 31st May 2024, Transport Infrastructure Ireland (TII) made the following comments / recommendations:

'With respect to EIAR scoping issues, the recommendations indicated below provide only general guidance for the preparation of an EIAR, which may affect the national road networks.

The project promoter should have regard, inter alia, to the following:

Having regard to the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports, 2022 it is recommended as appropriate that the national road and light rail networks be recognised as strategic transport assets under "material assets". EIAR assessment and mitigation should have regard to the following:

- **National Roads:** *Official policy for development at or near national roads is set out in the DoECLG Spatial Planning and National Roads Guidelines for Planning Authorities (2012) available at <https://www.gov.ie/en/collection/85b83-planning-guidelines-standards/>*
- **TII Publications:** *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/>.*

In addition, the EIAR should have regard to, inter alia, the following:

National Road Network:

- *TII would be specifically concerned with the potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development,*
- *Consultations should be had with the relevant Local Authority/National Roads Design Office (RDO) with regard to locations of existing and future national road schemes,*
- *The EIAR should have regard to any prior 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 in particular have regard to any potential cumulative impacts,*
- *The EIAR should have regard to the provisions of Chapter 3 of the DoECLG Spatial Planning and National Roads Guidelines in the assessment.*

TII Publications:

- *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 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. The Authority'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 and assessors are asked to consult TII Publications to determine whether a Road Safety Audit is required.

TII environmental assessment guidance:

- The EIAR should have regard to TII's Environmental Assessment and Construction Guidelines, including the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014)
- The EIAR should consider the European Communities (Environmental Noise) Regulations 2018 (S.I. No. 549 of 2018)) 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))

Haul routes utilising the national road network:

- Elements of the national road network are operated and managed by a combination of Public Private Partnerships (PPP) Concessions, Motorway Maintenance and Renewal Contractor (MMaRC) and local road authorities in association with TII. In relation to haul route identification, the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed to ascertain any operational requirements, including delivery timetabling, etc. to ensure that the strategic function of the national road network is safeguarded.
- Separate structure approvals/permits, and other licences and works-specific deeds of indemnity 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. Additionally, any damage caused to the pavement on the existing national road arising from any temporary works due to the turning movement of abnormal loads (e.g. tearing of the surface course, etc.) shall be rectified in accordance with TII Pavement Standards and details in this regard shall be agreed with the Road Authority prior to the commencement of any development on site.

Notwithstanding, any of the above, the developer should be aware that this list is non-exhaustive, thus site and development-specific issues should be addressed in accordance with best practice.'

The above comments from Transport Infrastructure Ireland have been addressed where relevant to the Site within Chapter 12 – Traffic.

2.6.4 Department of Transport

In letter correspondence dated 25th June 2024, the Department noted the following:

'There have been important policy developments which are relevant to accessible, integrated and sustainable public transport. The Department of Transport (DoT) considers these should be reflected in the proposed plan.

Accessible public transport for All, and especially for Persons with Disabilities, Reduced mobility and Older People

- the "whole of Government" National Disability Inclusion Strategy (NDIS) 2017-2022 includes specific actions assigned to local authorities. For example, action 108 relates to the 'dishing' of footpaths and action 109 relates to accessible infrastructure, including bus stops. Lack of dishing is often cited as a major concern for wheelchair users. The National Disability Inclusion Strategy came to an end at the end of 2022. The Department of Children,

Equality, Disability, Integration and Youth are working with the Disability Inclusion Strategy Steering Group to commence work on the development of a UNCRPD implementation strategy.

- *the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), ratified by Ireland in 2018. The UNCRPD puts obligations on State Parties to ensure access for persons with disabilities to, for example, the physical environment and transportation in both urban and rural areas.*
- *the Design Manual for Urban Roads and Streets (DMURS) Interim Advice Note – Covid-19 Pandemic Response published in 2020. It includes guidance that designers should ensure that*
 - *measures align with the principles of universal design,*
 - *consider Government policy on accessibility for people with disabilities and*
 - *consult people with disabilities to further appraise measures.*
- *References in the draft Plan to the 2019 version of DMURS should be replaced with references to the 2020 DMURS Interim Advice Note – Covid-19 Pandemic Response.*
- *To make public transport fully accessible to people with disabilities requires a ‘whole journey approach’. This refers to all elements that constitute a journey from the starting point to destination. Developers are a key stakeholder by ensuring a universal design approach to the built environment’. This including footpaths, tactile paving, dished footpaths, roads and pedestrian crossing points.*

The Department of Transport recommends that the applicant/developer should ensure that all proposed haul routes to be traversed are suitable to accommodate construction traffic and the transport of materials without damaging the condition of the road.

The applicant/developer should also ensure that the proposed works will not adversely damage the integrity of any existing bridge structure hydraulically or by traffic loading.

Separate structure approvals/permits, and other licences should be obtained where required in connection with all proposed haul routes.

The applicant/developer should ensure appropriate traffic calming measures suitable to the surrounding environment and education facilities to ensure safe transport in accordance with national policy.

The applicant/developer should ensure appropriate provision of active travel measures associated with the development and surrounding area.

The applicant/developer should ensure appropriate cross section of the adjacent existing roads and proposed roads facilitating the development to ensure safe transport of all required multi modal aspects of the development’.

The above comments from Transport Infrastructure Ireland have been addressed where relevant to the Site within Chapter 12 – Traffic.

2.6.5 Fisheries Ireland

Fisheries Ireland recommended via email correspondence on the 13th June 2024, that the following be addressed:

- *‘An Outline Construction Surface Water Management Plan. The plan will set out clear guidelines and mitigation measures to ensure that surface water quality and quantity is managed throughout the construction stage to prevent impacts on the River Dargle. This should include details on project phasing. A meeting with IFI, the Project Team and the Contractor should be specified in the document. The meeting should take place before commencement on site.*
- *A SuDS Preliminary Maintenance and Management Plan for the adopted SuDS measure. The plan should include the maintenance of the proposed fuel/oil separator and agreed SuDS measures.*

- *Indicate the proposed outfall for the development.'*

The required plans will be prepared by the appointed Contractor and the requirements are specified within the CEMP (Document Reference: 0089313DG0029) which included in the planning application.

The proposed outfall for the development is indicated in the proposed stormwater layout plan Drawing No.: BRA-ATK-02-ZZ-DR-C-52202, included in the planning application.

The above comments from IFI have been addressed where relevant to the Site within Chapter 7 – Water

2.6.6 Geological Survey Ireland (GSI)

In letter correspondence dated 18th June 2024, the GSI noted that the Site is located within vicinity of a Geological Heritage Site; Killiney Bay and noted various other geological features which should be considered during the EIA process as follows:

- **Geoheritage** *'Our records show that there is a CGS in the vicinity of the proposed development. 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. With the current plan, there are no envisaged impacts on the integrity of current CGSs by the proposed development...'*
- **Groundwater** *'The Groundwater Data Viewer indicates an aquifer classed as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' underlies the proposed development. The Groundwater Vulnerability map indicates the area covered is classed as 'Low' to 'Moderate' Vulnerability.'*
- **Geohazards** *'Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.'*
- **Natural Resources (Minerals/Aggregates)** *'We would recommend use of the Aggregate Potential Mapping viewer to identify areas of High to Very High source aggregate potential within the area. In keeping with a sustainable approach we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the proposed development are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered.'*
- **Geochemistry of soils, surface waters and sediments** *'Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Baseline geochemistry data can be used to assess the chemical status of soil and water at a regional scale and to support the assessment of existing or potential impacts of human activity on environmental chemical quality. Tellus is a national-scale mapping programme which provides multi-element data for shallow soil, stream sediment and stream water in Ireland. At present, mapping consists of the border, western and midland regions. Data is available..'*
- **Marine and Coastal Unit** *'marine environment is hugely important to our bio-economy, transport, tourism and recreational sectors. It is also an important indicator of the health of our planet. Geological Survey Ireland's Marine and Coastal Unit in partnership with the Marine Institute, jointly manages INFOMAR, Ireland's national marine mapping programme; providing key baseline data for Ireland's marine sector. The programme delivers a wide range of benefits to multi-sectoral end-users across the national blue economy with an emphasis on enabling our stakeholders. Demonstrated applications for the use of INFOMAR's suite of mapping products include Shipping & Navigation, Fisheries Management, Aquaculture, Off-shore Renewable Energies, Marine Leisure & Tourism and Coastal Behaviour.'*
- **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 sealevel 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 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.'

- **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.'

The above comments from GSI have been addressed where relevant to the Site within Chapter 6 – Land, Soils and Geology and Chapter 7 - Water.

2.6.7 Uisce Éireann

In letter correspondence dated 18th July 2024 Uisce Éireann detailed the following:

'Uisce Éireann strongly recommend the following items are addressed in the Environmental Impact Assessment Report and planning application, as appropriate for your proposal to avoid any unnecessary delays within the consenting process:

Existing Uisce Éireann Assets

There are number of Uisce Éireann watermains and sewer and stormwater pipes located within and around the periphery of the subject site within the road reserves. The development appears to include proposals to build over or traverse these public assets in some locations specifically in the southwestern and northern eastern portions of the site. 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 and lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed. Further details on existing public water and wastewater infrastructure, can be obtained by emailing an Ordnance Survey map clearly identifying the proposed location and layout of your intended development...

Building structures or works over, or near Uisce Éireann infrastructure is prohibited. Any impact of this nature inhibiting access for maintenance or endangering structural or functional integrity of public infrastructure is not permitted. Where building near Uisce Éireann assets, your designs and layouts are required to be agreed with the Uisce Éireann Diversions section prior to a planning application being lodged. Detailed designs and layouts should be submitted to diversions@water.ie well in advance of submitting your planning application to avoid unnecessary delays within the consenting process. Please also note, as an applicant you may be 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. You will also be required to provide evidence of separation distances between the existing Uisce Éireann assets and proposed structures, other services, trees, etc. are in accordance with the Irish Water Codes of Practices and Separation distances. Separation distances of proposed structures shall be in accordance with the Uisce Éireann Codes of Practice and Standard Details. In addition to protection and maintenance of in situ public assets, there are two large public wastewater assets in the wider vicinity of this development. Applicants should be aware that the operation & maintenance of these assets can result in the emission of odours during activities like desludging, cleaning and mechanical testing.

The storm water holding tank known as the Old Golf Course wastewater pump station (WwPS) adjoins the development site to the north which is owned and operated under contract by Uisce Éireann. It is a requirement of UE that 24/7 access is maintained to the stormwater tank as the continued operation of this tank is required to meet storm water overflow compliance standards.

The main Bray wastewater pumping station is directly south across the river. Where all efforts will be made by operators to minimise odour nuisance there is still the potential for nearby developments to experience odour. This should be considered as part of the development.

Planned Future Uisce Éireann Assets

As part of the strategic future planning of the Bray area Uisce Éireann have completed a Drainage Area Study. Although only at concept stage, upgrades at the Bray Pumping Station and improvements to the network will be required to facilitate development in the area. Upgrades of the existing 900mm sewer along Ravenswell Road and the existing sewer within the southwestern portion of the site are planned. Access to the sewer will be required by Uisce Éireann for these upgrades and this must be considered as part of your planning application

Connections to Service Development Proposals

...the following, non-exhaustive aspects of water services should also be considered in the scope of your EIA where relevant;

- a) Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.
- b) Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.
- c) Any and all potential impacts on the nearby public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.
- d) 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.
- e) The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.
- f) 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.
- g) 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.
- h) Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.
- i) 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.
- j) 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.

k) 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.

l) 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.

m) 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.

n) 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. have to be in accordance with the Irish Water Codes of Practice and Standard Details.

o) 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 p) Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water)...Uisce Éireann will not accept new surface water discharges to combined sewer networks.'

These comments have been addressed where relevant within the design proposals and the EIAR.

2.6.8 Other Stakeholders

The following stakeholders confirmed receipt of confirmation with no additional responses received. It was therefore assumed that there were no relevant comments or observations in relation to the Sea Gardens Phase 2 development:

'St John of God Hospitaller Services– confirmation of receipt received via. email and letter dated 24th June 2024. SJOG HSG are the owners of Ravenswell, Bray, Co. Wicklow and requested that all future correspondence and further developments of the planning process (including notice of application being lodged with WCC) should be addressed to their office.'

2.7 Meetings

As part of the consultation process individual meetings were arranged with a number of key stakeholders to effectively discuss the key issues of the proposed development in accordance with under Section 247 of the Planning and Development Act, initial consultation with Wicklow County Council (WCC) took place on the 31st January 2024 followed by an informal meeting on the 11th June 2024. Following the above consultations, the applicant submitted a document titled 'Response to Consultations' (RPS) to WCC on 5th July 2024 which addressed the feedback received from WCC during the consultations conducted to date. Additionally, feedback was received from WCC during telephone conversations relating to a submission made on 5th July 2024.

In August 2024, Fergal Keogh provided verbal feedback on the contents of the submission directly to the Client. WCC confirmed that the Phase 2 Sea Gardens application will be submitted via the standard section 34 application route should the proposed quantum of residential and commercial development not meet the criteria for an LRD application.

A Pre-application meeting was held on 16th September 2024 with the Roads & Transport Department of WCC via teams regarding the proposed scheme, traffic, transport and mobility. The meeting minutes can be found in Appendix

F of the TTA (AtkinsRéalis, 2025 Document Reference: 0088726DG0010) as included in the planning application. The proposed road hierarchy and cycle infrastructure were discussed and WCC agreed to the proposals made. AtkinsRéalis had set the proposed parking rationale for the site to WCC and they were happy with the rationale but needed some further clarity from Roads and Planning Department and had enquired about the provision of club/shared parking into the scheme. There was a general discussion on transport infrastructure in the area and the Bray and Environs Transports Study (2019) (BETS) requirements for the delivery of the site, the BETS study sets out the preferred approaches for the delivery of land use and transport objectives over the long term in the Bray area. This included BusConnects, Fran O'Toole Bridge, and increased DART services (DART +), all of which is covered within the TTA report (Document Reference: 0088726DG0010) included in the planning application.

All relevant recommendations have been addressed within this EIAR and the accompanying Natura Impact Statement.

2.8 Consideration of Cumulative Effects with other Projects

Potential cumulative impacts, defined as *'the addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects'* (EPA, 2022) have been considered for each environmental topic within this EIAR. A summary of all committed / proposed developments in the immediate environs of the proposed development, which have been approved by Wicklow County Council or ABP within the last 7 years, have been reviewed as part of the preparation of this EIAR. The majority of these developments have already been constructed or are of small scale in nature (i.e. extension works, or property retention works) or are considered to be a reasonable distance from the Site and so do not warrant further consideration as part of this assessment.

Relevant committed developments are summarised below under three broad categories; residential development, development within adjacent business parks, and community and utility development. In addition relevant projects are also considered i.e. Sea Gardens Masterplan Development, Bray Sustainable Transport Bridge and any other projects which could potentially have a cumulative impact.

Each environmental topic, where relevant, includes a cumulative impact assessment of the proposed development with other committed developments in the immediate area. Therefore, each of the following developments, which are not part of the existing environment, has been reviewed in terms of potential cumulative environmental impacts that may arise with the proposed construction and operation of this development. The results of the cumulative impact assessment for each environmental topic are presented in Chapter 16 – Cumulative Impacts. In addition, specific plans and projects have been considered where relevant during the preliminary design stage and the preparation of this EIAR, within individual environmental topics, as detailed further within the specific EIAR Chapters.

2.8.1 Sea Gardens Masterplan Development

Sea Gardens Masterplan (previously referred to as the Harbour Point Masterplan Development) consists of 3 Phases. The Masterplan aims to establish three distinct areas within Sea Gardens: the Coastal Quarter (Phase 1A: ABP-311181-21 and Phase 1B: ABP-314686-22), Sea Gardens Phase 2, and Sea Gardens Phase 3. This document specifically addresses the design principles for Sea Gardens Phase 2. It is important to note that Phase 1A is nearing completion, and planning permission for Phase 1B has recently been granted.

According to the Architectural Design Statement (Howells, 2025); *'The proposed development has been designed with careful consideration of the development and design guidance and standards set in the Wicklow County Development Plan 2022-2028. Although the Bray Municipal District Local Area Plan (LAP) 2018–2024 has expired, specific attention has been given to its objective SLO 3.'*

The overall Sea Gardens Masterplan Development comprises phased residential, retail and commercial development at a key development site within Bray town, via. the following 4no. core Phases (presented in no particular order):

- Coastal Quarter Phase 1A - ABP-311181-21, this phase was granted and included housing and Block C.
- Coastal Quarter Phase 1B - ABP-314686-22, this phase was granted and includes Block A and B.
- Sea Gardens Phase 2 – the subject of this particular planning application. A detailed description is provided in Section 2.1.
- Sea Gardens Phase 3 – Phase 3 marks the final stage of the Sea Gardens Masterplan, bringing together the remaining elements of both commercial and residential development as outlined in the Local Area Plan.

Refer to Figure 2-9 and Figure 2-10 for the Masterplan design layouts.



Figure 2-9 - Masterplan Development Layout- all Phases



Figure 2-10 - Masterplan Development - Sea Gardens Phase 2

2.8.2 Bray Sustainable Transport Bridge

Part 8 - Process for the Bray Sustainable Transport Bridge Project - The proposed bridge and link road will consist of a two lane public transport road 3.25m wide and variable width pedestrian, cyclist and shared path facilities. A new pedestrian boardwalk is proposed along the southern bank wall to link the existing walkway to the bridge crossing.

2.8.3 Residential Developments

Proposed residential developments within the vicinity of the Site generally comprise the construction of various types of residential developments or amendments to previously granted permission; the scope for each relevant committed development is briefly summarised below.

- **Aeval Ltd ABP – 30584419** - A planning permission for a strategic housing development on a site of 21.9 hectares generally bounded by the Old Dublin Road (R119) and St. James (Crinken) Church to the west, Shanganagh Public Park and Shanganagh Cemetery to the north, Woodbrook Golf Course to the east and Corke Lodge and woodlands and Woodbrook Golf Clubhouse and car park to the south. The proposed development is within the townlands of Cork Little and Shanganagh, Shankill, County Dublin.
- **Shankill Property Investments Limited, Seapoint Road, Ravenswell, Bray, Co. Wicklow, 22188** – demolition of 4 light industrial/commercial buildings including their extensions, change of use from light industrial/commercial to residential use, and the construction of a total of 54 no. apartment units across 2 no. blocks.
- **Silverbow Ltd, ABP – 313442** - Demolition of existing buildings, construction of 139 no. apartments, creche and associated site works
- **Dún Laoghaire Rathdown County Council, ABP – 306583** – a residential development with ancillary commercial uses (retail unit, café and crèche) partially comprising a "Build to Rent" scheme on circa 9.69 hectares.
- **Castlethorn Management Services UC, Dún Laoghaire Rathdown CC Ref: LRD24A/0482/WEB** - Castlethorn Management Services UC Intends to apply for a Permission for a Large-Scale Residential Development

comprising amendments to the permitted Strategic Housing Development (An Bord Pleanála Ref. ABP-305844-19 –Woodbrook Phase 1.

- **Aeval Unlimited Company , Dún Laoghaire Rathdown CC Ref:LRD24A/0382/WEB** - The proposed development is referred to as Woodbrook Phase 2 and consists of 479no. dwellings in a mixture of terraced and semi-detached houses, duplexes and apartments and a Neighbourhood Centre, ranging in height from 1 – 7 storeys

2.8.4 Community and Utility Developments

Proposed relevant committed development in the vicinity of the proposed development is briefly summarised as follows:

- **National Transport Authority, ABP – 317742** - BusConnects Bray to City Centre Core Bus Corridor Scheme
- **Uisce Éireann, Dún Laoghaire Rathdown CC Ref:D18A/0606** - Permission is sought for provision of water supply infrastructure. The development will consist of: 'A 10 year permission to facilitate construction in two phases'. In addition, as part of the strategic future planning of the Bray area Uisce Éireann have a completed a Drainage Area Study. Although only at concept stage, upgrades at the Bray Pumping Station and improvements to the network will be required to facilitate development in the area. Upgrades of the existing 900mm sewer along Ravenswell Road and the existing sewer within the southwestern portion of the site are planned. Access to the sewer will be required by Uisce Éireann for these upgrades and this must be considered as part of your planning application.

3. Alternatives

3.1 Introduction

This Chapter outlines the alternatives considered during the planning and design stages of this project. The requirement to consider alternatives within an EIAR is set out in Annex IV (2) of the EIA Directive (2014/52/EU) which states:

“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.”

3.2 Need for the Proposed Development

As discussed in Chapter 1, a variety of residential property types will be delivered which will provide for families of all ages and needs should permission for the proposed development be granted.

Bray is in a suitable location for families who want to live in a coastal setting within commuting distance of Dublin City and surrounding areas. Furthermore, the project addresses a number of objectives for residential housing set under the National Planning Framework, the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region and the Wicklow CDP.

Hence the proposed development is needed. However, alternatives have been considered as part of the iterative design and assessment process where relevant.

3.3 Assessment Methodology

3.3.1 Types of Alternatives

The EPA's 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2022) (hereafter referred to as 'the EPA Guidelines') outlines different types of alternatives that should be considered in an EIAR. These include; do nothing scenario, alternative processes and alternative locations (where feasible), alternative layouts, alternative designs and alternative mitigation measures.

The approach adopted for this assessment was firstly to identify where there were reasonable alternatives to all elements of the Proposed Development, then to consider the impact of these alternatives (if any) on the environmental factors used in this EIAR. Where an impact was identified, this effect was compared with the assessed effect of the 'Proposed Development'.

An indication of the main reasons for the option chosen, taking into account the effects of the project on the environment and including a comparison of their environmental effects is what is required by the Directive. As the EPA notes: "It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each option. A detailed assessment (or 'mini-EIA') of each alternative is not required."

3.3.2 Limitations and Assumptions

The degree to which it is possible to assess alternatives depends on the amount of information available for each alternative. Alternatives discarded at an early stage of the design process necessarily will not have the same level of information as is available for the Proposed Development.

3.4 Consideration of Reasonable Alternatives

3.4.1 Alternative Designs

The Sea Gardens Phase 2 area has consistently been a predominantly residential area in the various masterplans that have been prepared. A number of the key design iterations which were considered during the current design process, and how the overall design evolved taking account of site-specific design, engineering and environmental constraints, is described below.

3.4.1.1 Masterplan Development

The Masterplan has gone through numerous design iterations as detailed in Figures 3-1 to 3-4.

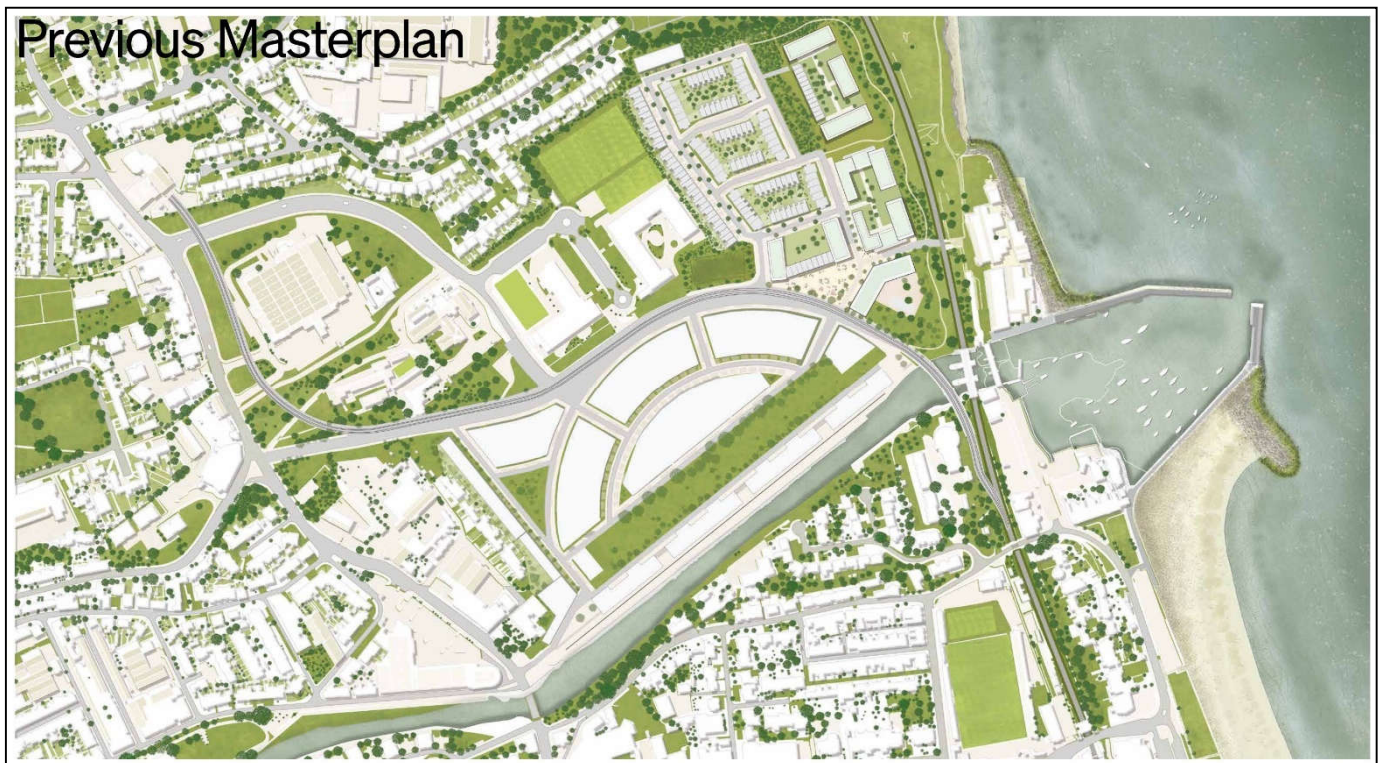


Figure 3-1 - Previous Masterplan for Phase 2 Sea Gardens



Figure 3-2 - Redevelopment Masterplan for Phase 2 Sea Gardens

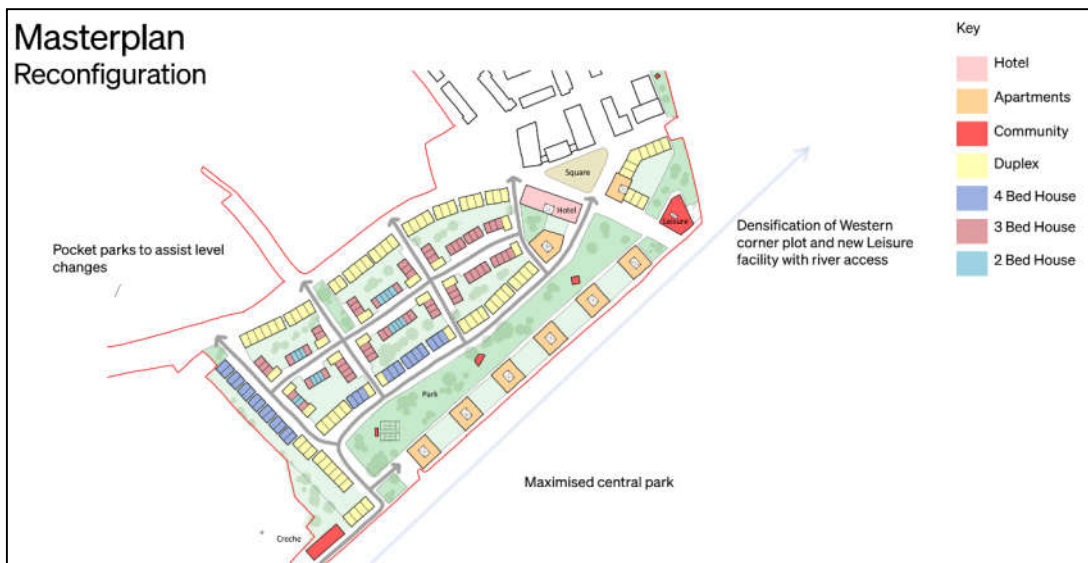


Figure 3-3 - First reconfiguration of Phase 2 Sea Gardens



Figure 3-4 - Second reconfiguration of Phase 2 Sea Gardens

At the early master planning stage it was important to develop an open space strategy of soft and hard landscaped areas through a pedestrian loop connecting the scheme back to Bray with key nodal points linking to the Dublin Road

and the future transport bridge. Just as important, was creating a central green hub - a mix of leisure and community space connecting the two quarters together.

The initial approach to the design emphasized creating a pedestrian-friendly walkway along the River Dargle, thereby connecting the western part of the site, accessed from the Main Road, to the Cork Abbey Valley Park.

Masterplan 01, as illustrated in Figure 3-5 below and as detailed in the Sea Gardens Phase 2 Architectural Design Statement (BRA-HWS-02-ZZ-R-A-05002), detailed pedestrian and traffic connectivity requirements, however, further alternatives were deemed necessary to establish adequate green corridors and connectivity to shops, public transport, and local amenities.

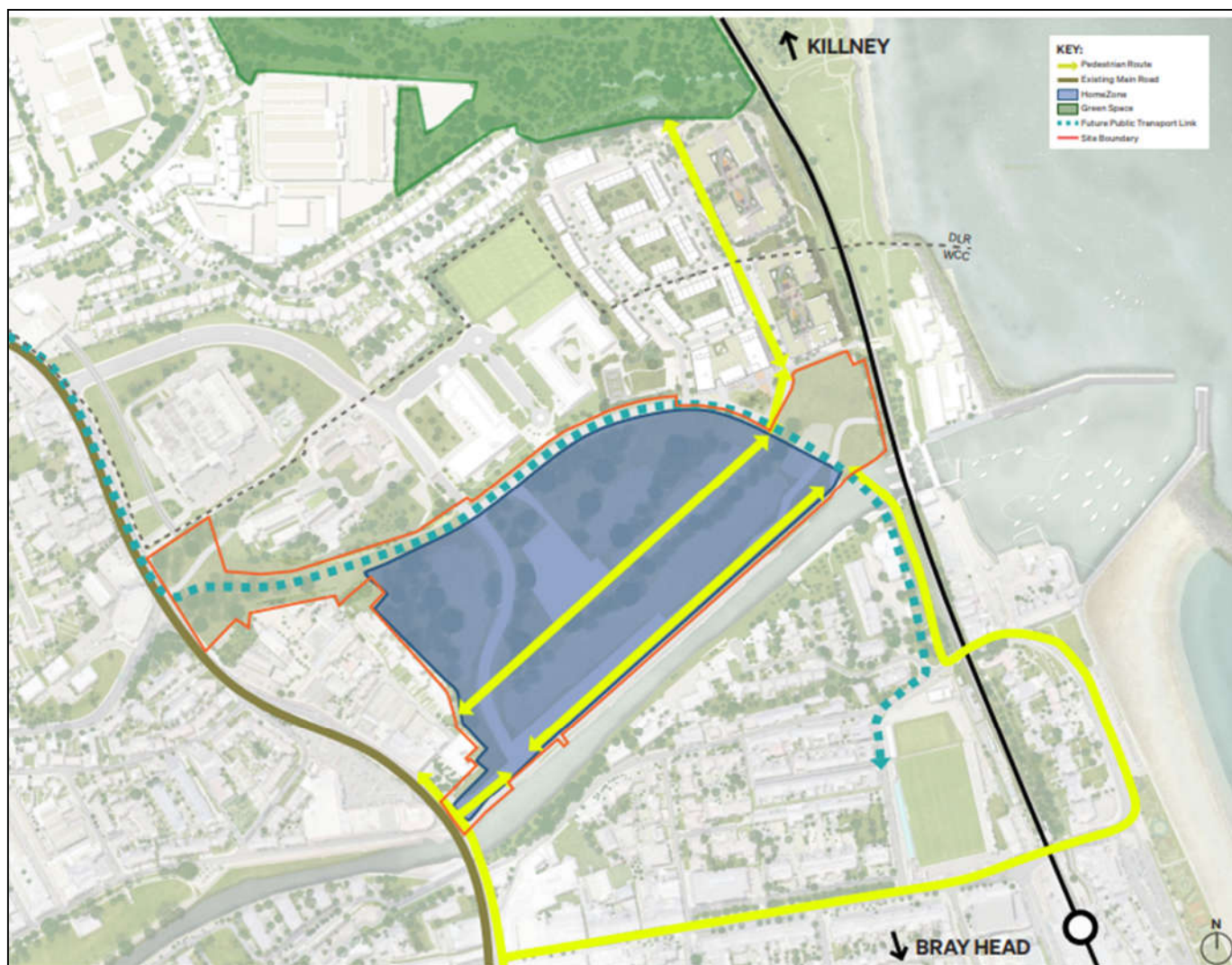


Figure 3-5 - Masterplan 01

Masterplan 02 (Figure 3-6 below) included the location of the Central Park which was included to create a natural flooding strategy. The park location aims to create a barrier in case of the flood between the homes and the River Dargle.

Following Wicklow County Council pre-application engagement, the Western Gateway block (yellow) was highlighted for the start of the commercial/retail spine running from Main St. up to the new Market Square.

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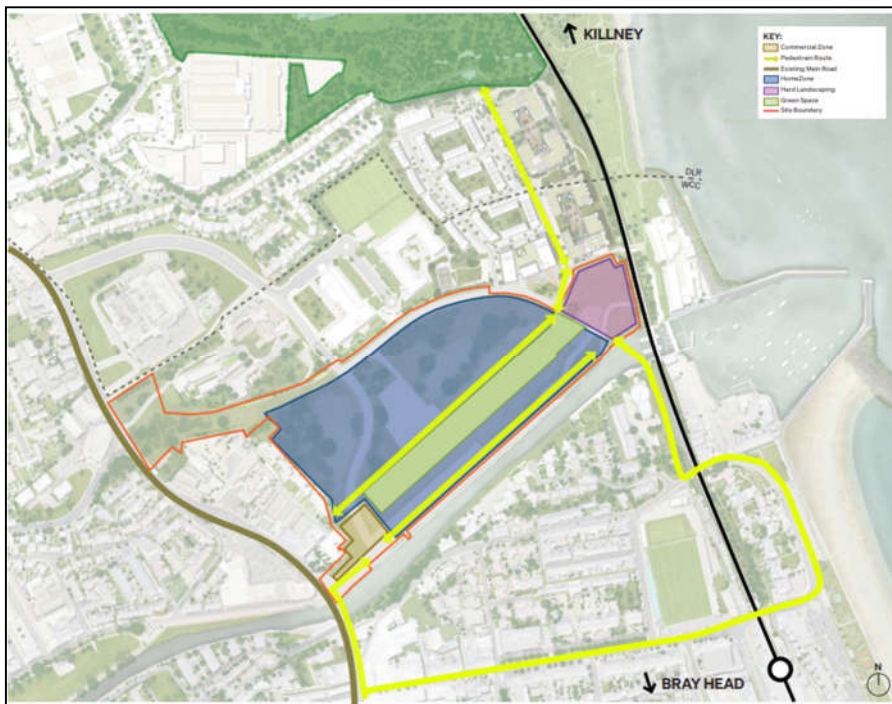


Figure 3-6 - Masterplan 02

Further design alternatives were developed in Masterplan 03 (Figure 3-7 below). The street network and public spaces within the Phase 2 were further designed to be intuitive and easy to navigate, ensuring that residents of all ages and abilities can easily move throughout their new neighbourhood.

These new streets create further linkages to the local school complex, existing cycle routes and green routes extending beyond the town.

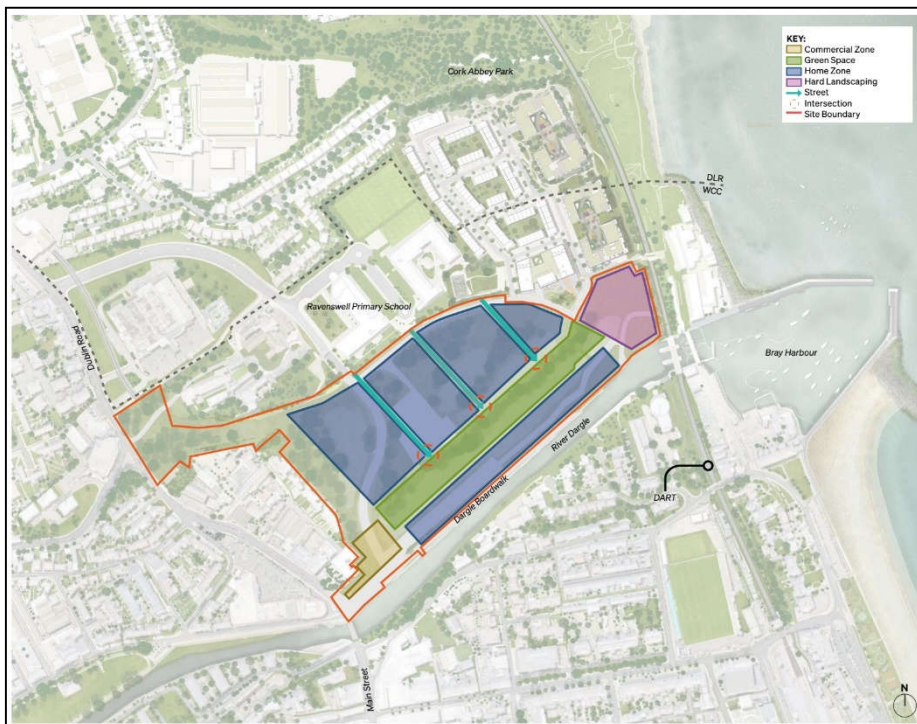


Figure 3-7 - Masterplan 03

The final masterplan (Masterplan 04, Figure 3-8) prioritized attractive and well-connected routes for both pedestrians and cyclists. A network of green corridors, pedestrian lanes, and cycle paths were designed in to ensure easy and direct connections to key areas of the development, including residential spaces, public amenities, and transport options. The final Phase 2 design provides pedestrian connections from the Western Gateway via Fran O'Toole Bridge, from the Market Square through the underpass to the Harbour and a new connection to the Dublin Road via the new Southern Access Road.

The final overall Sea Gardens Masterplan prioritizes public transport connectivity, ensuring the development is easily accessible by bus and other forms of public transport. The plan carefully balances the density of land uses with the site's location and surrounding environment. It ensures that the development density aligns with the site's access to public transport, local services, and amenities.

Phase 2 final proposal provides a complementary and interconnected range of open spaces, green corridors, and landscaped areas that are carefully designed to create and conserve ecological links.

The layout of homes for Phase 2 Sea Gardens within the Masterplan has been re-organised to reduce the risk of flooding.

The future Luas extension, as set out in the Greater Dublin Area Transport Strategy, is anticipated to run through the future development and terminate at the Bray Dart Station via a proposed Transport Bridge. Although this extension is not anticipated to be developed until 2040, the final iteration Masterplan for the development lands takes cognisance of the provision of the Luas extension and its interface with the development.



Figure 3-8 - Final Masterplan

3.4.1.2 Block Design Alternatives and Design Considerations

The proposed Sea Gardens development site is located adjacent to Bray Harbour which is an important site for waterbirds⁴. A Swan Sanctuary is located ca. 100m from the proposed development site. BirdWatch Ireland has stated Bray Harbour is of “international and national importance” for Mute Swans, with swans occurring in Bray Harbour populations in numbers of international and national importance⁵.

The development of Sea Gardens Phase 2 has been cognisant of bird collision risk and the new proposed blocks have been designed so as to minimise the factors influencing bird collision risk.

To reduce the risk of bird collision the following details have been considered in Phase 2 Sea Gardens Block designs;

- No large, continuous and expansive areas of reflective glass and restricted use of glass where possible with no straight ‘see through’ areas.
- Site lines to planted habitats through glass windows have been avoided.
- Internal street lights are angled downwards where possible to avoid attracting higher flying migrating birds.
- Avoidance of lighting that may reflect the planted environment via the glass windows which will cause a bird collision risk.
- Atria and rooftop greenspaces are not surrounded by reflective glass to mitigate any likelihood of birds confusing the reflection as an extension of the habitat.

Block E Tower

Block E is considered to be one of the most prominent buildings in the entire masterplan, given its height and visibility within the broader context of Bray and the surrounding areas. The location of Block E was carefully considered in relation to the entire seafront, with particular attention to how it interacts with the existing structures.

The building steps up in height in response to the consented Block B from Phase 1, but the main mass of Block E, particularly the tower, is set back from Block B to minimize its impact on daylight and preserve the light quality for the surrounding spaces. The massing of Block E, including the tower and duplex units, was designed with the goal of maximizing panoramic sea views.

The duplexes are positioned on a podium to ensure clear sightlines over the railway track, with windows raised high enough to maintain unobstructed views of the sea. Additionally, the design features a stepped arrangement of the duplexes facing the Coastal Gardens, varying between two and three storeys.

This intentional cutaway in the massing allows the duplexes facing the Market Square to also benefit from the stunning coastal views.

The tower itself is strategically positioned to ensure that all apartments within Block E have access to expansive sea views. The dual-aspect design of the apartments further enhances the panoramic vistas, allowing for natural light and views from multiple angles, creating a truly elevated living experience for all residents.

Block E Duplexes

The duplexes facing the square have been increased in height to 3 storeys and changed from 3B5P units to 4B7P units.

The key reasons why this option was selected are as follows:

⁴ https://birdwatchireland.ie/app/uploads/2023/08/iwebs_trends_0T907_Bray_Harbour.html

⁵ <https://www.irishtimes.com/news/environment/warning-issued-over-risk-of-swan-deaths-at-new-bray-bridge-1.4668724>

- This has improved unit variation within the building.
- The 3 storey duplexes look more sympathetic in relation to the tower part of Block E.

The massing of the duplexes facing the Coastal Gardens (South-East) has been changed to fluctuate between 2 and 3 storeys.

The key reasons why this option was selected are as follows:

- This allows for all duplex units within Block E to have access to sea views over the viaduct.
- The redesign of the south-facing units around the core significantly improved the daylight/sunlight impact.

Block G Position

Current Proposal – Block G Position

The massing is split across 3 buildings of various sizes to reduce the daylight /sunlight impacts on the neighbouring properties.

The key reasons this option was selected to be included in the proposed design layout are as follows:

- Block G1 is positioned towards the road which reduces its impact on the property at Dwyer Park.
- The roof slopes of Block G1 and G3 have been reduced to allow for more light into the existing house.
- Furthermore, the massing for Block G2 allows for better sightlines into the Central Park upon approach and minimises impact on the Dwyer Park house.

Block H Design Iterations

Block H has been subject to redesign to include new vehicle and pedestrian entrances via the southern access road. The new iteration block design now includes for a well-integrated mix of commercial uses beneficial to residents of Sea Gardens and the wider public in Bray town including;

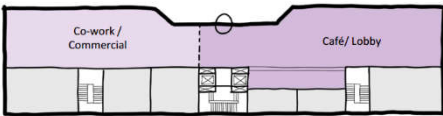
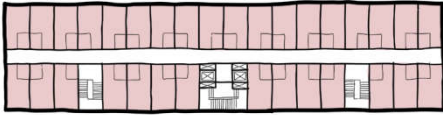
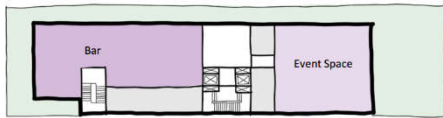
- A Medical Centre to provide healthcare facilities for residents and the wider community.
- A dedicated Childcare Facility to cater to young families, complete with a designated play area.
- A retail unit for local shopping options.

Additionally, the building will host 32 apartment units, including 1, 2, and 3-bedroom units, with universally designed layouts to ensure accessibility for a wide range of residents. Above the ground floor, the development features a Podium Garden Amenity and a 3rd-floor Terrace Amenity, offering outdoor spaces for relaxation and social interaction. To promote sustainable living, bike storage and parking will also be provided, encouraging eco-friendly transportation options for residents.

Block I Hotel Designs

The proposed Hotel Block I area has been through various design iterations within the overall development site (refer to Figure 3-9). The final design has ensured that this building is strategically bounded by key areas that enhance its accessibility and integration within the site: the Market Square to the North, Central Park to the South-East and Home Zone to the South-West.

Hotel (First Initial Proposal)



Total - 160 Keys

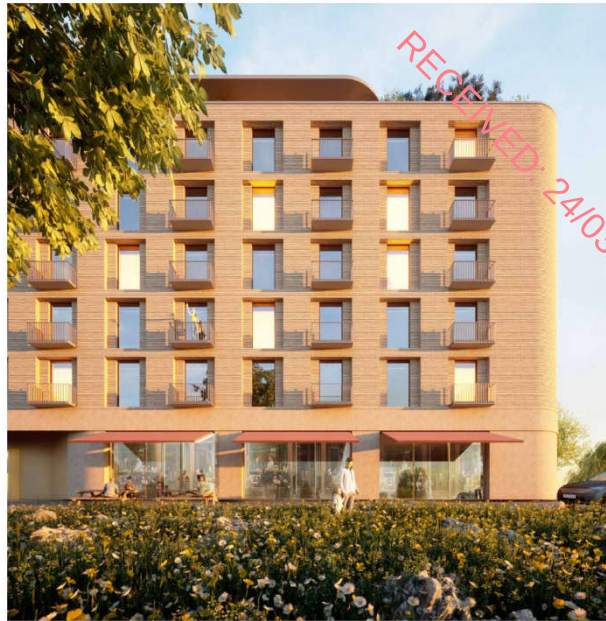


Figure 3-9 - Initial Hotel proposals

The final design (Figures 3-10 & 3-11) includes a commercial podium garden on Block I which has been thoughtfully designed to create a dynamic and inviting outdoor space for both hotel guests and the broader community. The landscaping within the podium garden features a variety of plant species, further contributing to the visual appeal and ecological value of the space. The design has been created to enhance the hotel's commercial function while providing a high-quality outdoor environment that encourages social interaction, relaxation and connection to nature.



Figure 3-10 - Final Hotel design – view from Block E entrance



Figure 3-11 - Plan showing commercial garden amenity within the hotel Block I

3.4.1.3 Pedestrian Bridge to Harbour

A pedestrian bridge linking the river walkway to the harbour area under the railway bridge was initially considered. The purpose of the proposed pedestrian bridge over the River Dargle was to provide for additional connectivity to and from the proposed development and to reduce the reliance on the underpass for pedestrians. An early sketch showing the bridge location is presented in Figure 3-12 below.

The key reasons that this option was not further considered as part of the final design layout and included in the current application for the proposed development are as follows:

- The requirements for Section 50 Application due to reduction of water flow under the existing bridge and the impacts on flooding were considered.
- With input from the design team, it became clear that to comply with the Section 50 recommendations, the proposed deck level would be below the T200 event (tidal level) before taking allowances for climate change into consideration.
- The proposed bridge would result in significant adverse environmental impacts, it was not considered to be an optimal design from an engineering and environmental perspective, specifically with respect to flood levels and extents, climate change, sustainability and biodiversity considerations.

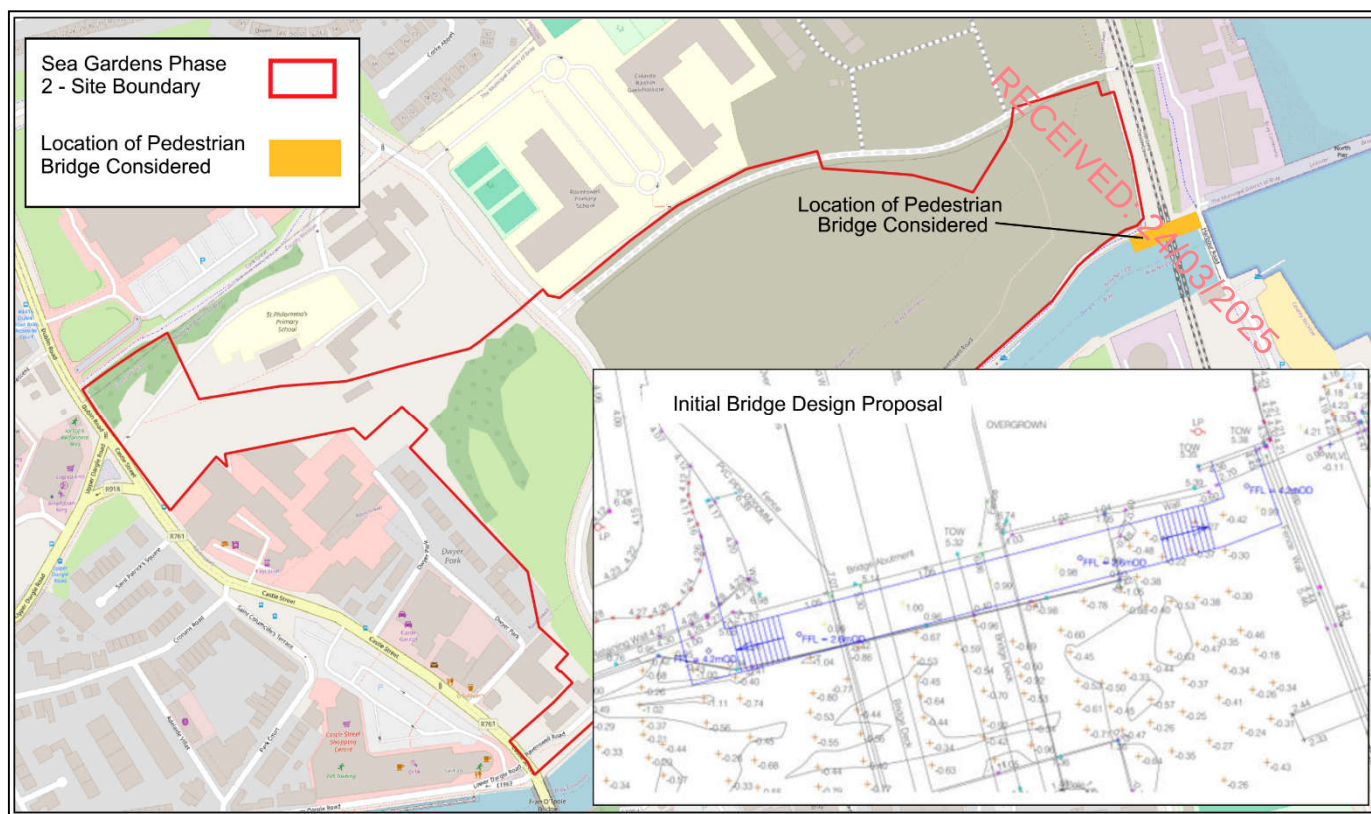


Figure 3-12 - Sketch showing bridge location

3.4.1.4 Southern Access Road and Road for Sisters Of Charity (RSOC)

A two way carriageway and single lane entry options linking the Southern Access Road to the Road for Sisters Of Charity (RSOC) were considered.

These options followed the existing terrain and aimed at providing direct access to Ravenswell School Campus from Southern Access Road.

RSOC Two Way Carriageway Option 1

The layout for Option 1 is presented in Figure 3-13 below.

The key reasons this option was not selected as the final design layout for the proposed development are summarised as follows:

- The proposed RSOC alignment had a significant level difference between the existing and the proposed alignment.
 - The proposed design would require retaining walls and a substantial amount of fill material.
 - In some areas of the road, the steep gradient would necessitate the use of a maximum fill volume of 8.3%.
- In addition, this option has a 20.42% grade which would be a road safety concern for vehicles exiting the RSOC onto the Southern Access Road.

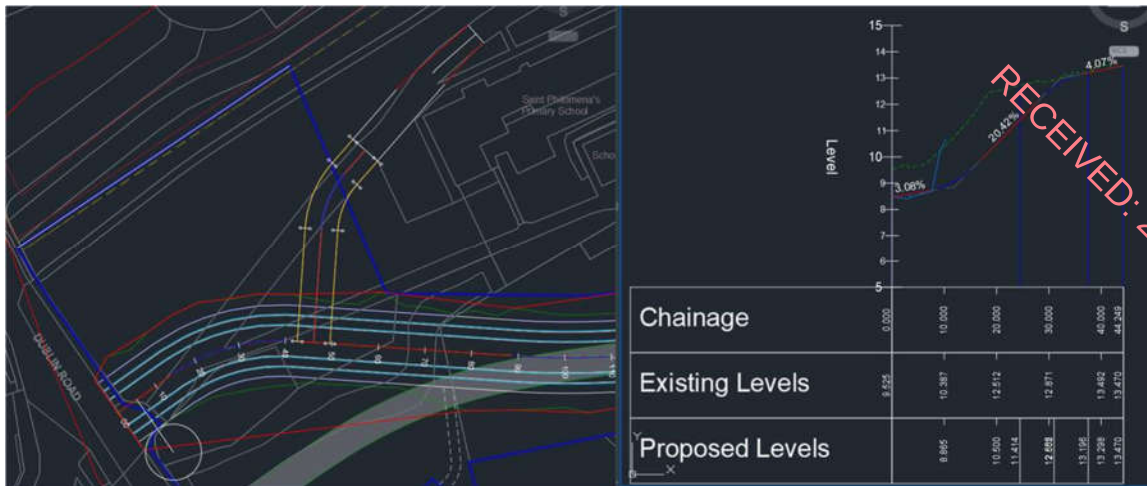


Figure 3-13 - Proposed RSOC Dual Carriageway shown in yellow

RSOC Single lane entry Option 2

This option proposed the use of RSOC as a single lane entry only road to Ravenswell School Campus and use of the existing exit to the right of the school. The layout for Option 2 is presented in Figure 3-14 below. It follows the existing RSOC with a small section of 20m being at a 9.26% gradient. The footpath and segregated cycle lane could then be designed to the north separate from the access road in order to attain the 5% gradients for a ped footpath and cycle lane to be compliant with DMURS.

The key reasons this option was not selected as the final design layout for the proposed development are summarised as follows:

- Similarly to the option above, this alignment has a significant level difference between the existing and the proposed alignment.
- The proposed design would require retaining walls and a substantial amount of fill material.

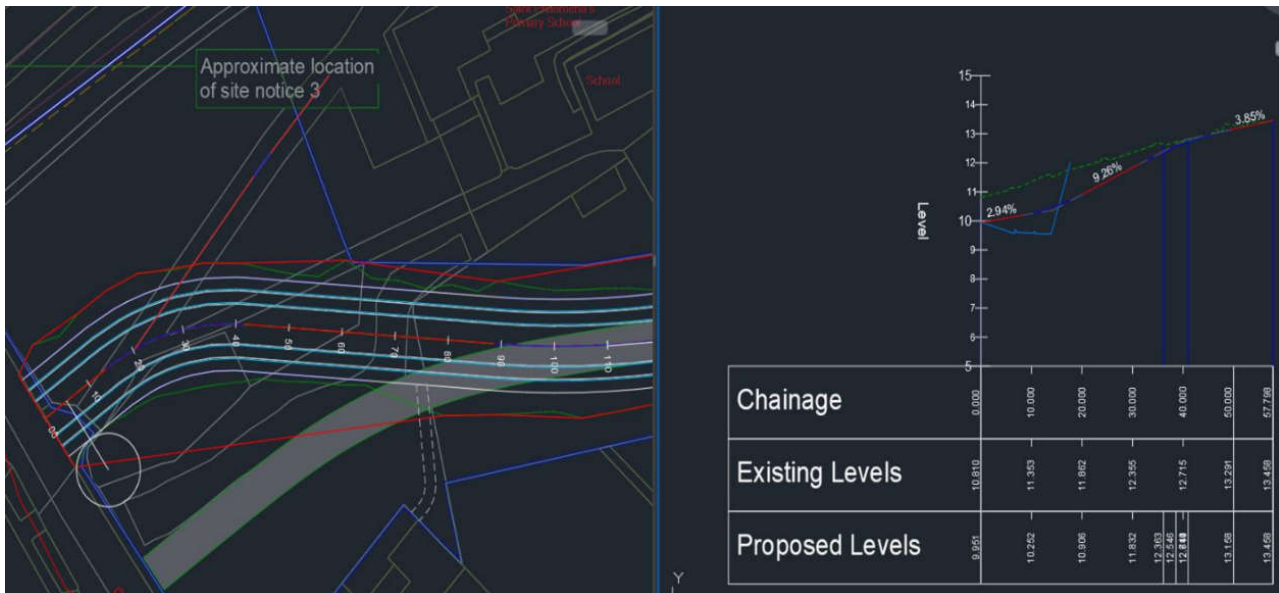


Figure 3-14 - Proposed RSOC Single lane entry

In summary, while these options would not result in significant adverse environmental impacts, it was not considered to be an optimal design from an engineering and environmental perspective, specifically with respect to traffic and sustainability considerations and the current proposal does not include linkage to RSOC Road.

3.4.2 Current Planning Application

The proposed Southern Access Road is located as further north as possible to optimise the developable area. This is favourable to the development to better accommodate Block H which includes the creche.

The design team were able to maintain the link between the new Southern Access Road and the existing junction.

The level of the road was designed taking into consideration the surplus fill on site available to re-use and to avoid the need for retaining walls.

3.4.3 Alternative Construction Processes

3.4.3.1 Ground Improvement Options

A number of options were considered for the proposed ground improvement works required due to the highly compressible material (very soft to soft cohesive material consisting of interbedded peat, clay and organic silt) encountered throughout the site as confirmed during site investigation.

In response to this finding, the following ground improvement techniques to facilitate the development were considered:

Do Nothing - Option 1

This involves raising the ground level to the proposed finished levels by loading the site with fill material and maintaining this fill in place until primary consolidation has been completed over a period of 30 months.

This option was not considered further to avoid the following:

- excessive secondary or creep settlement;
- the requirement of additional fill to bring settled ground levels back up to finished ground levels resulting in further settlement and;
- settlement from structure loading exceeding tolerable limits.

Surcharge - Option 2

This option consists of the soft soils being improved by the controlled addition of 2m of additional fill material to the proposed finished ground levels and maintaining this surcharge in place until primary consolidation has been completed.

This option was not considered further to avoid the following:

- Extensive timeframes associated with the settlement period;
- Excessive secondary or creep settlement; and,
- Additional construction period required to remove surcharge material to finished ground levels.

Vertical drains – Option 3

This option does not require a surcharge and consists of prefabricated vertical drains or sand drains inserted into the soft soils, raising the ground level to the proposed finished levels with fill material and maintaining this fill in place until primary consolidation has been completed.

The construction period of placing the prefabricated or sand drains will depend on the machine type and number of drains.

Controlled Modulus Columns (CMC) – Option 4

CMCs are used to control the rate of settlement in soft soils and are an economical alternative to a piled solution.

Mass Soil Mixing – Option 5

Mass soil mixing is a ground improvement method for soft soil by in-situ mixing of a binder of cement or lime throughout the treated soil layer. The use of this technique is limited to a depth of about 5 m and will require the management of secondary consolidation of the remaining untreated soil.

Surcharge with Mass Soil Mixing – Option 6

This option is a combination of the high level options noted above in Option 2 and 5.

Current Proposal

The selected proposed ground improvement techniques include a combination of Option 2, 3 and 4.

- For the houses and apartments, vertical drains are to be installed into the ground below the proposed houses and rear gardens. Reusable surcharge fill will be placed over the footprint of the proposed building structures. The ground settlement will be monitored through a series of survey points. Once settlement has stabilised, the surcharge fill will be removed and the foundations will be constructed.
- For the roads, vertical drains will be installed into the ground below the proposed roads. Controlled Modulus Columns and Vibrostone Column will be installed to satisfy road and services design. Services will then be installed within the vibrostone column area and then the road will be built up to design levels.

4. Population & Human Health

4.1 Introduction

This chapter describes the Population and Human Health setting in the general area of the proposed Sea Gardens Phase 2 development at Ravenswell, Bray, Co. Wicklow. The assessment addresses the potential impact of the construction and operation of the Proposed Development on these factors, together with any mitigation measures that may be required to eliminate or reduce potential impacts. A more complete description of the Proposed Development is presented in Chapter 2 – Project Description.

Population and Human Health comprise an important element of the environment, and any potential impacts which may result from the construction and operation of the Proposed Development must, therefore, be comprehensively addressed. There are three key considerations in this regard:

- To ensure that human beings experience no significant unacceptable diminution in an aspect, or aspects of 'quality of life' via. potential impacts to population, employment and economic activity, land-use, community and recreation.
- To improve the general health and wellbeing of the proposed residents through encouraging activities such as walking and cycling by means of inclusion of pedestrian and cyclist facilities and open green spaces.
- To ensure that there are no human health impacts via. potential environmental pathways including soil, water, air and noise.

The population and human health topic is broad-ranging and addresses the existence, activities and well-being of people as groups or populations. While most developments will affect other people, this chapter concentrates on those topics which are manifested in the environment, such as new land uses, more buildings or greater emissions. The principal concern is that human beings within the area experience no significant unacceptable diminution in aspects of quality of life because of the proposal. Potential impacts can arise from natural heritage, air and noise emissions, soils and water, visual and traffic, all of which are addressed in the relevant chapters of this Environmental Impact Assessment Report (EIAR). Topics assessed in this chapter, which are not covered in other chapters of the EIAR, include a detailed review of current land use, settlement pattern, demography, economic activity and social infrastructure.

4.2 Methodology

This chapter provides an assessment of the potential impacts of the construction and operation of the Proposed Development (also referred to as 'the Site') on the broader human environment under two considerations:

- Population and Associated Factors; and,
- Human Health.

Mitigation measures are proposed where appropriate in order to address any likely impacts associated with the construction and operation of the Proposed Development. This Population and Human Health Assessment has been undertaken in accordance with relevant Environmental Protection Agency's (EPA) Guidance.

- *Guidelines on the information to be contained in Environmental Impact Assessment Reports*, Environmental Protection Agency (EPA), 2022 highlights the amendments to Article 3(1) of amended European Union (EU) Environmental Impact Assessment (EIA) Directive which states that:
"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of a project on the following factors: a) population and human health; [...]"
- Moreover, Annex IV, paragraph 5(d) requires an EIAR to contain:

“A description of the likely significant effects of the project on the environment resulting from, inter alia, “the risks to human health”

- When outlining the scope of environmental factors covered by the EIA Directive within *Guidance on the Preparation of the Environmental Impact Assessment Report* (European Commission, 2017), “population and human health” is defined as follows:

“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 the 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.”

- The human health assessment will also consider unplanned events (in addition to construction and operational activities). Examples of such unplanned events include the following; spill from traffic accidents, floods or land-slides affecting the Site, fire, collapse or equipment failure on the Site.

To establish the existing receiving environment / baseline, a thorough desk-based study of the Site was undertaken, and the following publications and data sources were consulted in the preparation of this Chapter:

- Project Ireland 2040 - National Planning Framework;
- Eastern and Midlands Regional Assembly Regional Spatial and Economic Strategy 2019-2031;
- Wicklow County Development Plan 2022– 2028 and variations;
- Bray Municipal District Local Area Plan 2018-2024;
- Pre-Draft Bray Municipal District Local Area Plan 2025;
- Central Statistics Office (CSO) data website (2016 data and 2022) www.cso.ie;
- Department of Education data website www.education.ie/en/find-a-school;
- Economic and Social Research Institute (ESRI) Quarterly Economic Commentary Spring 2024;
- Google Earth;
- Google Map;
- Open Street Map;
- Health Service Executive data website www.hse.ie;
- Planning Applications Online Search at websites <http://www.eplanning.ie/WicklowCC/searchtypes>;
- Pobal Mapping @ maps.pobal.ie;
- TUSLA (Child and Family Agency; and,
- Geodirectory.

All data sources were consulted the week ending the 4th of October 2024 except where otherwise stated.

4.2.1 Difficulties Encountered

No particular difficulties were encountered in the preparation of this EIAR chapter.

4.2.2 Assessment Criteria

In undertaking the assessment of the impact of the Proposed Development on Population and Human Health, community and the local socio-economic environment, both positive and negative impacts are considered.

The following terms used in this assessment are defined as per the EPA *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (2022) as seen in **Table 4-1**.

Table 4-1 - Description of Effects

Description of Effects	
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 the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities) Neutral Effects: No effect 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 below.).	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?).
Describing the Probability of Effects	Likely Effects: The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.

Description 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.	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).
Describing the Types of Effects	Indirect Effects (a.k.a. Secondary Effects): 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 Effects: The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. ‘Do-Nothing Effects’: The environment as it would be in the future should the subject project not be carried out. ‘Worst case’ Effects: The effects arising from a project in the case where mitigation measures substantially fail. Indeterminable Effects: When the full consequences of a change in the environment cannot be described.

Description of Effects	
	Irreversible Effects: When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects: The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects: Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SO_x and NO_x to produce smog).

Source: Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022), EPA

4.3 Receiving Environment

A description of the relevant aspects of the current state of the environment (baseline scenario) in relation to population and human health is provided below. In line with the guidance provided by the EPA and the Department, the assessment of impacts on population and human health refers to those environmental topics under which human health effects might occur, e.g. noise, water, air quality, etc., but is not duplicated throughout this section.

The existing environment is considered in this section under the following headings:

- Land use and Settlement Pattern;
- Demographics and Local Population;
 - Population Density;
 - Age Profile;
 - Household Size;
 - Affluence and Deprivation;
- Employment and Economic Status;
- Local Services;
- Education and Childcare Facilities;
- Health Services;
- Human Health; and
- Risk of Major Accidents and Disasters.

The Study Area for the consideration of population and human health is the Proposed Development's Site and its immediate environs (the wider Bray area). Details of the defined Study Area for the population assessment are provided in the subsequent sections.

4.3.1 Land Use and Settlement Pattern

The Proposed Development's Site is located within the southern and western portions of the Sea Gardens Masterplan lands. Access is provided via a recently developed roadway, provided as part of Colaiste Raithin and Ravensdale Primary School developments.

The Proposed Development's Site is bordered to the north by Colaiste Raithin, St. Philomena's Primary School, Ravenswell Primary School, and the Phase 1 lands (inc. Phase 1A and Phase 1B); Phase 1A is currently under

construction and is nearing completion, to the south by the Ravenswell Road and River Dargle, the west by residential properties and to the east by the Dart railway line, a former landfill, and the coastline. Land uses in the area are mixed but predominantly those of a large town. Bray's town centre is located approximately 500m from the Site.

The Proposed Development's Site forms part of the former Bray Golf Course lands, with the derelict golf club building located within the western portion of the Site. The existing roadway bounding the north of the Proposed Development will be extended westwards to join Dublin Road to the west of the Proposed Development and will be utilised as the access road to the Proposed Development.

The Bray Sea Gardens site is located within Ravenswell townland. The townland boundary to the north at Ravenswell forms the county boundary between counties Dublin and Wicklow.

The subject lands are located entirely within Wicklow County Council's administrative area, and thus designated with land-use zoning of Mixed Use (MU) "To provide for mixed use development." Land use zoning objectives are consistent with the national and regional policy, which seeks the development of serviced sites within settlements designated for development. The National Planning Framework and Regional Spatial and Economic Strategy support providing additional housing and better using under-utilised sites in accessible urban locations benefitting from public transport and other facilities.

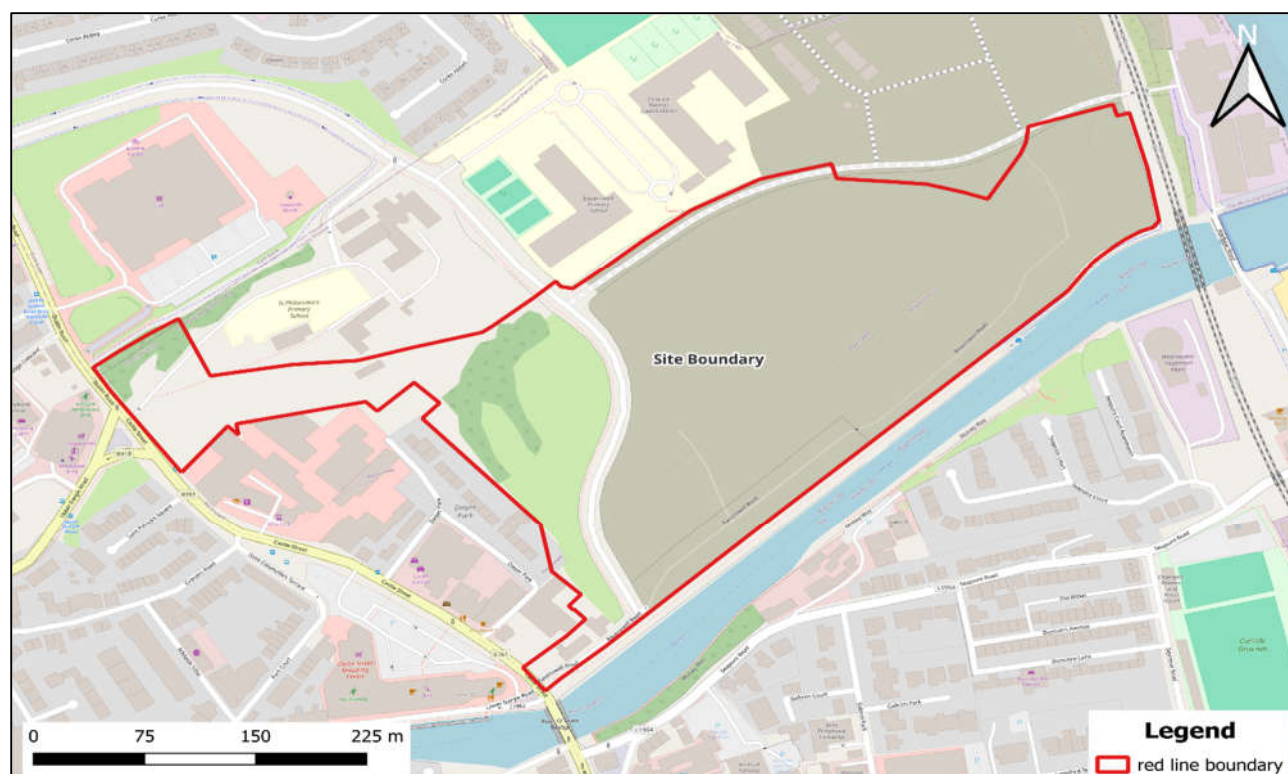


Figure 4-1 - Site Location Map

4.3.2 Demographic and Local Population

The most recent Census of Population was undertaken in 2022 by the CSO. Demographic trends are analysed at national (State), council levels (Wicklow County Council and Dun Laoghaire-Rathdown County Council) and local level (defined Study Area) for the purpose of demographic analysis.

For the purpose of demographic and local population analysis, a Study Area was defined using the '15-minute city' approach. The extent of the Study Area was defined by areas reachable within a 15-minute walk and a 10-minute cycle from the centre of the Proposed Development's Site.

Data gathering at the local level consisted of combining all ‘small areas’ within the Study Area. Small areas are boundary datasets provided by the CSO that present census data at the smallest geographical level for statistical purposes.

Figure 4-2 below illustrates the defined Study Area and the Proposed Development’s Site. Figure 4-3 illustrates all small areas that fall within the Study Area. Table 4-2 includes their IDs and their respective distances from the centre of the Proposed Development’s Site.

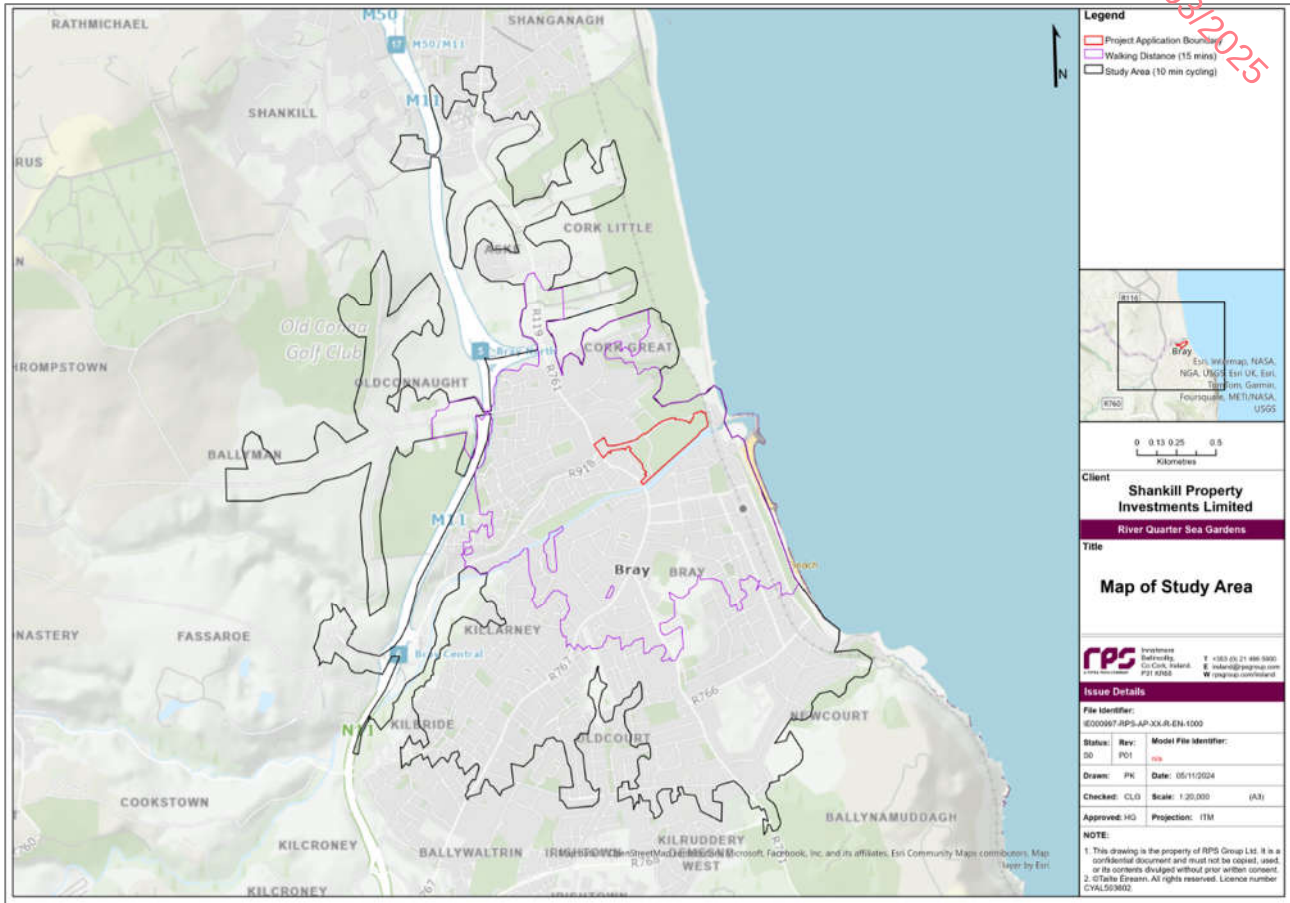


Figure 4-2 - Defined Study Area (for demographic and local population analysis)

Source: RPS

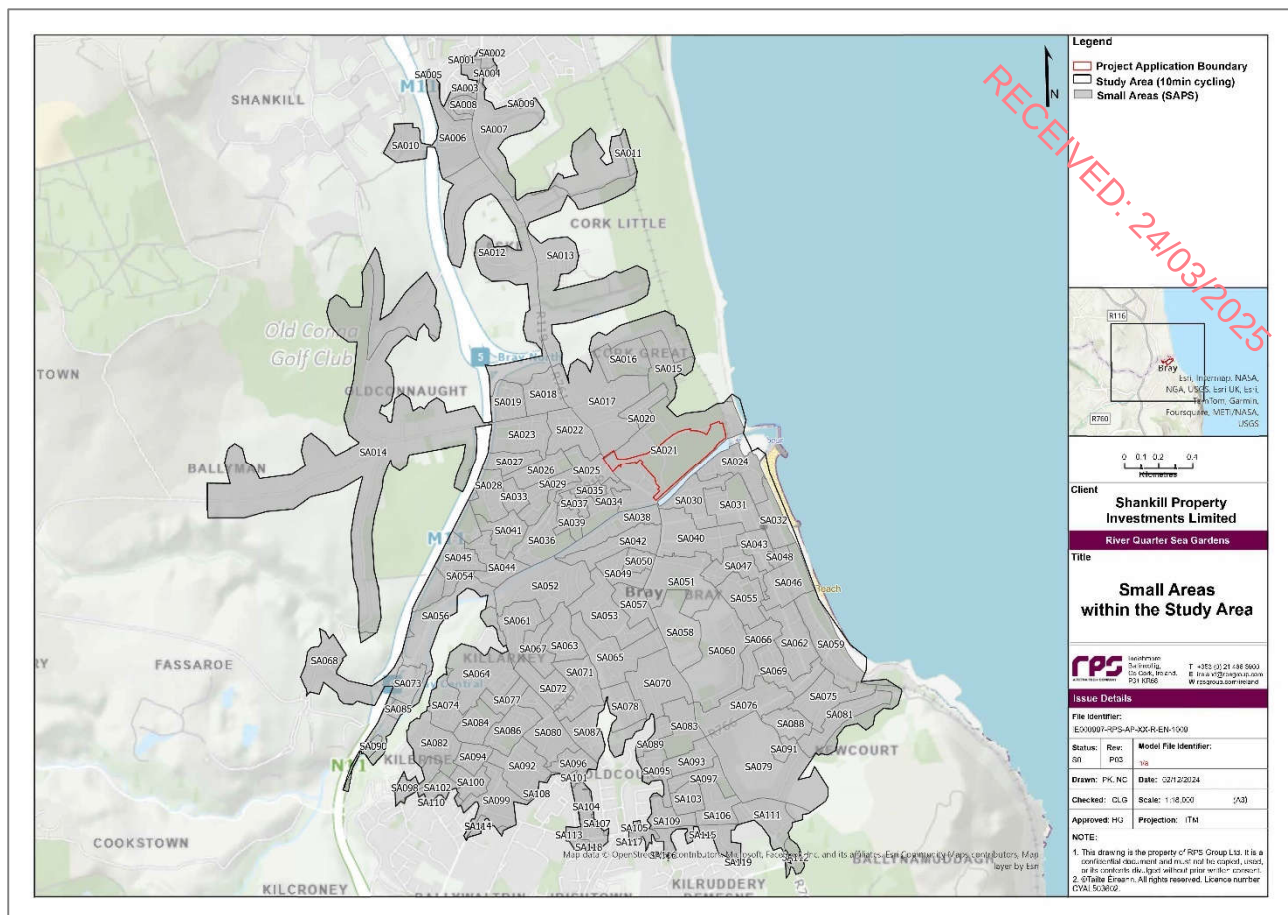


Figure 4-3 - CSO's Small Areas within the Study Area

Source: RPS based on CSO.ie

Table 4-2 - List of CSO's Small Areas within the Study Area

Label	Small Area ID	Distance to Site (m)	Label	Small Area ID	Distance to Site (m)
SA001	A267120012	2423.5	SA061	A257017009	874.0
SA002	A267122005	2361.0	SA062	A257081019	866.6
SA003	A267120015	2116.3	SA063	A257017021	799.7
SA004	A267122008	2250.2	SA064	A257051028	1058.4
SA005	A267120013	2432.4	SA065	A257017008	742.4
SA006	A267120010	1876.4	SA066	A257081005	899.0
SA007	A267122010	1502.5	SA067	A257017022	929.4
SA008	A267120011	2133.8	SA068	A257051033/02	1582.6
SA009	A267122009	2080.0	SA069	A257081001	1054.0
SA010	A267120014	2038.1	SA070	A257017014	864.0
SA011	A267122004	1525.4	SA071	A257017015	985.9

Label	Small Area ID	Distance to Site (m)	Label	Small Area ID	Distance to Site (m)
SA012	A267120009	717.4	SA072	A257017016	1149.0
SA013	A267122003	122.6	SA073	A257051027	1578.9
SA014	A267120004	606.6	SA074	A257051029	1490.4
SA015	A267122017	177.7	SA075	A257081018	1396.8
SA016	A267122002	376.2	SA076	A257081007	1182.1
SA017	A267122001	0.0	SA077	A257051012	1302.6
SA018	A267120008	354.6	SA078	A257017013	1074.5
SA019	A267120007	508.1	SA079	A257081008	1363.6
SA020	A267122016	137.1	SA080	A257051014	1315.7
SA021	A257080006	0.0	SA081	A257081021	1600.7
SA022	A257080004	19.6	SA082	A257051032	1769.0
SA023	A267120005	329.5	SA083	A257017019	1163.1
SA024	A257081010	31.1	SA084	A257051030	1541.0
SA025	A257080005	0.0	SA085	A257051031	1819.5
SA026	A257082007	183.6	SA086	A257051011	1415.1
SA027	A267120006	355.4	SA087	A257017025	1238.1
SA028	A257082004	601.7	SA088	A257081017	1405.0
SA029	A257082003	179.8	SA089	A257017024	1264.5
SA030	A257081012	21.8	SA090	A257051036	2064.7
SA031	A257081011	131.4	SA091	A257081016	1569.2
SA032	A257081006/01	316.3	SA092	A257051013	1587.1
SA033	A257082008	505.0	SA093	A257017020	1417.6
SA034	A257080007	35.4	SA094	A257051025	1739.7
SA035	A257080008	92.4	SA095	A257017017	1442.1
SA036	A257080002	298.5	SA096	A257051015	1518.9
SA037	A257080003	235.8	SA097	A257017018	1541.5
SA038	A257017002	21.8	SA098	A257051009	1974.9
SA039	A257080001	291.3	SA099	A257051042	1810.9
SA040	A257081014	47.8	SA100	A257051024	1854.0
SA041	A257082006	590.8	SA101	A257051016	1648.0
SA042	A257017003	134.1	SA102	A257051010	2027.3
SA043	A257081009	466.3	SA103	A257017012	1649.2
SA044	A257082005	737.7	SA104	A257051007	1697.7
SA045	A257082002	922.5	SA105	A257017023	1644.6

Label	Small Area ID	Distance to Site (m)	Label	Small Area ID	Distance to Site (m)
SA046	A257081022	709.4	SA106	A257017011	1679.1
SA047	A257081015	472.7	SA107	A257051008	1731.8
SA048	A257081006/02	662.0	SA108	A257051041	1837.4
SA049	A257017005	318.4	SA109	A257017010	1729.9
SA050	A257017001	304.3	SA110	A257051043	2169.7
SA051	A257081013	318.6	SA111	A257051022	1839.8
SA052	A257017004	548.2	SA112	A257051001	1928.9
SA053	A257017006	523.6	SA113	A257051049	1865.6
SA054	A257082001	996.5	SA114	A257051048	2107.3
SA055	A257081004	612.0	SA115	A257051021	1916.4
SA056	A257051033/01	957.2	SA116	A257051018	1927.5
SA057	A257017007	518.5	SA117	A257051044	2010.0
SA058	A257081002	528.6	SA118	A257051034	2050.5
SA059	A257081020	977.1	SA119	A257051023	2159.7

Source: CSO.ie

4.3.2.1 Population

Table 4-3 presents population figures for 2016 and 2022 and provides details of the change between 2016 and 2022.

From 2016 to 2022, the national population grew by 8.13%, indicating a steady increase in density. Within the council areas, WCC experienced a growth rate of 9.43%, while DLRCC saw a 7.27% increase, surpassing the national average. In contrast, the Study Area's growth was 3.72%, lower than that of the national and council levels.

Table 4-3 - Population Figures 2016 and 2022 & (%) Change

Area	Total Population (2016)	Total Population (2022)	(%) Change
State	4,761,865	5,149,139	+8.13
WCC	142,425	155,851	+9.43
DLRCC	218,018	233,860	+7.27
Study Area	33,555	34,803	+3.72

Source: CSO.ie

4.3.2.2 Population Density

Population densities for the years 2016 and 2022 are presented in **Table 4-4**.

The population density for the Study Area is above WCC but largely in line with DLRCC. A large part of WCC's administrative area is mountainous and occupied by green open space, and parts closer to Dublin City and

adjacent to DLRCC's administrative area are more urban in nature. Thus, the population density for the Study Area reflects these factors, given its location within the most built-up parts of WCC's administrative area.

Table 4-4 - Area & Population Density 2016 and 2022

Area	Area (sq.km)	Density (2016) per sq.km	Density (2022) per sq.km
State	70,265.03	67.77	73.28
WCC	2,025.25	70.32	76.95
DLRCC	126.56	1,722.62	1,847.79
Study Area	31.10	1,079.01	1,119.14

Source: CSO.ie

4.3.2.3 Age Profile

Tables 4-5 present census data arranged by age group for 2016 and 2022. It also details the change within each age group between 2016 and 2022.

The national and county levels experienced a notable increase in the 65+ age group, with rises of 0.2% nationally, 0.3% in WCC, and 0.1% in DLRCC. The Study Area mirrored this trend with a 0.3% increase in the 65+ demographic, indicating an ageing population consistent with national and council levels trends.

The Study Area's population aged 0-4 years, i.e., the population attending childcare and preschool facilities, saw an acute decrease. In 2022, it represented 5% of the overall population, from 6.7% in 2016. The Study Area's population aged 5-12 years, i.e., primary school-aged, saw a marginal increase, while the population aged 13-18 years, i.e., post-primary school-aged, saw a modest increase.

In summary, the ageing trend in the Study Area aligns with trends at the national and council levels.

Table 4-5 - Age Groups 2016 and 2022 & (%) Change

Age Groups	0-2 years (Early Years)	3-4 years (Pre School)	5-12 years (Primary School)	13-18 years (Post Primary)	19-24 years (Young Adults)	25-64 years (Adults)	+65 years (Older Adults)
State 2016	192,604	138,911	548,693	371,588	331,208	254,1294	637,567
State 2022	173,426	121,989	568,184	421,720	371,739	271,5766	776,315
(%) Change 2016-2022	-9.96%	-12.18%	3.55%	13.49%	12.24%	6.87%	21.76%
WCC 2016	5,796	4,377	17,984	11,585	8,721	75,386	18,576
WCC 2022	5,188	3,759	18,376	13,626	9,806	81,435	23,661
(%) Change 2016-2022	-10.49%	-14.12%	2.18%	17.62%	12.44%	8.02%	27.37%
DLRCC 2016	8,173	5,637	21,302	15,643	19,088	113,498	34,669
DLRCC 2022	7,383	5,271	23,756	17,111	19,256	121,165	39,918
(%) Change 2016-2022	-9.67%	-6.49%	11.52%	9.38%	0.88%	6.76%	15.14%

Age Groups		0-2 years (Early Years)	3-4 years (Pre School)	5-12 years (Primary School)	13-18 years (Post Primary)	19-24 years (Young Adults)	25-64 years (Adults)	+65 years (Older Adults)
Study 2016	Area	1,291	950	3478	2513	2345	18,192	4786
Study 2022	Area	1,041	710	3488	2701	2350	1,8515	5998
(%)	Change 2016-2022	-19.36%	-25.26%	0.29%	7.48%	0.21%	1.78%	25.32%

Source: CSO.ie.

4.3.2.4 Household Size

Table 4-6 presents census data on average household size in 2016 and 2022.

There was a slight decrease in average household size at the national and council levels, with the national average dropping from 2.75 to 2.74, WCC from 2.86 to 2.84, and DLRCC from 2.72 to 2.71. The Study Area experienced a more pronounced decrease from 2.78 to 2.73, reflecting a trend towards smaller household sizes.

Table 4-6 - Household Size 2016 and 2022

Area	Household Size (2016)	Household Size (2022)
State	2.75	2.74
WCC	2.86	2.84
DLRCC	2.72	2.71
Study Area	2.78	2.73

Source: CSO.ie

4.3.2.5 Children Per Family

Table 4-7 presents census data for the average number of children per family in 2016 and 2022. It also provides details of the change between 2016 and 2022.

A decrease in the number of children per family was observed at the national and council levels, with both the national average and WCC decreasing by 2.9%, and DLRCC by 3.1%. The Study Area experienced a more substantial decline of 4.6%, indicating a sharper reduction in family size compared to national and county levels.

Table 4-7 - Average Children Per Family 2016 and 2022 & Change (%)

Area	Average Children Per Family (2016)	Average Children Per Family (2022)	(%) Change 2016-2022
State	1.38	1.34	-2.9
WCC	1.40	1.36	-2.9
DLRCC	1.28	1.24	-3.1
Study Area	1.31	1.25	-4.6

4.3.2.6 Affluence and Deprivation

The Pobal Deprivation Index is Ireland's most widely used social gradient metric, which scores each small area (50 – 200 households) in terms of affluence or disadvantage. The index calculates this score using information from the Census, such as employment, age profile, and educational attainment. The Pobal Deprivation Index does not provide details at county council levels.

Table 4-8 states the Pobal Deprivation Index at a county level (Wicklow and Dublin) for 2016 and 2022 and the percentage of change. Both counties are classed as “marginally above average”. Both Wicklow and Dublin experienced reductions in deprivation levels, with the Pobal Deprivation Index decreasing by 22% in Wicklow and 35% in Dublin, indicating improvements in socio-economic conditions.

Table 4-8 - Pobal Deprivation Index 2016 and 2022 & (%) Change

	Pobal Index (2016)	Pobal Index (2022)	(%) Change 2016-2022
Wicklow	1.43	1.12	-22%
Dublin	4.12	2.69	-35%

Source: Pobal.ie

As noted above, the Study Area comprises a large number of small areas. The closest small areas to the Proposed Development's Site are classified as 'marginally below average' and 'marginally above average' in 2022. The majority of small areas within the Study Area are classified as 'marginally above average' in 2022. Between 2016 and 2022, no major changes were observed. See Figure 4-4 and Figure 4-5.

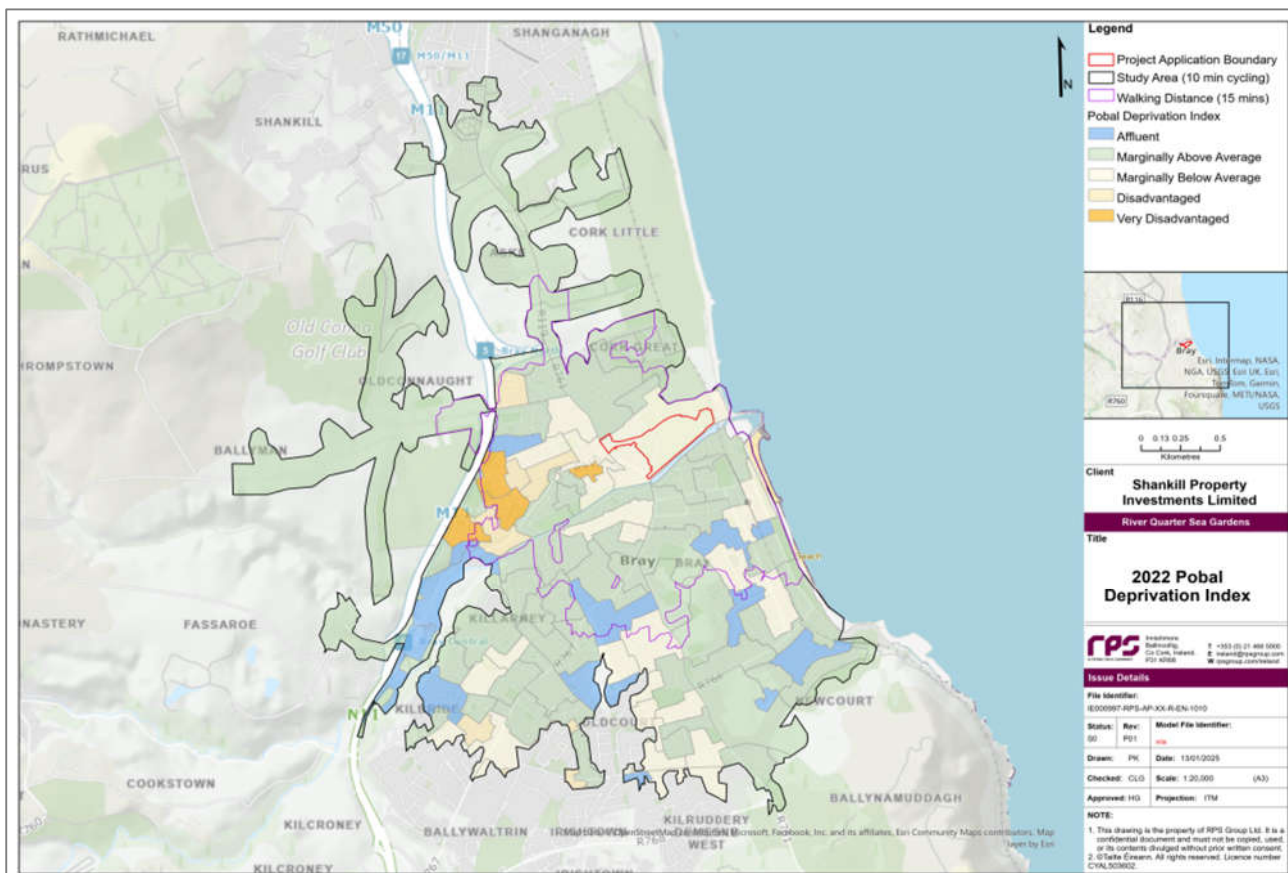


Figure 4-4 - Pobal Deprivation within the Study Area 2022

Legend

- Project Application Boundary
- Study Area (10 min cycling)
- Walking Distance (15 mins)
- Pobal Deprivation Index
 - Affluent
 - Marginally Above Average
 - Marginally Below Average
 - Disadvantaged
 - Very Disadvantaged

Client
Shankill Property Investments Limited
River Quarter Sea Gardens

Title
2016 Pobal Deprivation Index

Issue Details

File Identifier: E000097-RP3-APX-R-EN-1010	
Status: SD	Rev: P01
Model File Identifier: rev	
Drawn: PK	Date: 13/01/2025
Checked: CLO	Scale: 1:20,000 (A3)
Approved: HG	Projection: ITM

NOTE:

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Source: RPS based on Pobal Deprivation Index (Pobal.ie)

Table 4-9 presents census data about people's principal employment and economic status in 2016 and 2022. It includes information on the unemployment rate, calculated by adding the number of unemployed persons to first-time job seekers and then dividing the total by the overall labour force (i.e., the total number of unemployed persons and employed persons).

Principal economic status / Year			State		WCC		DLRC C		Study Area	
			2016	2022	2016	2022	2016	2022	2016	2022
Employed			2,006,641	2,320,297	59,134	68,873	95,925	106,476	14,473	15,655
Looking for Regular Job	First		31,434	34,526	791	955	927	1,223	178	237
Unemployed or given up Previous Job			265,962	176,276	7,812	5,328	6,789	5,827	1,762	1,252

Principal economic status / Year	State		WCC		DLRC C		Study Area	
	2016	2022	2016	2022	2016	2022	2016	2022
Student	427,128	459,275	11,880	13,148	25,644	25,396	3,035	2,958
Looking after home/family (inc. looking after relative)	305,556	272,318	10,164	9,365	13,801	12,237	2,135	1,911
Unable to work due to permanent sickness or disability	158,348	189,308	4,246	5,232	4,071	4,964	1,130	1,299
Other	14,837	27,062	409	904	483	950	87	216
Retired	545,407	657,790	15,722	19,79	30,339	34,484	4,232	5,077
Total	3,755,313	4,136,852	110,158	123,597	177,979	191,557	27,032	28,605
(%) Unemployment Rate 2016 - 2022	12.9%	8.3%	12.7%	8.3%	7.4%	6.2%	8.5%	6.3%

Source: CSO.ie

More recent data on employment is provided in the CSO Labour Force Survey, which is published quarterly. This shows that in Q3 2024 the national unemployment rate was 4.5%.

4.3.3 Local Services / Amenities

The Proposed Development's Site is located within Bray and c. 500 m from Bray's town centre, which is served by a wide range of social and community facilities typical of a large town.

Local Services / Amenities (Social and Community Infrastructure) includes a wide range of services and facilities, including health, education, community, culture, play, faith, recreation, and sports facilities that contribute to quality of life.

An audit of existing social and community facilities (see Appendix 4.1) within the Study Area has been prepared, and details of findings are presented in the subsequent sections. Overall, the findings of the audit reveal that due to the Proposed Development's Site proximity to Bray town and within sustainable walking and cycling distance from the town centre, there is a comprehensive range of existing services across the different categories of social and community infrastructure (i.e., childcare and preschools, education and further education facilities, open space, sports and recreation facilities, health & well-being, other social and community services, etc.).

4.3.3.1 Childcare Facilities

There are 19 existing childcare facilities and preschools in the Study Area, and they have a combined capacity of 382 spaces. 10 of the facilities are within a 15-minute walking distance.

The location of primary childcare facilities and preschools within the Study Area is illustrated in Figure 4-6; details of the identified facilities and capacity are presented in Table 4-10.

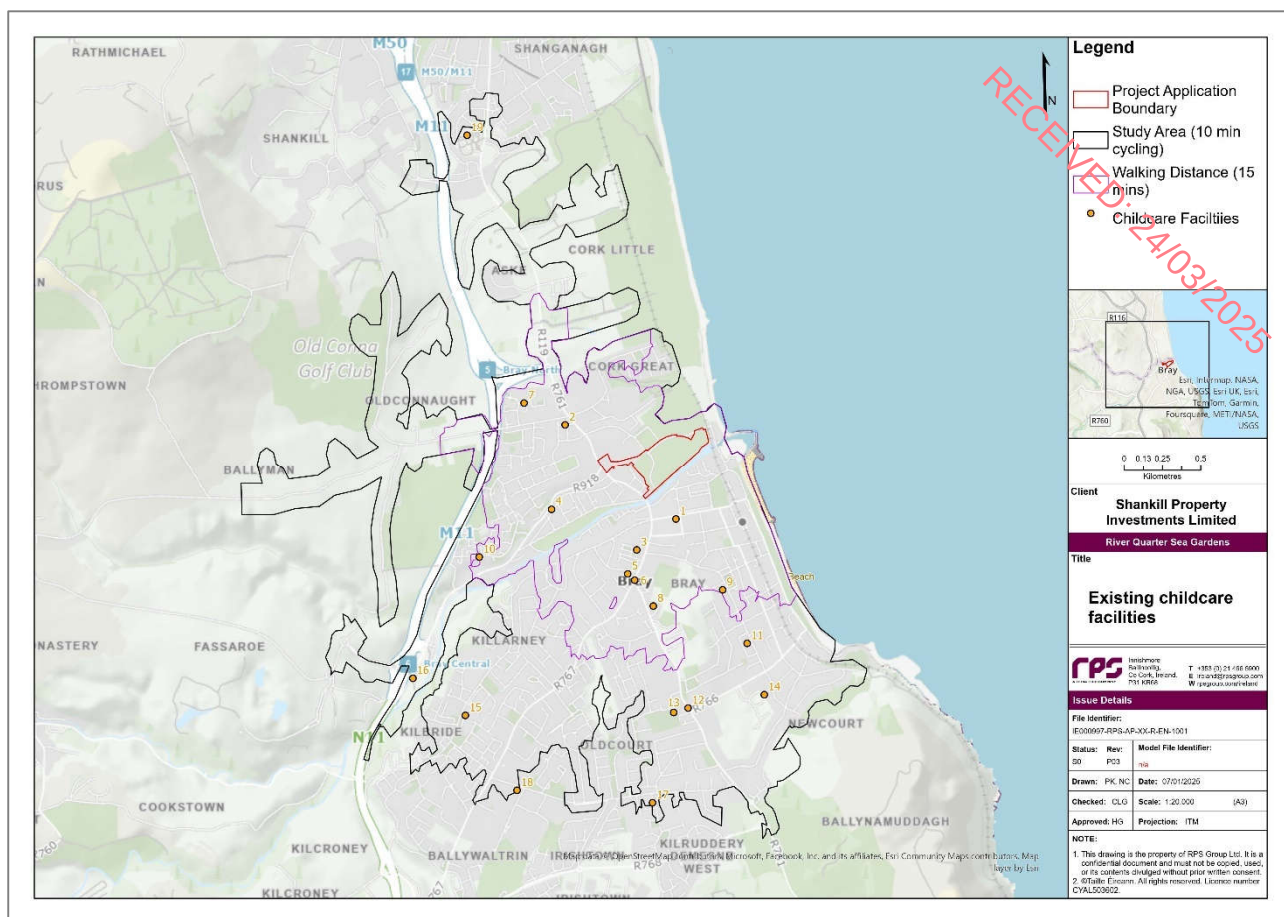


Figure 4-6 - Existing Childcare Facilities within the Study Area

Source: RPS

Table 4-10 - Childcare Facilities within the Study Area

Label	Name	Address	Service	Age Profile	Capacity	Distance to Site (m)
1	Tus Nua Montessori and	St. Andrew's Church Hall, Quinsborough Road	PT	2 - 6	44	c. 388
2	Hollyoaks Montessori Pre-	Saint Peter's National School, Ledwidge	Sessional	2 – 6	22	c. 526
3	LMNO Childcare	Purcell Lane, Bray	FT, PT, Sessional	2 – 6	39	c. 566
4	The Marian Centre Ltd	The Marian Centre, Green Park Road, Bray	Sessional	2 – 6	53	c. 720
5	Little Bunnies Montessori	Unit 1, Parnell Road, Bray	Sessional	2 – 6	44	c. 842
6	Belmont	235 Belmont, Bray	Sessional	3 – 6	11	c. 896
7	Cois Cairn Community	Cois Cairn, Bray	Sessional	2 – 6	22	c. 1,018
8	An Naionra Gaelscoil Uí Chéagaigh	Gaelscoil Uí Chéadaigh, Vevay Road, Bray	Sessional	2 – 6	33 (Max. 16 PT)	c. 1,172

Label	Name	Address	Service	Age Profile	Capacity	Distance to Site (m)
9	Clare Elizabeth Crèche	1 Ellerslie Villas, Bra	FT	1 – 6	49 FT and 51 Sessional	c. 1,301
10	Little Rascals Crèche	Little Bray Resource & Development Centre, New Ard Chualann, Fassaroe, Bray	PT, Sessional, Drop-In	0 – 6	14	c. 1,662
11	Westfield Montessori School	Sidmonton Road, Bray	PT, Sessional	2 – 6	11	c. 1,926
12	Little Oaks Academy	Vevay Road, Bray	PT	2 – 6	33	c. 2,326
13	Mother Goose Montessori	Wolfe Tone District Youth Club, Temple Sport Field, Bray	Sessional	2 – 6	40	c. 2,348
14	Cuala Montessori	3 Cuala Grove, Bray	PT, Sessional	2 – 6	22 (Max. 16 PT)	c. 2,496
15	Coillte Academy Pre-school	2 Cill Sarain, Bray	PT, Sessional	2 – 6	22 (Max. 17 PT)	c. 3,055
16	Little Harvard Crèche & Montessori	Little Harvard Crèche & Montessori, La Vallee, Bray	FT, PT, Sessional	0 – 6	104 (Max. 94 FT)	c. 3,074
17	Scallywags Childcare	25 Bentley Avenue, Bray	Sessional	2 – 6	22	c. 3,310
18	The Marian Centre Ltd	Ballywaltrim Community Centre, Schools Road, Bray	Sessional	2 – 6	30	c. 3,467
19	Discoveries Crèche & Montessori	Olcovar, Dublin 18	FT, PT, Sessional	0 – 6	54	c. 3,796

*FT = Full Time, PT = Part Time

Source: Tusla.ie

Permitted Childcare / Preschool Facilities

The current application represents Phase 2 of the overall Sea Gardens Masterplan. In this regard, the already permitted phases (ABP-311181-21 and ABP-314686-22) include providing a childcare facility with 88 childcare spaces for the needs generated by 586 residential units. The childcare demand assessment submitted with the application (ABP-314686-22) confirmed that the proposed 88 childcare spaces were in excess of the demand from the subject development. Furthermore, it is noted that the reports prepared by ABP's inspectors noted that the childcare facility was acceptable in meeting the demand generated by the developments.

In addition to the above, a desktop review of the planning history of the Study Area has also been completed in order to identify recent planning permissions for new childcare/preschool facilities.

▪ **ABP-305844-19 and ABP-30584419/E**

Development comprising 685 residential units (207 houses, 478 apartments), childcare facility, and associated site works.

ABP issued a grant of permission in February 2020. Condition no. 2, attached to the permission, required that the proposed childcare facility be increased to accommodate approximately 148 children. This accords with DLRCC's recommendation based on discounting the one-bedroom units and providing 20 childcare places per 75 units.

An application for an extension of duration under reference ABP-30584419/E was made to DLRCC, and the grant was issued in September 2024.

▪ **ABP-306583-20**

Development comprising 597 residential units and a childcare facility that can accommodate 107 children. Provision had been made for 20 childcare places per 75 residential units, excluding 1-bed and studio units.

In July 2020, ABP approved the application under section 175 of the Planning and Development Act 2000.

▪ **WCC 2446 and ABP-319474-24**

Development comprising 178 residential units and a childcare facility (428 sq.m) that can accommodate 30 children (i.e., excluding 1-bed and studio units).

Initially permitted by WCC and subsequently permitted in July 2024 by ABP following a third-party appeal. ABP's Inspector noted that the childcare facility will serve both residents and the community.

In light of the above, 373 childcare spaces have been permitted within the Study Area, complementing the 382 childcare spaces identified in the audit of existing childcare/preschool facilities in the Study Area.

4.3.3.2 Education Facilities

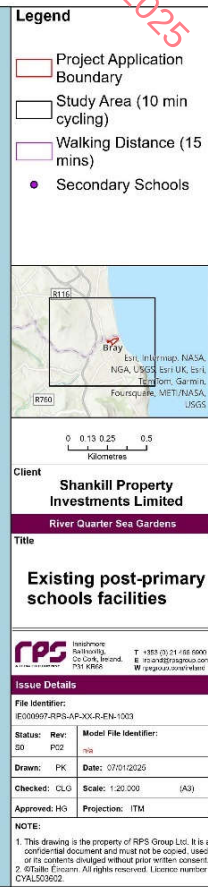
4.3.3.2.1 Primary Schools

There are 8 primary schools within the Study Area with a combined enrolment of 2,610 pupils between the ages of 5-12. The closest school to the Proposed Development's site is Ravenswell Primary School, (c. 38 m), which caters for 496 pupils.

The location of primary schools within the Study Area is illustrated in Figure 4-7; details are presented in Table 4-11.

ment 3,234. The closest p
School (c. 50 m), which ca
4-8; details are presente

The location of post-primary schools within the Study Area is illustrated in Figure 4-8; details are presented in Table 4-12.



Source: RPS

Label	Secondary School Name	Address	Enrolment Number	Distance to Site (m)
1	North Wicklow Educate Together Secondary School	Dublin Road, Bray	333	c. 50
2	Coláiste Raithín	Bóthar Bhaile Átha Cliath, Bré	351	c. 93
3	Woodbrook College	Dublin Road, Woodbrook, Bray	588	c. 931
4	Loreto Secondary School	Vevay Rd, Bray	718	c. 1,006

5	St. Gerard's School	Thornhill Road, Bray	612	c. 1,495
6	Presentation College	Putland Road, Bray	632	c. 1,562

4.3.3.2.3 Further Education & Training Facilities

There are 2 further education and training facilities in the Study Area, namely Bray Adult Education Centre and Bray Institute of Further Education. Both facilities are located in Bray's town centre (c. 500-600 m distance from the Proposed Development's Site).

The location of further education and training facilities within the Study Area is illustrated in Figure 4-9; details are presented in Table 4-13.

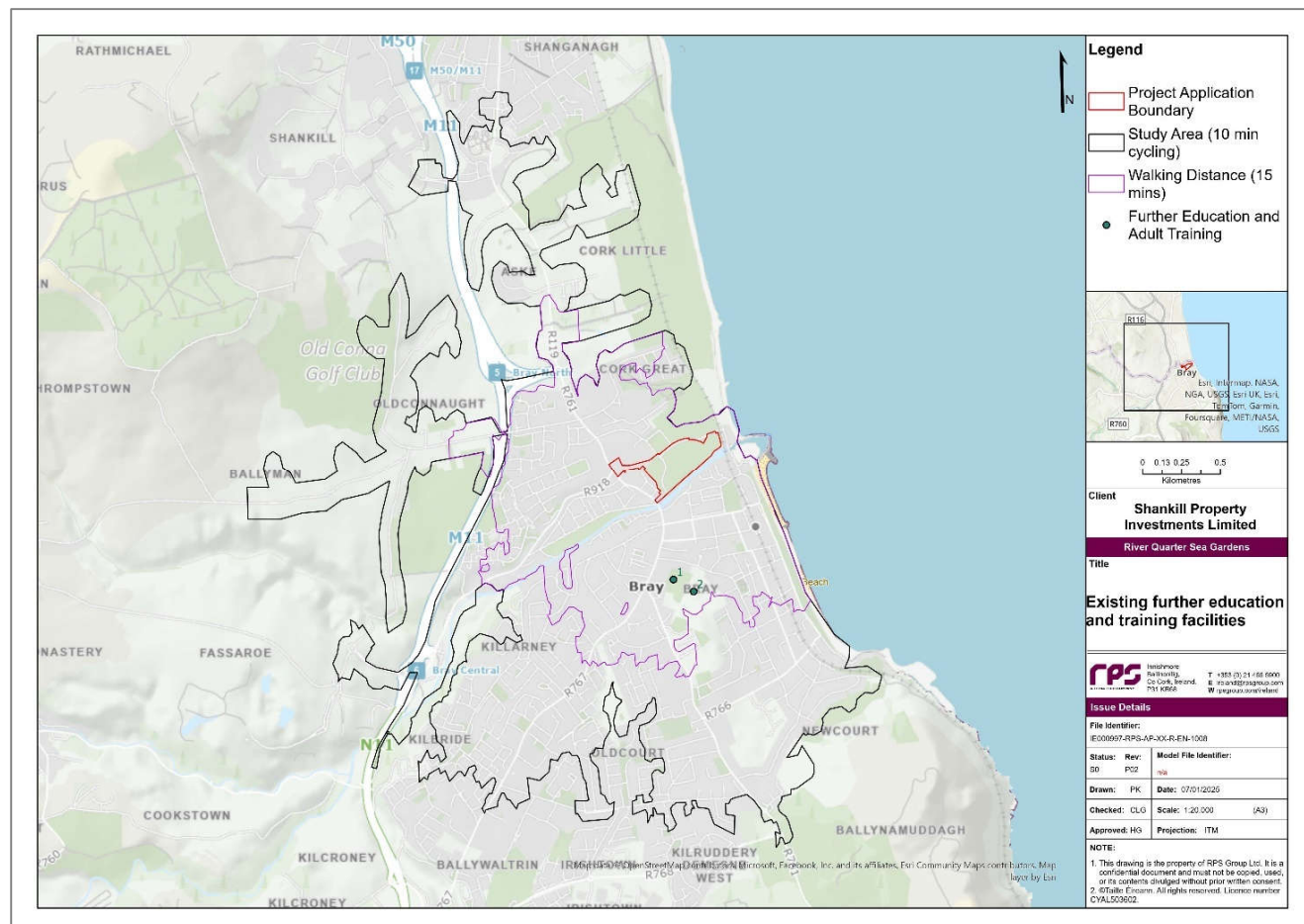


Figure 4-9 - Further Education and Training Facilities within the Study Area

Source: RPS

Table 4-13 - Further Education and Training Facilities within the Study Area

Label	Name	Distance to Site (m)
1	Bray Adult Education Centre	c. 504
2	Bray Institute of Further Education	c. 617

4.3.3.3 Open Space, Sports, and Recreation Facilities

There are 16 open space, sports and recreation facilities within the Study Area, as illustrated in Figure 4-10; details are presented in Table 4-14.

These include 4 public playgrounds and parks, 10 sports facilities and clubs, and 2 other recreational amenities. Notably, 11 of these facilities are within or less 15-minute walking distance from the proposed site, and all are accessible within 10-minutes or less by bicycle.

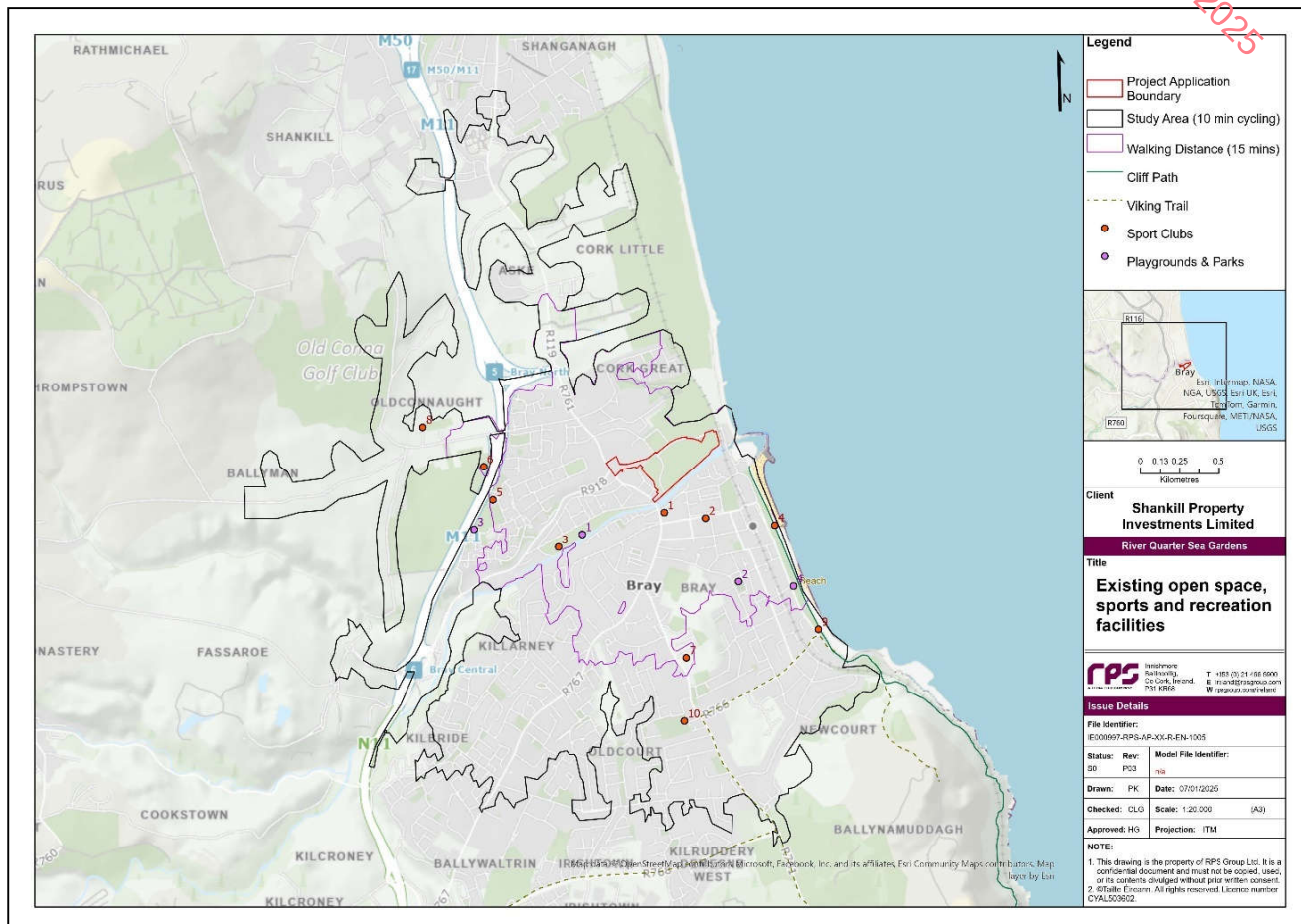


Figure 4-10 - Existing Open Space, Sports and Recreation Facilities

Source: RPS

Table 4-14 - Existing Sport & Recreation Facilities

Label	Name	Sport & Recreation Facility	Distance to Site (m)
Sports Clubs			
1	The Merrill Leisure Club & Spa	Swimming	c. 90
2	Fifth Wicklow Bray Sea Scouts	Hillwalking	c. 295
3	Peoples Park Users Committee	Soccer	c. 587
4	Wicklow Triathlon Club	Triathlon	c. 627
5	Liberty Boxing Club Bray	Boxing	c. 768

Label	Name	Sport & Recreation Facility	Distance to Site (m)
6	Bray Emmets GAA Club	GAA	c. 789
7	Bray Bullets Basketball Club	Basketball	c. 1,022
8	Festina Lente Enterprises Ltd	Equestrian Sports	c. 1,203
9	Bray Rowing Club	Rowing	c. 1,313
10	Wolfe Tone Community Centre	Soccer	c. 1,422
Playgrounds / Parks			
1	People's Park	Playgrounds / Parks	c. 432
2	Sidmonton Park	Playgrounds / Parks	c. 743
3	Fassaroe	Playgrounds / Parks	c. 953
4	Esplanade	Playgrounds / Parks	c. 999
Other Amenity Areas			
N/A	Bray Cliff Path		c. 241
N/A	Bray Viking Trail		c. 1,333

4.3.3.4 Health Services & Wellbeing Facilities

There are 46 health services and well-being facilities within the Study Area as illustrated in Figure 4-8; details are presented in Table 4-14. These include health centres, dentists, general practitioners, nursing homes and pharmacies.

The majority of the facilities are located in Bray's town centre and, thus, are within a short distance of the subject site. More than half of these facilities are within or less than 500 m from the Proposed Development's Site. Similarly, most facilities are within or less of a 15-minute walking distance.

There are 3 health centres within 500 m distance from the Proposed Development's Site, and 9 general practitioners, the majority of those also within 500 m distance.

Those medical General Practices located closest to the Proposed Development's Site are Bray Medical Centre (c. 188 m) and Duncairn Medical Centre (c. 298 m). Bray Medical Centre provides GP services, women's and men's health services, sport pre-participation screening, paediatric health, cardiovascular risk screening and treatment, over 70's health and specialist occupational health services. Duncairn Medical Centre provides GP services, women's health services, mother and baby care and minor surgeries.

The Bray Primary Care Centre, located on Killarney Road, Bray ca. 615 m from the Proposed Development's Site opened in the second half of 2020 and provides specialist diagnostic clinics, GP clinics, dental clinics, drug treatment service, mental health services, physiotherapy and occupational therapy, a new meals on wheel service for older people and those requiring support in Bray and a pharmacy.

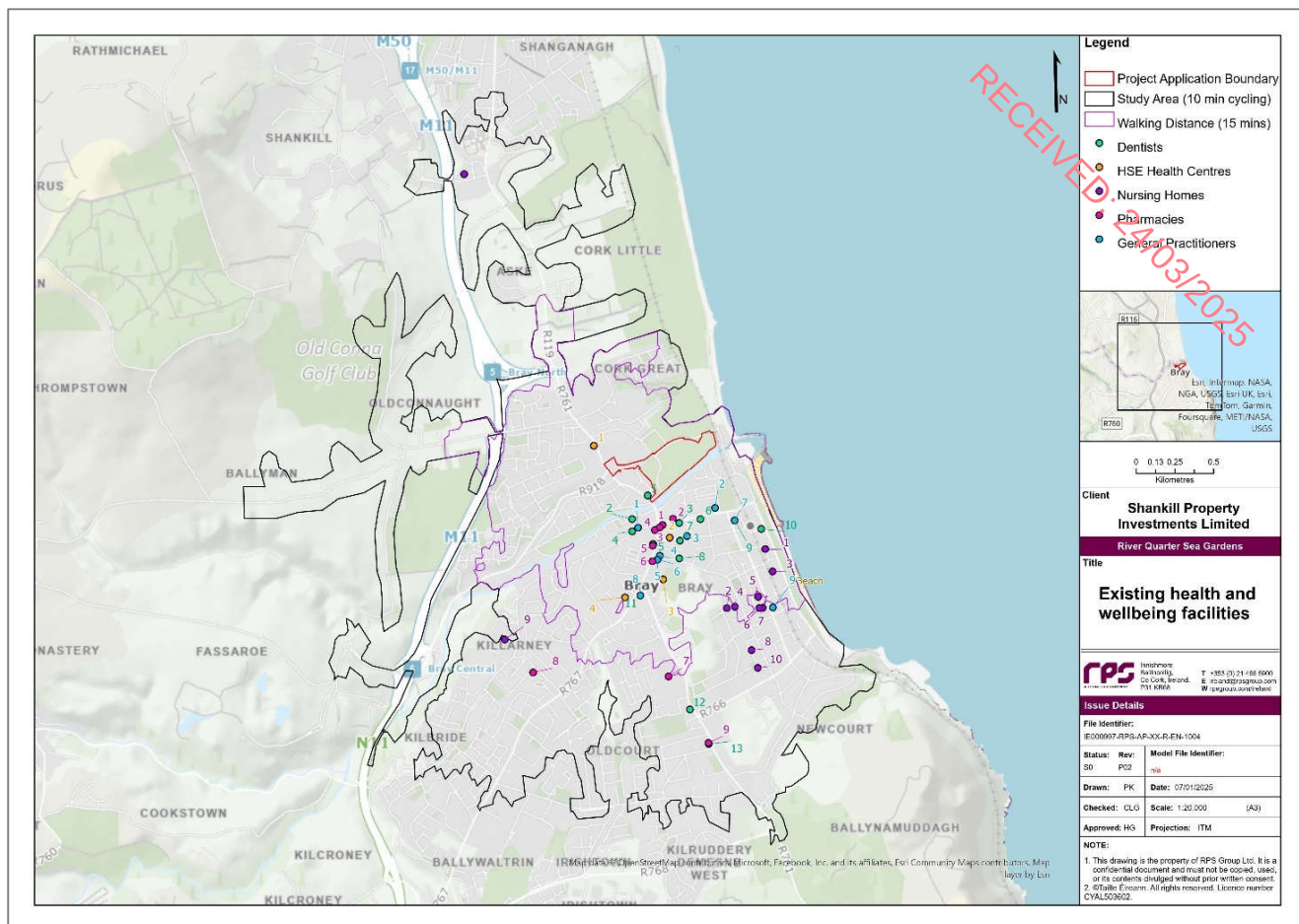


Figure 4-11 - Existing Health & Wellbeing Facilities

Source: RPS

Table 4-15 - Existing Health & Wellbeing Facilities

	Label	Address	Distance to Site (m)
Health Centres			
	1	Rathclaren House, 27 Dublin Road, Bray	c. 133
	2	24 Florence Road, Bray	c. 256
	3	Block B, Main Street, Bray	c. 504
	4	Bray Primary Care Centre, Killarney Road, Bray	c. 639
Dentists			
	1	Dental Practice, Belton House, Castle Street, Bray	c. 28
	2	Lemasney Orthodontics, The Maltings, Bray	c. 170
	3	Dental Practice, 13 Quinsboro Road, Bray	c. 217
	4	Dental Practice, St Georges, Herbert Road, Bray	c. 229
	5	Dental Practice, 93 Main Street, Bray	c. 270

Label	Address	Distance to Site (m)
6	Carlyle Dental Practice, 9 Goldsmith Terrace, Quinsboro Road, Bray	c. 290
7	Dental Practice, 1 Florence Road, Bray	c. 306
8	Dental Practice, 7 Carlton Villas, Novara Avenue, Bray	c. 403
9	Frances Brandon Orthodontic Clinic, Bri Chualann Court, Adelaide Road, Bray	c. 442
10	Dental Suite, 5 Fitzwilliam Terrace, Strand Road, Bray	c. 598
11	Town Dental, Main Street, Bray	c. 608
12	Avondale Dental Clinic, Vevay Road, Bray	c. 1,362
13	Vevay Medical & Dental Practice, 35 Vevay Road, Bray	c. 1,605

General Practitioners

1	Bray Medical Centre, Clonmore, Herbert Road, Bray	c. 188
2	Duncairn Medical Centre, 9 Duncairn Terrace, Quinsborough Road, Bray	c. 298
3	Dargle Clinic, 11a Eglinton Road, Bray	c. 313
4	The Carlton Clinic, 1/2 Carlton Terrace, Novara Avenue, Bray	c. 350
5	Dr. Ernan J. Gallagher, Donard House, Novara Avenue, Bray	c. 374
6	GP Surgery, Donard House, Novara Avenue, Bray	c. 374
7	Bray Women's Health Centre, Bri Chualann Court, Adelaide Road, Bray	c. 443
8	Town Hall Clinic, Market Court, Main Street, Bray	c. 608
9	Bray Family Practice, Saint Helen's, Meath Road, Bray	c. 1,028

Nursing Homes

1	Kinvara House Nursing Home, 3 - 4 Esplanade, Strand Road, Bray	c. 712
2	Donore Nursing Home, 13 Sidmonton Road, Bray	c. 838
3	Shannagh Bay Nursing Home, Strand Road, Bray	c. 852
4	San Remo Nursing Home, 14/ 15 Sidmonton Road, Bray	c. 862
5	Earlsbrook House Nursing Home, 41 Meath Road, Bray	c. 913
6	Roseville Nursing Home, 49 Meath Road, Bray	c. 972
7	Bray Manor Nursing Home, 47 Meath Road, Bray	c. 985
8	Kylemore House Nursing Home, Sidmonton Road, Bray	c. 1,152
9	Cairn Hill Nursing Home, Millers Wood Lodge, Herbert Road, Bray	c. 1,267
10	Tara Care Centre, 5/ 6 Putland Road, Bray	c. 1,270
11	St. Joseph's Centre, Crinken Lane, Shankill, Co. Dublin	c. 2,065

Pharmacies

1	Fitzmaurice's Pharmacy, 1c Quinsboro Road, Bray	c. 161
2	Lawlor's Pharmacy, 24 Quinsborough Road, Bray	c. 169

Label	Address	Distance to Site (m)
3	Hilton's Pharmacy Limited, 2 Main Street, Bray	c. 170
4	Boots, 105 Main Street, Bray	c. 181
5	Vance & Wilson Chemists, 92 Main Street, Bray	c. 280
6	Kennedy's Pharmacy Limited, 35 Main Street, Bray	C 382
7	Downey's Pharmacy, Tesco Shopping Centre, Vevay Road	c. 1,132
8	Cunningham's Pharmacy, 3 Killarney Park, Bray	c. 1,343
9	Roches Chemist, 34 Vevay Road, Bray	c. 1,598

4.3.3.5 Other Social and Community Facilities

There are 16 social and community facilities in the other social and community services category. These include 2 libraries, 1 Garda Station and 13 other facilities (e.g., ATMs, post offices, banks, art centre, etc).

The majority of the facilities are located in Bray's town centre and, thus, are within a short distance of the subject site. More than half of these facilities are within or less than 500 m from the subject site. Similarly, most facilities are within or less of a 15-minute walking distance.

The location of other social and community services within the Study Area is illustrated in Figure 4-12; details are presented in Table 4-16.

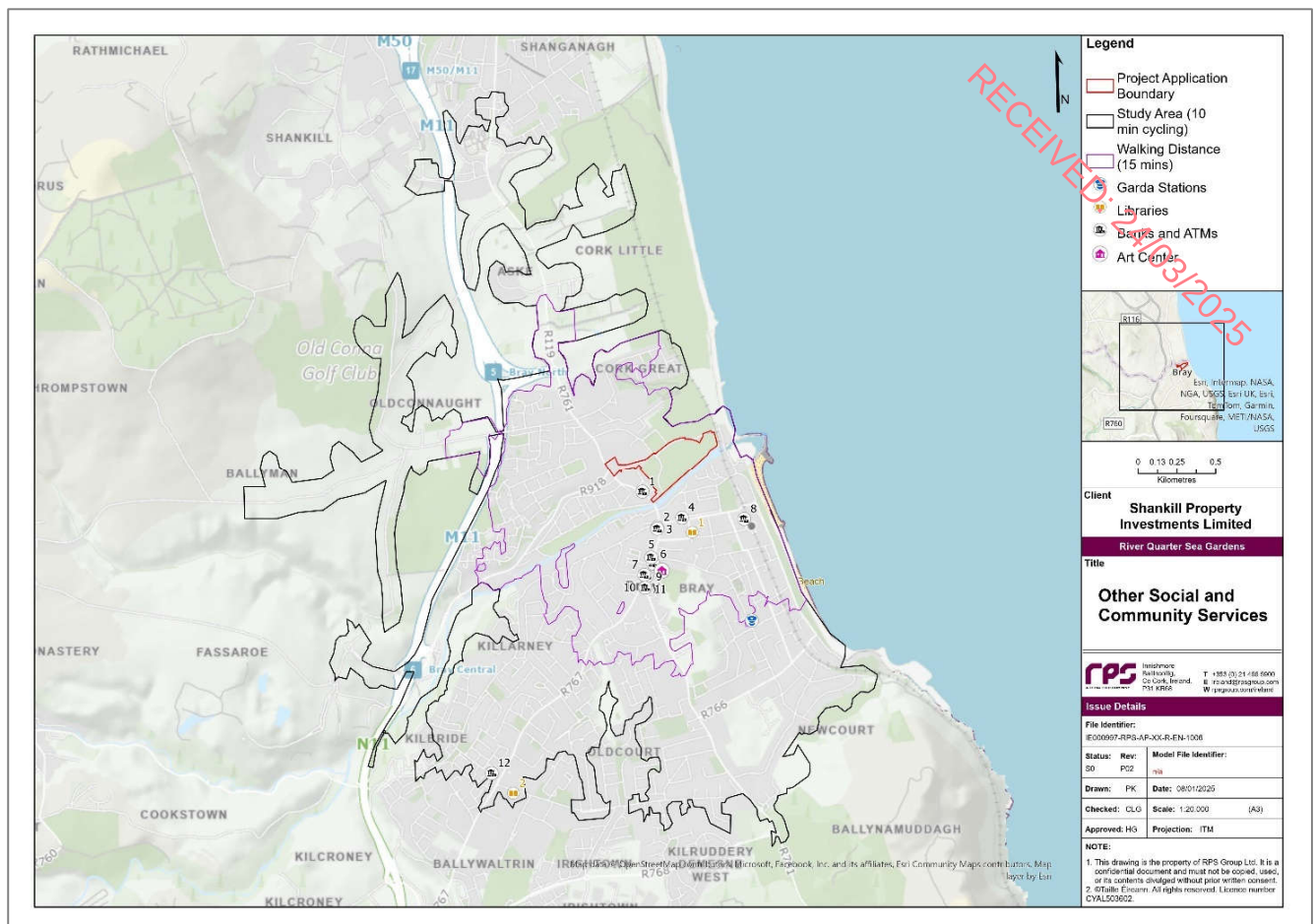


Figure 4-12 - Other Social & Community Services

Source: RPS

Table 4-16 - Other Social & Community Services

Label	Name / Service	Distance to Site (m)
Library		
1	Post , Eglinton Road	c. 311
2	Ballywaltrim Library, Boghall Road	c. 2,079
Garda Station		
1	Bray Garda Station	c. 992
Other Services including Post Offices, Banks, ATMs & Defibrillator		
1	Post Office	c. 75
2	Bank (AIB)	c. 162
3	ATM (AIB)	c. 172
4	Post Office	c. 198
5	Bank (EBS)	c. 355
6	ATM	c. 394

7	Bank (PSTB)	c. 470
8	ATM (PSTB)	c. 470
9	Bank (Bank of Ireland) and ATM	c. 476
10	Defibrillator	c. 550
11	Credit Union (East Coast)	c. 552
12	Post Office	c. 2,032
Arts Centre		
1	Mermaid County Wicklow Arts Centre	c. 443

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4.3.4 Human Health

The Department of Health's report *Health in Ireland Key Trends, 2023* provides statistical analysis on health in Ireland over the last 10no. years. Chapters 1 and 2 of the report deal specifically with life expectancy and health. Life expectancy data shows that there has been a continual upward trend for women since 1996 and it currently stands at 84.3 years. Male life expectancy has shown a continual rise since 2006 and now stands at 80.5 years. It is also noted in the report that the gap between male and female life expectancy has continued to narrow over the last decade. Overall life expectancy has increased by ca. 33% at age 75 since 1997. An upward trend is evident in the life expectancy of older age groups reflecting decreasing mortality rates from major diseases. Older Irish people's life expectancy (65 years of age) to be lived in good health, is higher for both men and women compared with the EU average.

The report also states that "*Ireland has the highest self-perceived status in the EU, with 80.0% of people rating their health as good or very good*". Overall population health at the national level shows decreasing mortality and a rise in life expectancy over the last ten years. The health in Ireland report also goes on to state, "*age-standardised mortality rates have declined for all causes over the past decade by 10.3%*," which is relatively equal to the EU average.

The vast majority of people in Wicklow (85.4%) reported that their health was good and very good (CSO, 2022).

The receiving environment for human health in the context of biophysical factors such as air quality, climate, noise and water, as relevant are outlined in Land, Soils and Geology (Chapter 6), Water (Hydrology and Hydrogeology) (Chapter 7), Air Quality (Chapter 8), Climate (Chapter 9), Noise & Vibration (Chapter 10), Traffic (Chapter 12), Material Assets (Chapter 14).

4.3.5 Risk of Major Accidents and Disasters

The 2022 EIAR Guidelines state that an EIAR must include the expected effects arising from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project. There are two key considerations; the potential of the project to cause accidents and/or disasters and the vulnerability of the project to potential disasters/accidents.

The Site location is outside the consultation zones of all SEVESO Sites and is therefore considered to not be susceptible to any particular exceptional human health risks.

4.4 Potential Impacts on Population and Human Health

For the purposes of this assessment, the potential impacts of the demolition and construction and operational phases of the Proposed Development have been assessed.

The predicted impacts will be discussed having regard to their character, magnitude, duration, consequences and significance. Potential Impacts are considered under the following headings:

- Land use and Settlement Pattern;
- Demographics and Local Population;
- Economic Activity and Employment;
- Local Services / Amenity;
- Human Health; and
- Risk of Major Accidents or Disaster.

4.4.1 Demolition and Construction Phase

4.4.1.1 Land Use and Settlement Pattern

Bray is the largest town in County Wicklow, situated in a strategic location within the metropolitan area and at the eastern gateway to the County. The town has high-capacity transport links with Dublin City and surrounds via the N11 / M11 transportation corridor (including M50), DART/ rail line and quality bus service. The ongoing economic growth of this core town is positive; this, along with the population increase in Bray and its environs over the last ten years, suggests that the proposed residential development is in line with existing and emerging trends for the area. Compliance with Wicklow County Council Development Plan 2022-2028's zoning and site-specific local objectives are discussed separately in the Planning Report prepared by RPS, submitted as part of this application documentation.

The Site is located within the former Bray Golf Course lands. Once a golf course, these lands are currently undergoing significant transformation. A new school development has been built, and high-density residential-led developments and are currently under construction Phase 1a and Phase 1b of the Sea Gardens Masterplan. These developments are changing the previous land use of these lands from mostly recreational (i.e., golf course) towards a more mixed-use. Regarding land use, the Proposed Development's Site is currently zoned with land use zoning objective Mixed Use 'MU'. The Proposed Development will consist of a mixed-use development, including residential, retail and commercial uses and supportive social and community uses.

The Proposed Development will, therefore, result in a permanent change from a former golf course to a mixed-use development. This change is consistent with trends emerging in the receiving/adjoining lands and the land use zoning objective set at the local planning level; thus, it complies with statutory land use zoning.

There will be no severance of land, loss of rights of way, or impacts to existing connections or amenities as a result of the construction works associated with the Proposed Development. The Site will temporarily be a construction Site. The construction phase of the Proposed Development will primarily consist of site clearance, demolition works, excavation (and piling as required) and construction works, and has the potential to impact adversely and result in the temporary degradation of the local visual environment on a short-term basis. The visual impacts of the Proposed Development during the construction stage are assessed in greater detail in Chapter 11 - Landscape and Visual Impact Assessment.

Secondary land use impacts include off-site activity in relation to building materials and appropriate disposal sites for removed spoil. Construction and demolition works are addressed in more detail in the Construction Environmental Management Plan (CEMP) (document ref.:0089313DG0029) and Construction Resource and Waste Management Plan (CRWMP) (document ref.: 0089313DG0004) prepared by AtkinsRéalis Consulting Engineers.

The construction phase impacts on land use and settlement pattern will be adverse, short term in duration, limited in extent and slight in significance. In EIAR terms, these are not significant.

4.4.1.2 Demographics and Local Population

The construction phase is considered unlikely to result in a significant increase or decrease in the local population. Construction workers would be anticipated to travel from their existing residence instead of using temporary accommodation in the local area. There will, however, be a short-term increase in the local working population during the construction phase of development.

The impact of construction on the local population is considered to be neutral, imperceptible and short-term in nature. Therefore, the impact is not considered to be significant in EIAR terms.

4.4.1.3 Economic Activity and Employment

A significant portion of the capital inputs required for construction will require the purchase of Irish-sourced goods and services. The construction phase will boost the local construction sector in terms of employment generation and capital spent on materials and construction labour costs.

It is difficult to estimate the number of employees who will be engaged on a phased residential development such as this. During peak activities, approximately 100 operatives are expected to work directly on the construction site. However, for much of the construction period, the level of operatives on site shall be considerably less than this. The staff will comprise of managerial, technical, skilled and unskilled workers.

As far as practicable, local labour or those construction workers already working in the immediate area will be employed. It is unlikely that the Proposed Development will increase the population of the area as a result of the construction phase.

In addition to direct employment, there will be off-site employment and economic activity associated with the supply of construction materials and provision of services, such as professional firms supplying financial, architectural, engineering, legal and a range of other professional services to the project. There will also be induced employment arising from the spending of those employed directly and indirectly. The Transport Infrastructure Ireland document *Transport Research & Information Note - The Employment Benefits of Investment Projects* has provided estimates of employment effects arising from various types of construction projects, including social housing. This effectively estimates that employment effects will be 56.3% direct, 30.4% indirect, and 13.3% induced.

The impact of construction on economic activity and employment is considered to be moderate, positive, and short-term in nature. Therefore, the impact is not considered to be significant in EIAR terms.

4.4.1.4 Local Services/Amenities

Specific potential effects on local services/amenities are considered under the specific topics of the environmental media by which they might be caused, including air, traffic, and noise.

Having reviewed the assessment carried out under Chapter 8 – Air Quality, Chapter 10 – Noise and Vibration and Chapter 12 – Traffic, it is determined that the construction stage will not have significant impacts on the population with regard to local services/amenities following the implementation of best practices and proposed mitigation measures.

Overall, the impact of construction on local services/amenities is considered to be imperceptible, neutral and short-term. Therefore, the impact is not considered to be significant in EIAR terms.

4.4.1.5 Human Health

The potential likely significant effects on human health during construction are described in Table 4-17. This table identifies the potential source of the impact; potential impact pathways (route by which receptors can become impacted) and potential effects arising from the potential impact.

Table 4-17 - Potential Significant Effects to Human Health during Construction

Potential Impact	Significant	Potential Impact Pathway	Significant	Potential Effect	Significant	Significant Effect?
Noise from Construction Traffic		Noise impact on sensitive receptors		Indirect health effect on sensitive receptors		Discussed further in Chapter 10 – Noise and Vibration and Chapter 17 Interactions
Noise from Construction Works		Noise impact on sensitive receptors		Indirect health effect on sensitive receptors		Discussed further in Chapter 10– Noise and Vibration and Chapter 17 Interactions
Noise on existing structures from Construction		Noise impact on sensitive receptors		Indirect health effect on sensitive receptors		Discussed further in Chapter 10 – Noise and Vibration and Chapter 17 Interactions
Vibration from Construction Works		Vibration impact on sensitive receptors		Indirect health effect on sensitive receptors		Discussed further in Chapter 10– Noise and Vibration and Chapter 17 Interactions
Surface or Groundwater Impact during Construction Works		Potential Water Quality water impact on sensitive receptors		Direct health effect on sensitive receptors		Discussed in Chapter 7 – Water and Chapter 17 Interactions
Soil Contamination during Construction Works		Potential Soil Quality impact on sensitive receptors		Direct health effect to sensitive receptors due to direct contact, ingestion or inhalation of contaminated soils		Discussed further in Chapter 6– Land, Soils and Geology and Chapter 17 Interactions
Employment from Construction Works		Economic impact on sensitive receptors		Increase in employment opportunities for sensitive receptors		Discussed further within this Chapter
Visual Impact from Construction Works		Visual impact on sensitive receptors		Temporary indirect health effect on sensitive receptors		Discussed further in Chapter 11 - Landscape and Visual and Chapter 17 Interactions
Dust generation from Construction Works		Air quality impact on sensitive receptors		Temporary direct health effect on sensitive receptors		Discussed further in Chapter 8 – Air Quality and Chapter 17 Interactions

Emissions from Construction Vehicles & Machinery	Air quality impact on sensitive receptors	Indirect health effect on sensitive receptors	Discussed Further in Chapter 8 -Air Quality, Chapter 9 - Climate and Chapter 17 Interactions
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The construction phase of the development will lead to temporary traffic, noise and vibration, dust generation and visual impact within the site and the general vicinity. The proposed development complies with the statutory land use zoning. There will be no severance of land, loss of rights of way, or impacts to existing connections or amenities as a result of the construction works associated with the proposed development, provided the mitigation measures proposed in this EIAR are followed.

All impacts are predicted not to be significant and short term in nature, as determined by the assessments included in the aforementioned chapters. Further details of the construction phase are discussed in, Chapter 6: Land, Soils and Geology, Chapter 7 – Water, Chapter 8: Air Quality, Chapter 9: Climate, Chapter 10: Noise and Vibration, Chapter 11 – Landscape and Visual and Chapter 12: Traffic.

Construction impacts are likely to be short term and will be subject to control via the implementation of required mitigation measures (as presented in Chapter 18 – Volume 2 of this EIAR) and a CEMP. The construction methods employed and the hours of construction proposed will be designed to minimise potential impacts. The development will comply with all Health & Safety Regulations during the construction of the project. As a result, the proposed development will result in temporary construction related Population and Human Health effects (minor adverse), but mitigation measures will be applied.

4.4.1.6 Risk of Major Accidents or Disasters

There is always the possibility of unplanned events (including traffic/machinery accidents, fire, collapse/equipment failure and spill/leaks of fuel, chemicals or paint) occurring during the construction phase of a development of this scale given the type of work being carried out. However, the potential human health risk will be reduced and managed through the implementation of mitigation measures as detailed further in Section 4.5.

In summary, the construction phase impacts on human health will be adverse, short term in duration, limited in extent and not significant.

4.4.2 Operational Phase

4.4.2.1 Land Use and Settlement Pattern

The Proposed Development complies with the statutory land use zoning and national (National Planning Framework) and regional (Regional Spatial and Economic Strategy) policies supporting the provision of additional housing, the delivery of compact and sequential growth through the development of existing brownfields and underutilised sites within the existing built-up areas of cities, towns and villages.

The Proposed Development also aligns with the National Planning Framework policy supporting the better use of under-utilised sites in accessible urban locations benefitting from public transport and other facilities.

The Proposed Development includes a network for pedestrians, cyclists and vehicles, linking future residents to existing public transport services, cycling and pedestrian networks, adjacent developments and local social and community facilities.

The operational phase of the Proposed Development will provide mixed development land use, which will provide much-needed housing and amenities for the growing population of the immediate area. A significant quantity of open space consisting of recreational and amenity space is also proposed, underpinning healthy communities.

The provision of a residential community with supporting ancillary and community facilities, commercial and retail facilities and a hotel as proposed will have a moderate, positive impact of permanent duration on land use and settlement.

4.4.2.2 Demographics and Local Population

Once the development has been constructed and occupied, the most significant impact will be an increase in the resident population.

The Proposed Development of 341 residential units can be expected to accommodate c. 931 residents based on Study Area's average household size (2.73). The Proposed Development will include residential units ranging from 1 to 4 bedrooms and capable of accommodating 2 to 8 people, details of which are provided in Appendix 4.1. Full occupancy, based on the number of bedrooms per unit, can generate a population of up to 1,587 residents. Considering these two estimates, it is expected that a robust calculation of the potential population is to be between these two figures, i.e., 1,250 new residents.

An increase in the population of Bray accords with its designation as a 'Key Town' in the Regional Spatial and Economic Strategy.

The impact of the increased number of residents in the local population is considered to be neutral, moderate, and long-term in nature.

4.4.2.3 Economic Activity and Employment

The constrained housing supply has been identified as a potential threat to the competitiveness and economic growth of the Greater Dublin Area. The proposed 341 residential units represent an increase in the overall housing supply and, as such, contribute positively to economic activity.

There will also be a modest number of people directly employed in the proposed childcare facility, medical centre, hotel, retail/retail services units and general management operatives.

The future resident population will generate additional spending within the area which will likely have a long-term moderate positive impact on economic activity within Bray. New residents, the working population, and users and visitors to proposed facilities (i.e., childcare, medical centres, hotels, etc.) will have a permanent moderate positive impact on local economic activity and employment.

4.4.2.4 Local Services/Amenities

The Proposed Development comprises 341 residential units made up of houses, duplexes and apartments. In addition to the residential component, the proposed development also includes the following:

- **Childcare Facility:** This facility is located in Block H; with a capacity for 150 children.
- **Medical Centre:** This facility is also proposed for Block H.

The development will provide supporting amenities, including:

- **Open Spaces**
 - Approximately 1.8 ha (c. 18,458 sq.m) of public open spaces will be created in Phase 2, including Central Park. The development will also feature hard and soft landscaping for public and communal areas, as well as boundary treatments. These open spaces will be accessible to both residents and visitors.
 - The proposed Central Park will incorporate play areas .

- **Communal Open Spaces**

- Dedicated communal gardens for residents will be provided in Blocks E and H.
- Dedicated communal gardens for duplex units will be provided in the community gardens.
- Block I, which is proposed as a hotel, will also include gardens.

- **Private Open Spaces**

- Each residential unit will have dedicated private open spaces, such as rear gardens and/or balconies/terraces.

- **Play Areas**

- The proposed development includes the provision of children's play areas distributed across the proposed open spaces, i.e., the community garden and public open spaces.

- **Residents' Amenity Spaces**

- Block E will feature a multipurpose room, co-working space, cinema room, gym, and a lobby with a lounge area and post room.

- **Accessibility Infrastructure:**

- The proposed development will involve constructing an internal road network consisting of local streets, local link streets, home zones and access routes. Local link streets include fully segregated cyclist and pedestrian facilities. The home zones and local link streets include shared cyclist and vehicle carriageways and fully segregated pedestrian facilities.
- The proposed development has been designed to facilitate the future provision of a sustainable transport bridge subject to a separate consenting procedure.
- The proposed development includes provision of resident and visitor bicycle parking.

- **Other Social & Community Spaces**

- Block I, the proposed hotel, will include a wedding venue, a rooftop restaurant, and a wellbeing centre (with a swimming pool and gym). A separate public access area will cater to hotel guests and the local community.

- Additionally, a number of retail/retail services units will be distributed across Blocks E, G, H and I.

The provision of these facilities within the development will be of benefit to future residents and existing residents in the local environs.

Regarding childcare services and demand, the childcare demand assessment included with the *Social Infrastructure Audit* (see Appendix 4.1) concludes that the proposed childcare facility, with a capacity of 150 spaces, will be able to absorb the likely demand generated by the scheme. Given the declining trend in the childcare-age population, the proposed development's childcare provision is well-positioned to meet current and future needs. In this regard, it is planned that the proposed childcare facility will also meet future demand from other phases of the Sea Gardens Masterplan.

In terms of educational services and demand, the primary and post-primary school demand assessment included with the *Social Infrastructure Audit* (Appendix 4.1) concludes that the likely primary and post-primary school demand generated by the scheme can be accommodated by the existing schools. Furthermore, there is an additional proposed primary school as well and the expansion of Loreto Secondary School which will also add capacity to address any future demands.

Significant local health and wellbeing services are available to serve the Proposed Development, which facilitates the planned population growth. In addition to the existing facilities, the Proposed Development will include the provision of a medical centre (Block H) and a wellbeing centre (Block I). Future residents of Block E will also enjoy access to the proposed gym within the block. The proposed health and wellbeing facilities will adequately meet the needs of future residents and enhance the offer level for existing communities.

The increased population shall have a potential positive impact on retail shops and services located in Bray through growing the local customer base.

The proposed open space and recreational provision, including new cycle links, pedestrian walkways, and playgrounds, will help provide a high-quality residential environment with exercise and play and will be a valuable amenity and cultural resource to surrounding residential areas. Such provisions shall also promote psychological comfort, aesthetic pleasure, a sense of belonging and civic pride.

The overall impact on the population with respect to local services/amenities during the operation stage is considered to be positive, moderate and long-term in duration.

4.4.2.5 Human Health

The operational stage of the development is unlikely to precipitate any significant impacts in terms of human health. The design of the Proposed Development has been formulated to provide for a safe environment for future residents and visitors alike. The paths, roadways and public areas have all been designed in accordance with best practice and the applicable guidelines. Likewise, the proposed residential units and retail/retail services units accord with the relevant guidelines and will meet all relevant safety and building standards and regulations, ensuring a development which promotes a high standard of health and safety for all occupants and visitors.

The Proposed Development prioritises pedestrian and cycle movements ensuring strong connectivity between Dublin Road, Bray Seafront and the DART station with a high quality network of pathways which enhance the flow through the site which links residential quarters with Bray town centre, amenities, parks and transport links. The Proposed Development therefore has the potential to positively impact on population and human health.

As indicated below, the following plausible impact to human health has been identified during the operational phase:

- The Proposed Development will have a slight positive permanent impact on mental health and wellbeing during the operational stage through the provision of pedestrian and cyclist facilities, open space and childcare facility.

Further details of potential operational phase effects and mitigation measures are discussed in Chapter 6 - Land, Soils and Geology, Chapter 7 – Water, Chapter 8 - Air Quality, Chapter 9 - Climate, Chapter 10 - Noise and Vibration, Chapter 11 – Landscape and Visual, and Chapter 12: Traffic.

4.4.2.6 Risk of Major Accidents or Disasters

In the case of unplanned events occurring within the development while operational, key potential risks considered include the following:

- Significant traffic accidents (and associated spills);
- Risk of onsite / offsite flooding;
- Risk of onsite fire / emergency;
- Risk of onsite landslides; and,
- Risk of onsite building collapse or equipment failure.

With regards to the potential for traffic accidents, all vehicular, cyclist and pedestrian routes, along with the internal and external road layouts have been carefully designed in order to reduce any potential for traffic accidents / collisions. Thus, the risk of significant traffic accidents (and associated spills) is considered to be low during the operational phase of this development.

A detailed 'Flood Risk Assessment' (FRA) (document ref.: 293308-ARUP-ZZ-XX-RP-C-0001), as well as a 'Flood Emergency Management Plan' (document ref.: 293308-ARUP-ZZ-XX-RP-C-0002) prepared by Arup for the Proposed Development are included in Appendix 7.1, Volume 3 of the EIAR. The FRA makes the following conclusions:

The Sea Gardens Phase 2 development site is protected from fluvial and tidal flooding by the existing River Dargle Flood Defences. Risk of pluvial flooding to the development is low, with some local ponding potentially occurring at the low-lying areas of the site, behind the River Dargle Flood Defences. This is alleviated through an existing drainage ditch and culvert to the river. The risk of groundwater flood risk is low.

A hydrological analysis and hydraulic modelling were undertaken to analyse the risk of flooding to the site in the absence of defences and during an exceedance event. Three scenarios have been modelled: the fluvial 1% AEP event, tidal 0.5%AEP event and Hurricane Charlie extreme fluvial event. This were modelled for three conditions: undefended condition, defended baseline (no proposals) and defended with proposals.

The dominant flood event at the site location is the tidal 0.5%AEP event. The highest flood level nearest to the site was found to be 3.2m AOD. This level is used to set the flood protection level for the site, with a 300mm allowance for freeboard. As such, the flood protection level is set at 3.5m AOD.

In order to understand residual risks to the development and any impacts it might have to other sites, an overtopping exceedance scenario was run. The modelling demonstrates no rise in flood levels outside of the site and the maintenance of existing flow paths within the site to channel and remove water from Little Bray and Dwyer Park to the river. The flood risk management strategy of the site comprises of:

- *Locating residential (highly vulnerable) properties away from flood risk;*
- *Raising residential properties and key access routes above the flood protection level of 3.5m AOD. Some localised roads including those to the north and south of Block G have levels below 3.5m AOD to allow for maintenance of the exceedance flow path from Dwyer Park through the linear park*
- *Where raising of levels is not possible, demountable barriers and a water exclusion strategy is proposed for retail units (less vulnerable development).*

The proposed development comprises of 'highly and less vulnerable development', and partially lies within Flood Zone A. Therefore, a Justification Test in accordance with the OPW Guidelines is required. Both the Development Plan and Development Management Justification Tests are passed.

This FRA demonstrates that the risks relating to flooding can be managed and mitigated to acceptable levels and therefore comply with DoEHLG / OPW planning guidance and the Wicklow County Council Development Plan 2022-2028 objective CPO 14.09.

Accordingly, the risk of onsite or offsite flooding associated with the Proposed Development has been fully addressed and will not result in any significant environmental or human health risks during the operational phase. The potential future risk of impact to the Proposed Development caused by rising sea levels associated with climate change is considered to be low based on the findings of the site-specific flood risk assessment report (Arup: 293308-ARUP-ZZ-XX-RP-C-0001) which takes into account climate change, and the proposed design.

Regarding the risk of onsite fire or emergency, fire assembly points will be clearly marked throughout the development. Permanent 24-hour emergency access and egress to the development will be provided. As noted previously, Bray Garda Station is located ca. 1km south of the Site with Bray Fire Station located ca. 2.2km south west of the Site. The Proposed Development will be designed, constructed and maintained in accordance with all relevant statutory building and fire safety requirements.

With regards to the potential risk of landslides or building collapse, there is no evidence of significant historic landslides in the vicinity of the Proposed Development. The Proposed Development will be designed,

constructed, certified and maintained in accordance with all relevant statutory building and health and safety requirements. Accordingly, the risk of onsite building collapse or equipment failure is considered to be low.

4.5 Mitigation Measures

4.5.1 Construction phase

During the construction phase, all legal duties under the Construction Regulations (Safety, Health and Welfare at Work (Construction) Regulations 2013) will be adhered to. In accordance with these duties, a Project Supervisor Design Process (PSDP) will be appointed by the relevant contractor to co-ordinate the design effort and minimise the construction risks during the design period. In addition, a Project Supervisor - Construction Stage (PSCS) will be appointed to coordinate and supervise all safety aspects of the project.

The CEMP (document ref.: 0089313DG0029) for the project which accompanies this planning application, sets out the basic measures to be employed in order to mitigate potential negative effects during construction. This document represents a comprehensive approach to construction phase mitigation which in accordance with good practice, will be refined and added to as the project proceeds on Site. The CEMP includes the following with regard to population and human health.

“A rodent and pest control plan will be put in place so as to manage and limit any potential disturbance to populations that may utilise the Site. The pest control plan will be in accordance with the Chartered Institute of Environmental Health’s “Pest minimisation Best practice for the construction industry” guidelines or a similar appropriate standard.”

Procedures shall also be adopted to ensure that noise impacts from construction operations are minimised, to protect local amenity as detailed in Chapter 10 - Noise and Vibration. The proposed mitigation measures to minimise noise impacts during the construction phase are detailed in Chapter 10 – Noise and Vibration. Prior to the commencement of construction, the CEMP will be refined by the selected contractor prior to work commencing on Site. The main purpose of a CEMP is to provide a mechanism for implementation of the various mitigation measures which are described in this EIAR and contained within the CEMP that accompanies this application under separate cover.

All personnel will be required to understand and implement the requirements of the CEMP and shall be required to comply with all legal requirements and best practice guidance for construction sites.

Mitigation measures will be implemented during the detailed design, and construction phase, and are detailed in full in the following sections of this EIAR: Chapter 6 – Land, Soils and Geology, Chapter 7 – Water, Chapter 8 – Air Quality, Chapter 9 – Climate and Chapter 10 – Noise and Vibration, Chapter 11 - Landscape and Visual Impact Assessment.

Adherence to the construction phase mitigation measures presented in this EIAR will ensure that the construction of the Proposed Development will have an imperceptible and neutral impact in terms of health and safety.

4.5.2 Operational Phase

Taking account of the relevant mitigation measures to be implemented during the Detailed Design Stage and Demolition and Construction Stage (including the installation of an appropriate ground gas membrane beneath Block H), no further mitigation measures will be required during the operational phase.

Accordingly, no significant human health impacts are likely to arise during the operational phase of the Proposed Development.

4.6 Residual Impacts

Taking account of the nature and extent of the Proposed Development, detailed impact assessments which have been completed in respect of land soils and geology, water, air quality and climate, noise and vibration and traffic (presented in Chapter 6, Chapter 7, Chapter 8, Chapter 9, Chapter 10 and Chapter 12 respectively), analysis of childcare and school provision and proposed mitigation measures, no residual adverse impacts to population or human health are anticipated as a result of the Proposed Development. All identified potential key risks associated with unplanned events occurring have been evaluated, and do not pose an unacceptable risk to human health.

The overall impact on population and human health will be positive (ranging from slight to moderate) and permanent, as the Proposed Development will provide employment and will also benefit the local economy through spin-off activities and will provide high-quality housing at a sustainable level to the local community. The provision of onsite facilities, including pedestrian and cyclist facilities, high-quality amenity open space, medical centre and childcare via a childcare facility, will also result in a positive contribution to the mental health and wellbeing of the residents and local amenity users.

4.7 Do Nothing Scenario

A do-nothing scenario would result in the subject lands remaining undeveloped and the potential for the delivery of key objectives of the Sustainable Residential Development and Compact Settlements in the Guidelines for Planning Authorities (2024) would remain unrealised. National and regional policy is supportive of population growth in key towns and locations served by high capacity public transport. There is a significant opportunity cost associated with a failure to develop the subject site as follows:

- The local economy would not experience the direct and indirect positive effects of the construction phase of development, including employment creation;
- Under-utilisation of zoned and serviced suburban lands within a Key Town at a location served by existing and planned high level public transport services; and,
- Failure to provide residential development in a timely fashion at a time of acute housing scarcity.

The failure to provide housing at this location would:

- Encourage unsustainable development of greenfield lands more remote from high capacity public transport services;
- Have adverse effects on the character of the area. Anti-social behaviour is often associated with vacant sites and this could have a negative effect on the local population; and,
- Failure to deliver the proposed residential units would result in existing housing need and demand remaining unmet. The new pedestrian and cycle links, and public open spaces to be provided in the development and serving the wider area would also not be provided.

The positive impacts on the retail and services sector within Bray would also be foregone.

4.8 Monitoring Requirements

Measures to avoid negative impacts on population and human health are largely integrated into the design and layout of the Proposed Development. Compliance with the design and layout will be a condition of any permitted development.

Monitoring will be undertaken by the Building Regulations certification process and by the requirements of specific conditions of a planning permission. Monitoring of compliance with Health and Safety requirements will be undertaken by the Project Supervisor for the Construction Stage (PSCS).

It is considered that the monitoring measures outlined in regard to the other environmental topics will ensure that the Proposed Development is unlikely to result in any adverse impacts in relation to population and human health.

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5. Biodiversity

5.1 Introduction

The application for Sea Gardens Phase 2 proposes a mixed-use development comprising residential (c. 41,013 sq.m), retail/retail services (c. 8,155 sq.m), and commercial (c. 10,778 sq.m) spaces. The residential component will comprise 341 residential units (94 houses, 106 duplex units, and 141 apartments located in Blocks E and H). In addition, a hotel is proposed in Block I, a public house in Block E, a childcare facility and a medical centre in Block H, and retail/retail services units distributed in Blocks E, G, H and I. The proposed development will also provide private, communal, and public open spaces, along with car and bicycle parking for residents and visitors. An internal road network for vehicles, cyclists, and pedestrians will connect to the existing transport networks. All associated development infrastructure will also be provided, including public lighting, hard and soft landscaping, utilities, drainage, and clearance, demolition and removal of existing structures on site.

Sea Gardens Phase 2 forms part of the Sea Gardens Masterplan (previously known as the Harbour Point Masterplan) located on the former Bray Golf Club Lands off Ravenswell Road and the Dublin Road, Bray, Country Wicklow (here after referred to as the 'proposed development' or 'the Site').

The Site is bound by the permitted Phase 1 Coastal Quarter SHD (Phase 1A: Reference ABP-311181-21 & Phase 1B: ABP-314686-22) part of which is currently under construction in the North, by the Irish Rail Dublin-Rosslare main rail line in the East, by the River Dargle in the South and by existing residential developments to the West.

This section of the report outlines the baseline ecological conditions and potential ecological constraints found within the study area of the proposed development. Information and data on habitats and sites that are legally protected, are of conservation value or are of ecological importance have been detailed below.

5.2 Methodology

This assessment has been undertaken in accordance with and has regard to the following relevant guidelines, legislation, policies and plans: -

- EPA Guidelines on the Information to be Contained in Environmental Impact Statements, Draft (EPA, 2017);
- EPA Advice Notes of Current Practice (in the Preparation of Environmental Impact Statements (EPA, 2003) (and revised advice notes 2015);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission, 2013);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009);
- Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM 2018; 2019 reprint);
- Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017);
- A Guide to Habitats in Ireland. The Heritage Council. The Heritage Council (Fossitt, J.A. 2000);
- Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council, Church Lane, Kilkenny, Ireland (Smith, G., O'Donoghue, P., O'Hora, K. & Delaney, E. 2011);
- European Commission (EC) Habitats Directive 92/43/EEC;

- European Commission (EC) Birds Directive 2009/147/EC;
- European Communities (Birds and Natural Habitats) Regulations, 2011-2015;
- Flora (Protection) Order, 2015;
- EIA Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014;
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018);
- The Wildlife Act 1976 as amended by the Wildlife (Amendment) Act 2000;
- The Planning and Development Acts (2000, as amended);
- Fourth National Biodiversity Plan 2023 – 2030;
- County Wicklow Biodiversity Action Plan 2010-2015. Wicklow County Council;
- Wicklow County Development Plan, 2022 – 2028;
- Bray Head Special Amenity Area Order 2007 (Wicklow County Council 2007);
- Bray Municipal District Local Area Plan, 2018-2024;
- Planning for Watercourses in the Urban Environment. Inland Fisheries Ireland 2020; and,
- All-Ireland Pollinator Plan 2021-2025. National Biodiversity Data Centre.

Consultation was undertaken with National Parks and Wildlife Service (NPWS) via the Development Applications Unit (DAU) of the Department of Culture, Heritage and the Gaeltacht on 21/12/2023. NPWS responded on 01/08/2024 declining to make any specific comment.

The methodology used to carry out the various ecological surveys undertaken of the Site, to evaluate the ecological value and baseline ecological environment, and to prepare this impact assessment is outlined as follows.

5.2.1 Desk Study

The locations of conservation sites, protected species occurrences and areas of ecological interest were reviewed in context of the Site using online sources such as Google Earth, Google maps⁶ and Bing maps⁷ (last accessed on 09/01/2025).

Sources of data including; published reports, records, datasets and on-line mapping, which were used to collate and compile information of ecological features of interest and importance within and around the Site include: -

- National Parks and Wildlife Service (NPWS) webpage / data;
 - Information on sites designated for nature conservation, including spatial data (NPWS);
 - Habitats and species data
 - Wildfowl Sanctuaries
 - Red List of Terrestrial Mammals (Marnell et al, 2019)
- National Biodiversity Data Centre (NBDC)
 - Protected species records
 - Invasive species records
- Environmental Protection Agency
 - Watercourses and lake spatial files
 - Water quality data

⁶ <https://www.google.ie/maps>

⁷ <http://www.bing.com/maps/>

- Corine land cover data
- Geological Survey of Ireland
 - Underlying geology, soils and hydrogeology
- Tailte Ireland mapping and aerial photographs
 - Historic mapping
- Birdwatch Ireland
 - Bird count data from the Irish Wetland Bird Survey (I-WeBS)
 - Birds of Conservation Concern in Ireland (Gilbert et al. 2021)
- Bat Conservation Ireland
 - Bat monitoring data
- Wetland Survey Ireland
 - Information on identified wetland habitats within the study area
- Inland Fisheries Ireland (IFI) - Eastern River Basin District River Surveys⁸

Relevant planning information for the surrounding area was reviewed using the planning enquiry systems of Wicklow County Council and Dún Laoghaire-Rathdown County Council. Search criteria were implemented to determine whether such projects or plans would be relevant to this study and this information was used to determine potential cumulative impacts from other plans / projects with the proposed development.

5.2.2 Zone of Influence

The '*zone of influence*' for a project is the area over which ecological features may be subject to significant effects because of the proposed project and associated activities. This is likely to extend beyond the project Site, for example where there are ecological or hydrological links beyond the Site boundaries. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change (CIEEM, 2018, 2024 reissue).

It follows that given the nature of the proposed development at Bray, the zone of influence will be limited to the Site and immediate environs as well as areas connected via hydraulic pathways (ground or surface water) and landscape features such as hedgerows, treelines and watercourses.

Determining the potential for impacts and the zone of influence is based on the source-pathway receptor chain principle and involves assessing likely significant effects on ecological receptors within the zone of influence in relation to three pathways:

- Surface water;
- Groundwater; and,
- Land & Air.

5.2.3 Ecological Field Surveys

Multiple site visits and ecological surveys were undertaken within the Site by AtkinsRéalis ecologists Colin Wilson, Daniel Blake, and Kevin Coogan from 2020 to 2024 details of which presented below. Surveys were also undertaken by Dr Tina Aughney (2020 Bat Surveys) and John Morgan of Independent Tree Surveys (2020 & 2024).

⁸ <http://wfdfish.ie/index.php/category/river-surveys-2017/>

5.2.3.1 Previous Surveys

Initial ecological surveys were undertaken by Colin Wilson on 27th February, 16th July and 14th August 2020 and 21st July 2022. Surveys were undertaken within the Site and also across the wider landscape including the Sea Gardens Phase 2 development site and all the Harbour Point Masterplan lands, Rathmichael Woods to the north of the Site and scrublands to the east of the railway line / east of the Site. During the course of both the winter and summer walkover surveys the Site was evaluated for the presence of and suitability for birds, mammals, amphibians and insect groups such as lepidoptera and hymenoptera. A Phase 1 habitat survey was undertaken during 16th July and 14th August 2020.

Dr Tina Aughney was commissioned by Atkins to undertake bat surveys for the Site in line with published best practice. The Site was surveyed for evidence of bat activity during 12th and 15th July and 6th and 7th August 2020. Bat surveys assessed the Site for evidence of roosting, feeding and commuting bats and included Tree Potential Bat Roost (PBR) Surveys, Static Detector Surveys, Dusk and Dawn Bat Surveys, Walking Transects and Building Inspections (old clubhouse buildings now demolished).

5.2.3.2 2023 - 2024 Surveys

The proposed development site was subject to re-surveying in 2023 and 2024 by AtkinsRéalis ecologists. Site surveys evaluated the importance of the Site to flora and fauna in line with the approach set out in the *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018, 2024 reissue).

The Site and surrounding lands were resurveyed for evidence of terrestrial mammal activity and mammal refugia (badger setts, fox dens) during the 22nd February, 22nd April and 24th May 2024. The Site was surveyed for evidence of badger, otter, fox, hedgehog, and squirrel activity as these species have been historically recorded within the environs of the Site. Surveys paid particular attention to any evidence of protected mammal species; badger as there is a known and recorded breeding/maternity sett located in lands to the north (c. 1km outside) of the proposed Site. A mammal hole was discovered within the projects redline boundary and a camera trap survey was undertaken between 22nd April and 24th June 2024.

The Site was visited on 5 no. occasions to undertake bat surveys. Two Bat Emergence Surveys were conducted around two oak trees which had roosting bats noted during 2020 bat surveys. Bat Activity Transect Surveys were also conducted throughout the development site. Bat Emergence Surveys were conducted on 25th June 2024 and 17th July 2024. Bat Activity Transect Surveys were undertaken 26th June 2024, 2nd July 2024 and 3rd July 2024. Two static detectors were left on site to gain additional bat data between the following dates between the 2nd July 2024 and 19th July 2024.

An otter survey was undertaken on the 25th October 2024. The survey consisted of inspecting both banks of the River Dargle (c. 840m per bank) beginning at the Swan Sanctuary at Harbour Road extending as far as Lower Dargle Road. The area surveyed for field signs of otter such as prints, slides, holts, couches and spraints.

The proposed development site was subject to surveying for the presence of wintering waterbirds on 22nd February 2023, 31st March 2023, 15th September 2023 and 22nd February 2024. A further waterbird survey was undertaken within the development site and along the River Dargle to ascertain if the Mute Swan (*Cygnus olor*) population associated with Bray Harbour utilise the greenfield areas of the development site or have regular passage over the development site. Morning and evening vantage point surveys were undertaken on the 22nd February 2024, 23rd February 2024, 29th February 2024 (midday survey), 7th March 2024 and 8th March 2024.

A Phase 1 Habitat survey was undertaken during 24th May 2024 and 24th June 2024 and 3rd July 2024. The ecological surveys identified and recorded the dominant habitats types found within the Site were in line with published best practice (Smith *et al.*, 2011), with habitats classified in line with the Heritage Council Classification scheme (Fossitt, 2000). Dominant plant species in each habitat type were recorded. Plant nomenclature followed

the Botanical Society of Britain and Ireland's List of Accepted Plant Names (Botanical Society of Britain and Ireland, 2019). Invasive plant species noted while on Site were also recorded.

A Tree Survey was undertaken by Independent Tree Surveys during February 2024 for the proposed development. The significant individual trees inside the Site were assessed from ground level using Visual Tree Assessment (VTA) techniques and relevant observations and findings were recorded in compliance with the industry standard document BS5837: *Trees in relation to design, demolition and construction* (2012).

5.2.4 Evaluation of Ecological Receptors

Ecological features can be important for a variety of reasons. Importance may relate, for example, to the quality or extent of the site or habitats found within, or the rarity of the habitat and / or species, the extent to which such habitats and / or species are threatened throughout their range, or to their rate of decline⁹.

The importance of an ecological feature was considered within a defined geographical context. The frame of reference used to determine ecological value relied on known and published accounts of the feature's ecological importance, rarity and distribution combined with professional judgement.

The following geographic frame of reference was used for evaluating the importance of ecological features within the Site:

- International importance;
- National importance;
- County importance;
- Local importance (higher value); and,
- Local importance (lower value).

The geographical context for determining the value of ecological receptors followed recommendations as outlined in the Guidelines for Assessment of Ecological Impacts of National Roads Scheme, National Roads Authority (2009). This methodology is consistent with the Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018, 2024 reissue).

5.2.5 Determining Ecological Significant Effects

CIEEM (2018, 2024) define an ecologically significant impact as an impact (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographic area.

The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified (CIEEM, 2018, 2024). The significance of predicted effects has been assessed in line with National Roads Authority Guidelines for Assessment of Ecological Impacts of National Road Schemes, (NRA, 2009) and best scientific professional judgement. The evaluation of significant effects should always be based on the best available scientific evidence. If sufficient information is not available, further survey or additional research may be required. In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect should be assumed. Where uncertainty exists, it must be acknowledged in the Ecological Impact Assessment (EclA).

⁹ NRA's Guidelines for Ecological Impact Assessment of National Road Schemes (NRA, 2009), Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland (CIEEM 2018, 2024 reissue).

5.2.6 Mitigation & Overall Residual Ecological Impact

Where significant impacts have been identified, the mitigation hierarchy has been taken into account considered, as suggested in the 2018 EclA Guidelines and 2022 EPA Guidelines, which sets out a sequential approach of avoidance of impacts where possible, application of mitigation measures to minimise unavoidable impacts and then compensation for any remaining impacts. Once avoidance and mitigation measures have been applied, along with any necessary compensation measures, and opportunities for enhancement incorporated, residual impacts have then been identified.

Overall residual, or mitigated, ecological effects are assessed by taking account of any expected beneficial ecological effects and those measures which have been integrated within the development proposals in order to avoid, eliminate or reduce the significance of ecological impacts (and any further recommended measures which attach a high probability of successful implementation). The following widely accepted strategy for mitigation (Chapter 6 of the CIEEM Guidelines) has been employed (Refer to Table 5-1).

Table 5-1 - Approach to Mitigation

Avoidance	Where viable, the project has been re-designed to avoid adverse ecological effects.
Elimination	Where possible and feasible, measures which eliminate adverse ecological effects are employed.
Reduction	Measures intended to reduce the significance of adverse ecological effects are employed where options for avoidance or elimination have been exhausted or are deemed to be impractical.
Compensation	Where adverse ecological effects cannot be avoided or eliminated or reduced in significance to an acceptable level, consideration is given to compensating for residual adverse effects.
Remediation	Where adverse ecological effects are unavoidable, consideration is given to undertaking limiting remedial works.
Enhancement	Consideration is given to providing opportunities for ecological improvement, enhancement and the realisation of beneficial ecological effects.

5.2.7 Uncertainty in Assessment

In Impact Assessment, uncertainty is associated with both the prediction and assessment of environmental effects. The precautionary principle, a central feature of environmental legislation, planning policy and professional guidance, provides a mechanism for managing uncertainty in ecological assessment – the precautionary principle requires that where there is a lack of full scientific certainty, the protection of the environment is prioritised.

Where confidence or uncertainty is expressed, an objectively defined scale, as detailed in Table 5-2¹⁰ is employed. Decisions as to confidence in predictions are necessarily based primarily on expert judgement.

¹⁰ The confidence levels employed were originally set out in an earlier (2006) version of the CIEEM guidelines, have been adapted and reproduced in several other guidance documents since then, and are widely applied and accepted in Ecological Impact Assessment.

Table 5-2 - Confidence & Uncertainty

Confidence Level	Details
Certain	Probability estimated at 95% chance or higher.
Probable	Probability estimated at above 50% but below 95%.
Unlikely	Probability estimated at above 5% but below 50%.
Extremely Unlikely	Probability estimated at less than 5%.

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5.2.8 Appropriate Assessment (AA)

The proposed development has been subject to the Appropriate Assessment process. Details of the assessment are provided for in the accompanying Appropriate Assessment Screening Report (AtkinsRéalis, 2025 Document reference: 0089313DG0022).

5.2.9 Difficulties Encountered in Completion of this Chapter

No difficulties were encountered in completing survey work to inform this ecological assessment. Habitat surveys, terrestrial and volant mammal surveys were undertaken during the seasonally appropriate times of year. Datasets of species records was sought from and provided by National Parks and Wildlife Service. Datasets were sought from and provided by BirdWatch Ireland for I-WeBS high tide waterbird survey records in the coastal waters of Bray Harbour count site; 0T907. The latest and most up-to-date available I-WeBS data is for the period 2018/19 – 2023/24 (the last data request was submitted to BirdWatch Ireland 24/10/2024).

5.3 Description of Existing Environment

5.3.1 General Description of Existing Environment

The site is located within Bray east of the R761, north of the River Dargle and south of Ravenswell Primary School and the St. John of Gods Community Centre. The site for the proposed development is a greenfield site with scattered trees and a bordering treeline also present. The Site is located within Wicklow County Council (WCC) jurisdiction.

The development site is bordered by an urban environment to the west, a primary school to the north of the Site, a railway line on the eastern boundary and the River Dargle in close proximity to its southern border of the Site, the river flows in an easterly direction outfalling to the Irish Sea in Bray Harbour. This stretch of the river has been subject to flood alleviation works and the banks of the river have been developed into a formalised promenade and public amenity space. To the northeast of the Site is currently the construction site of Phase 1 of the overall Masterplan lands.

The former Bray Golf Club lands have been subject to recent development in certain areas between 2016-2018. Ravenswell Primary School along with associated sports / recreational areas have been constructed on a ca. 5 hectares site. Significant infrastructural works were also undertaken with a new road network in situ providing two main access routes, a Northern Access Route which borders the eastern and northern boundaries of the Industrial Yarns site and a Southern Access Road which facilitates access via the Upper Dargle Road.

5.3.2 Designated Conservation Areas

5.3.2.1 European Designated Sites

The potential for impacts on European sites within the 'zone of influence' (Zoi) of the proposed Site was considered. Full details of the assessment are outlined in the accompanying Appropriate Assessment, (AtkinsRéalis, 2024 Document reference 0089313DG0022). The Zoi for a project is the area over which ecological features may be subject to significant effects as a result of the development project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the Site boundaries. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change (CIEEM 2018, 2024 reissue).

A distance of 15km is recommended in the case of plans, as a potential zone of influence and this distance is derived from UK guidance (Scott Wilson *et al.*, 2006). However, for projects the distance could be much less, and in some cases less than 100m. National Parks and Wildlife Service guidance¹¹ advises that this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, the sensitivities of the ecological receptors, and the potential for in-combination effects.

Thus, given the nature, scale and extent of the mixed use development project in Bray, the potential zone of influence will consider European sites with regard to the location of a European site, the Qualifying Interests of the site and their potential mobility outside that European site, the Cause-Pathway-Effect model and potential environment effects of the project.

The proposed project does not lie within any European site.

There are 14 no. European sites within the potential Zoi of the development project; 9 no. Special Areas of Conservation (SACs) and 5 no. Special Protection Areas for birds (SPAs), as outlined in Table 5-3 below.

Table 5-3 - European sites with potential Zoi of the proposed Site.

European Site (site code)	Distance from Works
Bray Head SAC (000714)	ca. 1.7km
Ballyman Glen SAC (000713)	ca. 2.2km
Knocksink Wood SAC (000725)	ca. 4.1km
Rockabill to Dalkey Island SAC (003000)	ca. 4.1km
Glen of the Downs SAC (000719)	ca. 7km
Wicklow Mountains SAC (002122)	ca. 7.5km
South Dublin Bay SAC (000210)	ca. 10km
The Murrough Wetlands SAC (002249)	ca. 11km
Carriggower Bog SAC (000716)	ca. 11.3km
Dalkey Islands SPA (004172)	ca. 6.4km
Wicklow Mountains SPA (004040)	ca. 7.7km
South Dublin Bay and River Tolka Estuary SPA (004024)	ca. 10km

¹¹ DoEHLG (2009). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Department of Environment, Heritage and Local Government, Dublin, Ireland.

European Site (site code)	Distance from Works
The Murrough SPA (004186)	ca. 12.1km
North-West Irish Sea SPA (004236)	ca. 14.5km

The nearest European site is Bray Head SAC which is located along the coastline ca. 1.7km south of the project site. There is no direct connectivity from the project site to Bray Head SAC or any other European site. There is no viable hydrological connectivity to the qualifying interest (QI) terrestrial heath and cliff habitats of this SAC as they are terrestrial in nature. In addition, there is no direct or viable indirect hydrological connectivity to the QI habitats of any other European site within the potential Zol of the development site.

The proposed development site is connected to the River Dargle as drainage infrastructure works are proposed on the riverbank and surface water drainage (rainfall) from the development site is proposed to outfall to the River Dargle when the development is in use. As such there is the potential for some mobile ex-situ QI species that may utilise the river or adjoining coastal waters to be within the Zol of the proposed development.

It is considered that QI species Harbour Porpoise (*Phocoena phocoena*), a QI species of Rockabill to Dalkey island SAC, which have been recently recorded directly around Bray harbour are within the Zol of the proposed development.

Other QI mobile species have also been considered. Otters (*Lutra lutra*) a QI of Wicklow Mountains SAC. It is considered that the lower stretches of the River Dargle in Bray town are likely outside of the territorial range of the otter populations of Wicklow Mountains SAC, however, following a highly precautionary approach, it has been assumed for the purposes of this assessment that ex-situ QI otters from the SAC may range 14km downstream to the estuarine waters of the River Dargle in Bray town. As such Wicklow Mountains SAC QI Otters are assumed for the purposes of this assessment to be within the Zol of the proposed development.

Note: This precautionary approach has been taken in light of High Court proceedings (McManus v An Bord Pleanála, High Court Record No. 2024/1256 JR) (the 'proceedings') challenging a grant of permission for a previous phase of the Masterplan development (Coastal Quarter Phase 1B ABP-314686-22), where one of the grounds of challenge relates to the decision to screen out otters associated with the Wicklow Mountains SAC in the context of Appropriate Assessment. In light of the 'proceedings' it is considered prudent to screen in QI otters of Wicklow Mountains SAC for full Appropriate Assessment in respect of the present application for permission for the avoidance of any doubt as to potential impacts arising from the Proposed Development. This is done without prejudice to any arguments made in opposition to the grounds pleaded by the Applicant in the 'proceedings' and is done without prejudice to the conclusions reached in the Appropriate Assessment Screening and NIS carried out in respect of the Coastal Quarter Phase 1B development.

No SPAs are considered to be within the Zol of the proposed development. Site surveys and NBDC records identify the proposed development site is not used by SPA birds (bar small numbers of common gull, Refer to Section 5.3.3.4 below). The proposed development is not a terrestrial area utilised by field feeding wildfowl and/or waterbirds. The proposed development does not lie between wetland sites and as such there is no regular passage, or migratory paths, of wintering waterbirds across the proposed development site.

Figures 5-1 and 5-2 depict the locations of the European Sites within the potential Zol of the proposed development.



Figure 5-1 - SACs within the Potential Zone of Interest of the Proposed development

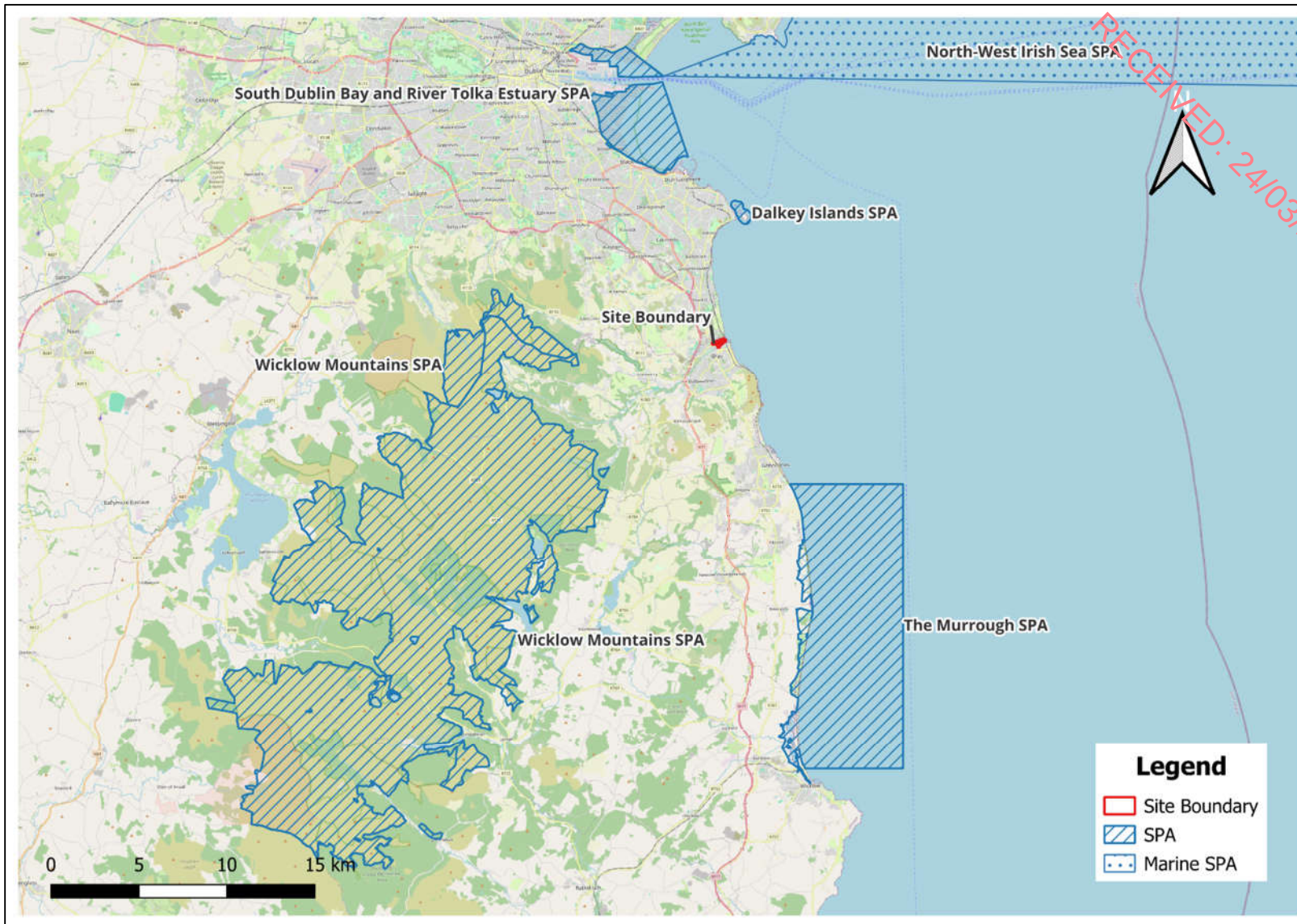


Figure 5-2 - SPAs within the Potential Zone of Interest of the Proposed development

5.3.2.2 Natural Heritage Areas

Natural Heritage Area (NHA) is the basic designation for wildlife sites. These sites are considered to represent important habitats for species of plants and animals whose habitat needs protection¹². These sites are protected under the Wildlife Amendment Act (2000)¹³.

Additionally, proposed Natural Heritage Areas (pNHA) are those which have been published on a non-statutory basis, and have yet to be statutorily designated. These sites are of significance to flora, fauna, and their respective habitats. These sites will be designated on a phased basis over the coming years. Prior to designation pNHAs are subject to limited protection¹⁴.

The proposed development site does not lie directly on any pNHAs or NHAs. Bray Head pNHA is the nearest pNHA to the proposed development site located c. 1.6km to the south. There is no direct or viable indirect hydrological connectivity to the terrestrial habitats of Bray Head pNHA.

There is no direct or indirect connectivity from the proposed development site to any NHA or pNHA.

A map of NHAs and pNHAs located within a 15km radius of the proposed development site is illustrated in Figure 5-3 below.

¹² <https://www.npws.ie/protected-sites/nha>

¹³ <https://www.npws.ie/legislation/irish-law/wildlife-amendment-act-2000>

¹⁴ <https://www.npws.ie/protected-sites/nha>

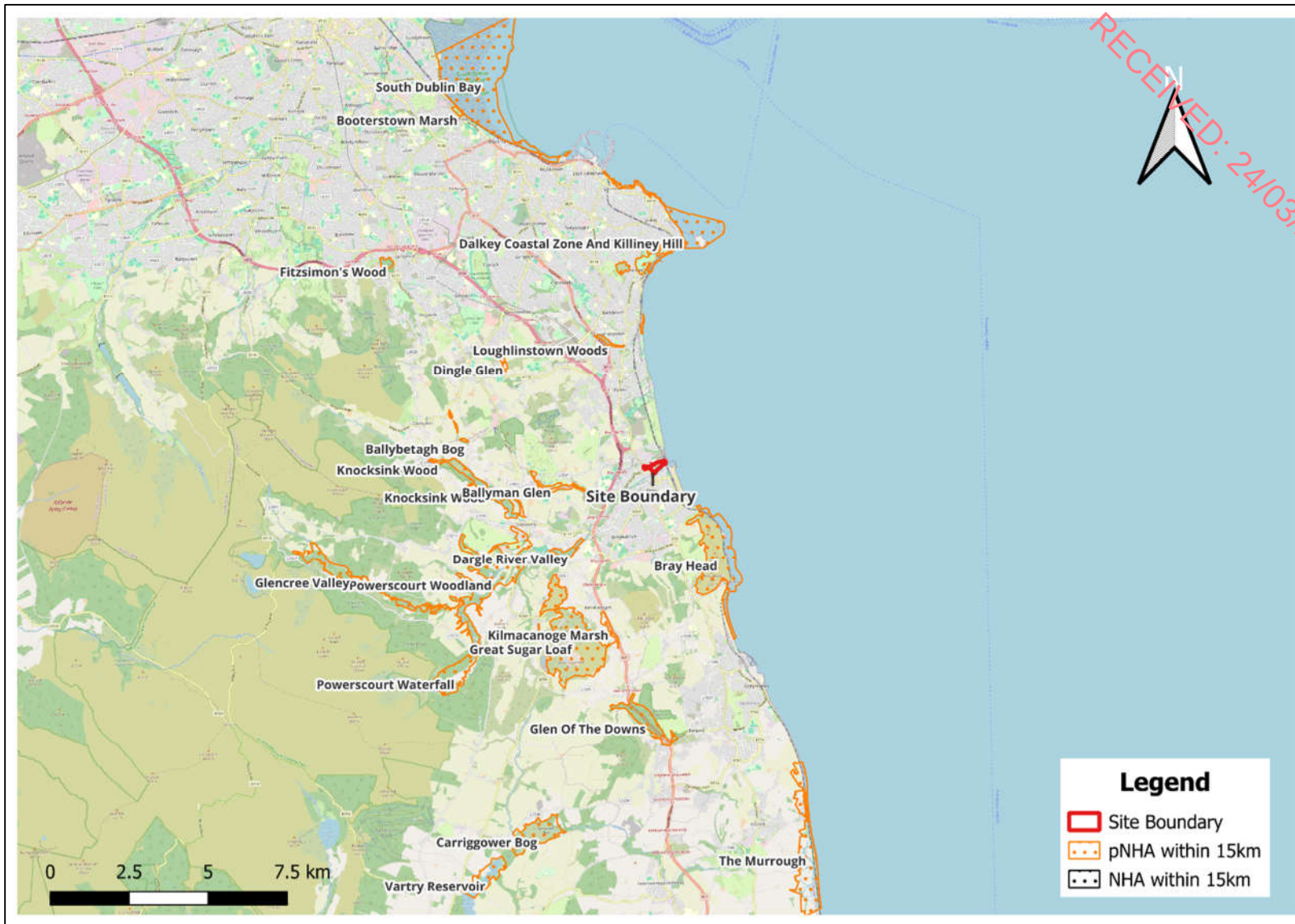


Figure 5-3 - NHAs and pNHAs located within a 15km radius of the Proposed development

5.3.2.3 Annex I Habitats

Annex I habitats are those whose conservation requires the designation of Special Areas of Conservation. Priority habitats which are in danger of disappearing within the EU territory, are also highlighted¹⁵

The proposed development is located c. 180m from Annex I habitat; Tidal mudflats and sandflats [8330], the proposed development is separated from the annexed habitat by the physical barrier of the railway line, Harbour Road and commercial developments. The location of the Tidal mudflats and sandflats is illustrated in Figure 5-4 below.



Figure 5-4 - Proposed development location proximity to Annex I Tidal Mudflats and Sandflats

5.3.2.4 Other known sites ecological value

There are no National Parks or National Nature Reserves within the immediate vicinity of the Bray development site. Wicklow Mountains National Park is ca. 7.9km from the Site. Knocksink Nature Reserve and Glen of the Downs Nature Reserve are ca. 4.4km and ca. 7.2km from the Site respectively. There is no direct or indirect connectivity from the Site to any National Parks or Nature Reserves.

A review of wetland sites, as provided by Wetland Survey Ireland datasets¹⁶, did not identify any wetlands within or adjacent to the development site. There are no wetland sites within the development site designated under the Convention of Wetlands, i.e. Ramsar Sites.

¹⁵ <https://www.npws.ie/sites/default/files/publications/pdf/Art17-Vol1-web.pdf>

¹⁶ <http://www.wetlandsurveysireland.com/wetlands/map-of-irish-wetlands--map-of-irish-wetlands--map/index.html>

A review of datasets for the Inventory of Long Established and Ancient Woodlands of Ireland¹⁷ and the National Survey of Native Woodlands¹⁸ did not identify any protected woodlands within or adjacent to the development site.

Datasets were reviewed of the Irish Semi-natural Grassland Survey 2007-2012, published by Department of Culture, Heritage and the Gaeltacht¹⁹. There are no semi-natural grasslands within development site.

The Irish Wetland Bird Survey (IWeBS) has a waterbird count site located directly south-southeast of the development site. I-WeBS count site – Bray Harbour (Site code OT907) covers the lower stretches of the River Dargle, Bray Harbour and a section of the Irish Sea at the mouth of the harbour. Datasets for wintering waterbird counts within the Bray Harbour I-WeBS site were requested from BirdWatch Ireland and are discussed below.

Bray Head is designated as a Special Area of Conservation; Bray Head SAC (000714) and is further designated at a national level as a proposed Natural Heritage Area; Bray Head pNHA (000714). Bray Head is also subject to a Special Amenity Area Order (Wicklow County Council; Bray Town Council; Greystones Town Council, 2007²⁰). A Special Amenity Area Order (SAAO) is designed to protect areas that are of particularly high amenity value, which are sensitive to intense development pressure and which cannot be adequately protected by existing planning controls. The Special Amenity Area Order for Bray Head lists: - *Objectives in relation to the Preservation or Enchantment of the Character or Special Features of the Area*. A summary of the objectives detailed in Bray Head SAAO are as follows (non-exhaustive list): -

- Objective 1.1 - *'In order to facilitate social inclusion, it is an objective of the Council to increase public access on foot to coastal, heathland and woodland areas for informal recreation.'*
- Objective 1.2 - *'To protect the special amenity area ensuring that its resources are used in an effective and sustainable manner.'*
- Objective 1.3 - *'To manage the area in order to conserve its natural and cultural assets and realise its exceptional potential as a place for informal recreation, tourism and environmental education.'*

The SAAO further outlines: - *"Heath, a habitat listed on Annex I of the EU Habitats Directive, is the principle habitat over much of the Head. It occurs over the light sandy soils found in the upper slopes of Bray Head. The heath community is frequently accidentally or deliberately burned and this assists its development rather than hinders it."* Bray Head SAAO lists as Policy 1.3.4; *'The Council, in accordance with the Wildlife (Amendment) Act, 2000 and the National Parks and Wildlife Service shall promote a Heathland Management Programme consisting of controlled burning of the site on a ten year rotation, in small patches, during the legal burning season.'*

5.3.2.5 Hydrology/Aquatic Ecology

The Water Framework Directive (WFD), Directive 2000/60/EC, was adopted in 2000 as a single piece of legislation covering rivers, lakes, groundwater and transitional (estuarine) and coastal waters. Its objectives include the attainment of good status in water bodies that are of lesser status at present and retaining good status or better where such status exists at present (EPA, 2023). Status relates to the condition of the water in the waterbody as defined by its chemical status and its ecological status, whichever is worse.

There are no surface water features within the proposed development site. Surface water drainage from the development site will outfall to the River Dargle located c. 10m south the Site. The Rathmichael stream located c. 315m north of the proposed development site, there is no connectivity from the development site to this stream. These

¹⁷ Perrin, P.M. & Daly, O.H. (2010) A provisional inventory of ancient and long-established woodland in Ireland. Irish Wildlife Manuals, No. 46. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

¹⁸ <https://maps.biodiversityireland.ie/Map>

¹⁹ <https://data.gov.ie/dataset/irish-semi-natural-grassland-survey-2007-2012>

²⁰ <https://www.wicklow.ie/Portals/0/adam/Content/46A8jfaW0el3Wd4pR64AQ/Link/Bray%20Head%20Special%20Area%20Amenity%20Order%202007.pdf>

watercourses flow directly to the Irish Sea c. 100m from the development site. See Figure 5-5 for the locations of the River Dargle within proximity of the development site.

The proposed development is located within the Dargle subcatchment (Subcatchment ID 10-5). The River Dargle (EPA code: IE_EA_10D010300) is detailed by the Environmental Protection Agency (EPA) as having 'Good' water quality status (2016-2021) and is detailed as being 'Not at Risk' of failing to meet the relevant Water Framework Directive (WFD) objectives by 2027. The Rathmichael stream (EPA code: IE_EA_10D010300) is detailed as having 'Good' water quality status (2016-2021) and is noted as being 'Not at Risk'.

EPA undertake biological monitoring of the River Dargle along a stretch of the river c. 1km upstream of the proposed development site. The 2024 EPA Q-Value is noted to be 5 indicating the watercourse has a 'Good' WFD status, is unpolluted and has a satisfactory condition.

The EPA also monitor the Dargle Estuary (EPA code: IE_EA_110_0100) which commences in Bray Harbour. The estuary is recorded as having 'Moderate' water quality status (2016-2021) and is detailed as being under 'Review' of failing to meet the relevant Water Framework Directive (WFD) objectives by 2027.

The main channel of the River Dargle is noted to be designated as Salmonid Waters under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293/1988). The river is within the Eastern River Basin District and Inland Fisheries Ireland (formerly the Eastern Regional Fisheries Board, ERFB) undertake fish stock surveys within this district along the River Dargle catchment (incorporating River Dargle, Glencree River, Killough River and Glencullen River). IFI survey reporting during the period 2017²¹ and 2018²² (latest available reports) detail the River Dargle catchment as accommodating the following fish species; Brown trout (*Salmo trutta*), Salmon (*Salmo salar*), European eel (*Anguilla anguilla*) and Stone loach (*Barbatula barbatula*) with trout being the most abundant species captured during surveys. IFI reporting outline in regard to the River Dargle; '*The river is one of Ireland's best sea trout rivers and also gets a small run of salmon (grilse)*'. The River Dargle also provides for foraging habitat for local otter populations with sightings of otter recorded within the main channel as recently as 2017. In the vicinity of the development site, and throughout Bray town, the River Dargle has been subject to flood alleviation works and the banks of the river have been recently developed into a formalised promenade and public amenity space. The banks of the river to the south of the development site are entirely artificial and are noted to be either vertical walls (flood walls) or shallow reinforced slopes (rock armour).

5.3.2.6 Hydrogeology

The development site lies within the Wicklow Groundwater Body (IE_EA_G_076) and EPA records indicate this groundwater body is classified as 'Good' for the 2016 to 2021 monitoring period (EPA, 2025). Groundwater vulnerability (in the bedrock aquifer) is predominantly Moderate (M) in the northern and central portions of the Site, and Low (L) in the southern portion of the Site (EPA 2025). Inferred groundwater flow is expected to follow topography in general southerly, and south easterly directions, primarily towards the River Dargle and to the Irish Sea (Refer to Chapter 7 for details on hydrogeology).

²¹ Matson, R., Delanty, K., Gordon, P., O'Briain, R., Garland, D., Cierpal, D., Connor, L., Corcoran, W., Coyne, J., McLoone, P., Morrissey-McCaffrey, E., Brett, T., Ni Dhonnabhain, L. and Kelly, F.L., (2018) Sampling Fish in Rivers 2017 – Dargle Factsheet No. 5. National Research Survey Programme. Inland Fisheries Ireland.

²² Matson, R., Delanty, K., Gordon, P., O'Briain, R., McCarthy, E., Cierpal, D., Connor, L., Corcoran, W., Coyne, J., McLoone, P., Morrissey-McCaffrey, E., Brett, T., Gavin, A and Kelly, F.L., (2019) Sampling Fish in Rivers 2018 - Dargle, Factsheet No. 1. National Research Survey Programme. Inland Fisheries Ireland.

5.3.3 Field Survey Results and Species Records

5.3.3.1 Habitats & Flora

The habitats within the Site are shown on Figure 5-5 and are individually described and evaluated in the following text. Plates 5-1 – 5-6 below depict the habitats within the Site. The approach to determining ecological importance of the Site is set out in Section 5.2.4 of this report and is based on CIEEM (2024) guidance.

Amenity Grassland GA2

The eastern side of the site is a former golf course and the lands are predominantly comprised of amenity grassland (GA2). The grasslands are well maintained and regularly mown for the large part, however, small areas of grassland (around scattered parkland trees and informal pathways) have been left uncut during the summer months. Grass species within the Site include; *Lolium perenne* (Rye grass), *Fescue* spp. and *Dactylis glomerata* (Cock's foot) (non-exhaustive list); as well as *Trifolium repens* (White clover). In areas where the grass has been left uncut *Rumex* spp. (Dock), *Senecio jacobaea* (Ragwort) and *Achillea millefolium* (Yarrow) have also established

Scattered Trees and Parkland WD5

There are 302 no. trees found within the Site and the vast bulk of these can be categorised as scattered trees (WD5) (all those bar the treeline detailed below). These trees are, for the most part, landscaping features of the former golf club. Predominant species include: - *Acer pseudoplatanus* (Sycamore), *Fraxinus excelsior* (Ash), *Alnus cordata* (Italian Alder), *Populus alba* (White Poplar), *Populus X canadensis* (Hybrid Black Poplar), *Alnus glutinosa* (Common Alder), *Betula pendula* (Silver birch), *Sorbus aria* (Whitebeam), *Fagus sylvatica* (Beech) and *Pinus contorta* (Shore pine). There are also *Acer platanooides* (Norway Maple), *Quercus robur* (Oak), *Tilia X europaea* (Common lime), *Malus sylvestris* (Crab apple), *Prunus* spp. (Cherry), *Eucalyptus gunnii* (Cider gum), *Cotoneaster frigidus* (Cotoneaster), *Salix* spp. (Willow), *Chamaecyparis Larssonian* (Lawson cypress), *Sorbus aucuparia* (Rowan), *Tilia cordata* (Small leaved lime) and *Thuja plicata* (Western red cedar).

The former golf club lands are managed and maintained, and all areas of scattered trees are underlain by mown amenity grassland (GA2).

Treeline WL2

A treeline c. 160m in length, comprised of predominantly Sycamore and Poplar species with Scots pine, Leyland cypress and Alder also present. There are 26 no. trees in this treeline located on an area on the western boundary of the Site. This treeline also acts as the boundary between two fields on the western side of the Site. Refer to Figure 5-5 for location.

Dry Meadow and Grassy Verges GS2

The north western area of the site is a grassland which was historically used for the grazing of goats (up to 2021). The grassland is uncut and left in its natural state. Species found in this area included; *Lolium perenne* (Rye grass), *Fescue* spp. and *Dactylis glomerata* (Cock's foot), *Trifolium repens* (White clover), *Anthriscus sylvestris* (Cow Parsley), *Dipsacus* (Teazel), *Sonchus oleraceus* (Common Sow Thistle), *Heracleum sphondylium* (Common Hogweed), *Geranium robertianum* (Herb Robert).

Scrub WS1

Within the north western area of the site are patches of scrub within the dry meadow and grassy verges. This scrub is primarily located along the boundary areas with some central patches present within the field. This scrub is primarily made up of *Rubus* (Bramble) with species including dock, *Chamaenerion angustifolium* (Rosebay willowherb) and *Urtica dioica* (Nettle).

Spoil and Bare Ground ED2

Within the west section of the Site, east of Dwyer Park Road there is an area of manmade spoil piles. These spoil piles have been created by the storage of soil generated from the works undertaken within the site.

Artificial Surfaces BL3

The Site compound is comprised artificial surfacing. This area has a carpark, hall roads and associated temporary buildings. The existing roadways within the Site are also artificial surfaces.

5.3.3.2 Invasive Species

The Site was surveyed for invasive plant species listed on the third schedule of the EC (Birds and Natural Habitats) Regulations 2011 S.I. No. 477/ 2011. Species surveyed for included Japanese knotweed (*Fallopia japonica*) and associated hybrids.

Japanese knotweed was identified on the western side of the site. One singular Japanese knotweed plant is located within the development redline boundary, the location of which is illustrated in Figure 5-5 below. A larger stand of Japanese Knotweed, c. 3m by 3.5m, is located outside of the redline boundary in an adjoining former allotment. The offsite Japanese knotweed is excluded from the site by a metal fence.

A National Biodiversity Data Centre search of the site and surrounding area was conducted to determine species presence within the last ten years. The records showed Japanese Knotweed being recorded in 2021. Winter Heliotrope (*Petasites fragrans*) was also recorded within the area in 2018.

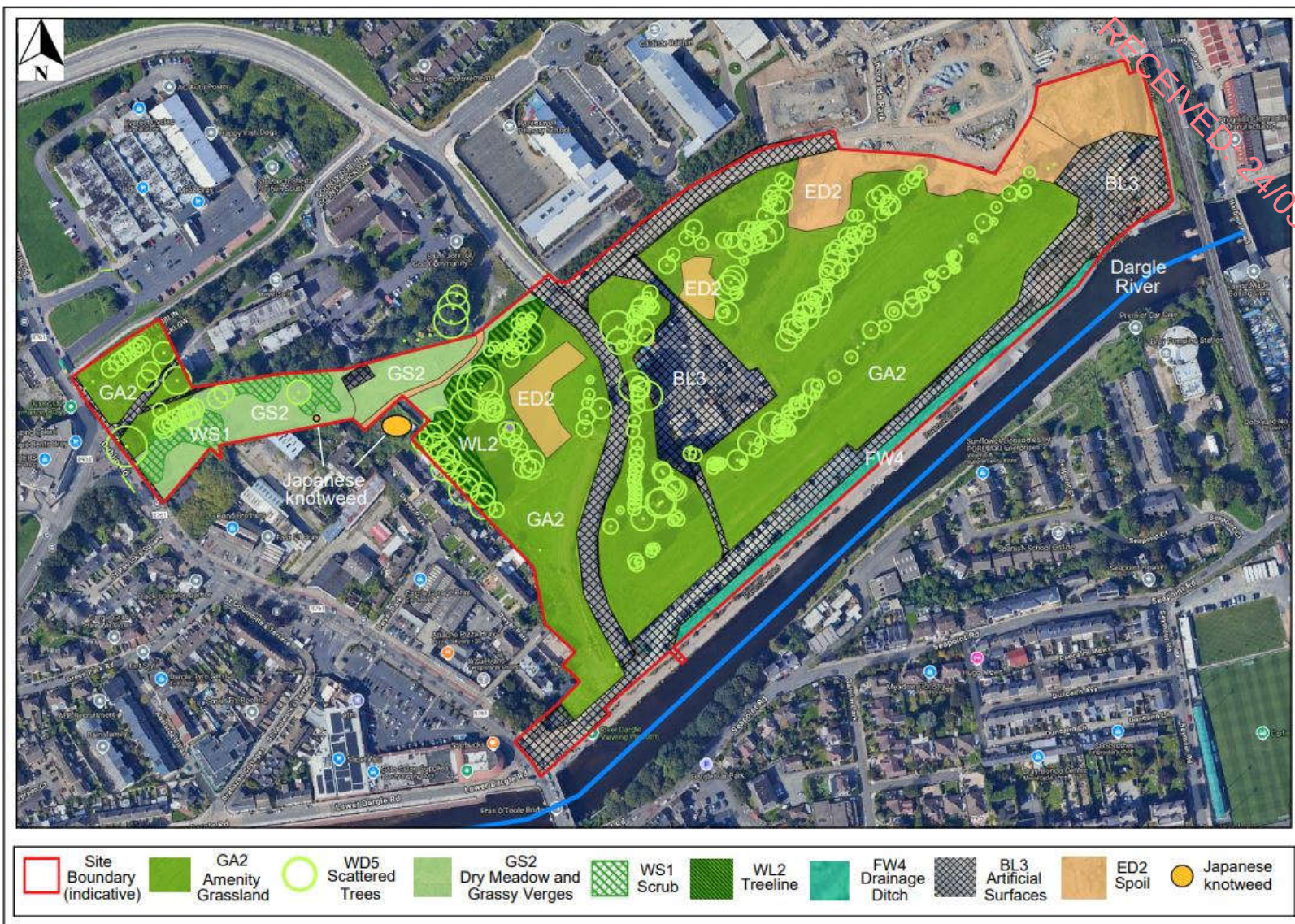


Figure 5-5 - Habitats with the proposed site boundary



Plate 5-1 Amenity Grassland GA2



Plate 5-2 Scattered Trees WD5



Plate 5-3 Treeline WL2



Plate 5-4 Scrub WS1



Plate 5-5 Dry meadows and grassy verges GS2



Plate 5-6 Singular Japanese knotweed plant

5.3.3.3 Tree Surveys

A Tree Survey was undertaken by Independent Tree Surveys during February 2024 for the proposed development. The significant individual trees inside the Site were assessed from ground level using Visual Tree Assessment (VTA) techniques and relevant observations and findings were recorded in compliance with the industry standard document BS5837: *Trees in relation to design, demolition and construction (2012)*.

Approximate tree locations, BS5837 category, Root Protection Areas and approximate crown shape are shown in Tree Survey Drawings 20021_TS Sheets 1-4 within the Tree Survey Report presented in Appendix 5.1.

A total of 231 individual trees were inspected, of these none were graded category A (high value), 58 were graded category B (moderate value), 134 were category C (low value) and 39 were graded category U (poor condition).

6 no. tree Groups were recorded with 77 no. trees (total) within these groups; many of the trees within the groups were not accessed or assessed individually due to poor ground conditions and incomplete topographic survey data (6 no. are outside the Site boundary). The majority of the survey site covers lands previously used as a golf course between the DART line to the east and Bray town to the west, with elements of the grounds of Ravenswell School and adjacent rough ground also included. The tree cover across most of the site is remnant landscape planting associated with the old golf course, with some trees also being located within the grounds of Ravenswell School and the derelict land between the school and western part of the old golf course.

Recommendations for tree protection and maintenance are included within the Tree Survey Report.

5.3.3.4 Fauna

Bats

A National Biodiversity Data Centre search of the site and surrounding area was conducted to determine species presence within the last ten years. This search showed records of Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Lesser Noctule (*Nyctalus leisleri*) and Daubenton's Bat (*Myotis daubentonii*) in 2020.

The Site was subject to numerous bat surveys the findings of which are summarised in this section of the report. The Bat Survey Report is included for in Appendix 5.2.

The Site was visited on 5 no. occasions to undertake bat surveys. Two Bat Emergence Surveys were conducted around two oak trees which had roosting bats present in 2020 bat surveys. Bat Activity Transect Surveys were also conducted throughout the development site. Bat Emergence Surveys were conducted on 25th June 2024 and 17th July 2024. Bat Activity Transect Surveys were undertaken 26th June 2024, 2nd July 2024 and 3rd July 2024. Two static detectors were left on site to gain additional bat data between the following dates between the 2nd July 2024 and 19th July 2024.

1. Emergence Surveys

Two emergence surveys were undertaken on 2 no. oak trees previously determined to have roosts in 2020. Both surveys were undertaken in the appropriate seasonal window and faced no limitations or constraints.

The results of the first emergence survey demonstrated no bat emergences. A single Common Pipistrelle (*Pipistrellus pipistrellus*) was observed during this survey briefly foraging before proceeding west. No other bats were observed during this survey and bat activity recorded throughout the survey was minimal. This area was noted to be well lit by streetlighting throughout the survey.

The results of the second emergence survey demonstrated no emergences. Similarly, to the previous emergence survey activity was minimal with a singular Common Pipistrelle observed commuting and a singular Leisler's bat being recorded, this was likely commuting overhead as this is a high flying bat species.

No bats were identified to be roosting in either of the oak trees (or any neighbouring trees).

2. Activity Surveys

Three transects (survey areas) were developed across the development site and bat activity surveys were conducted on each, refer to Figure 5-6 for surveyed areas.

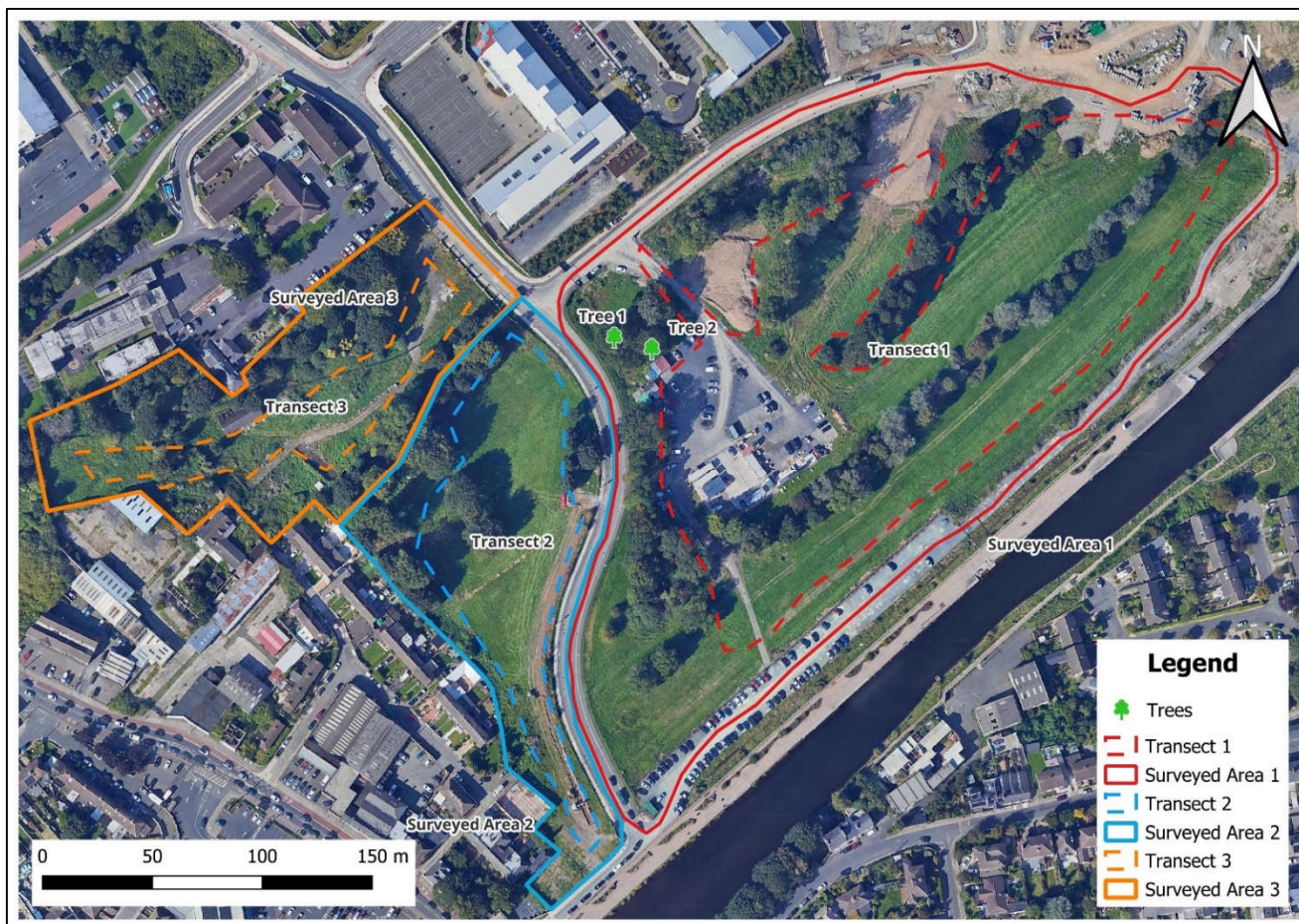


Figure 5-6 - Location of Transects and Surveyed Trees

Activity Transect 1

Four species of bat were recorded during this survey Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Leisler's bat (*Nyctalus leisleri*) and Daubenton's bat (*Myotis daubentonii*). It was noted that the Site compound was lit throughout the survey but the remainder of the Site was naturally darker.

Common & Soprano Pipistrelles were both seen and recorded on Site. There were both instances of foraging and commuting behaviour by these species. Foraging behaviour was observed primarily by the trees north of the Site compound where a single bat foraged and in the grassland south of the central treeline where three bats were observed foraging. Other singular instances of individuals foraging around the treeline were observed as seen in Figure 5-7 below.

4 no. Leisler's bat were recorded at the start of the survey but were never directly observed, this would suggest this species is commuting over this Site and as this is a high-flying bat is typically not observed while it commutes. These observations were primarily recorded around the central treeline.

A single recording of a Daubenton's bat was recorded on the Southern boundary of the transect along the River Dargle. This was an individual call, and the bat was not observed within the transect. This species hunts over water so was likely foraging along the river corridor off Site.

The overall bat activity in this area was deemed as low with the treelines deemed most active as commuting routes and foraging areas.

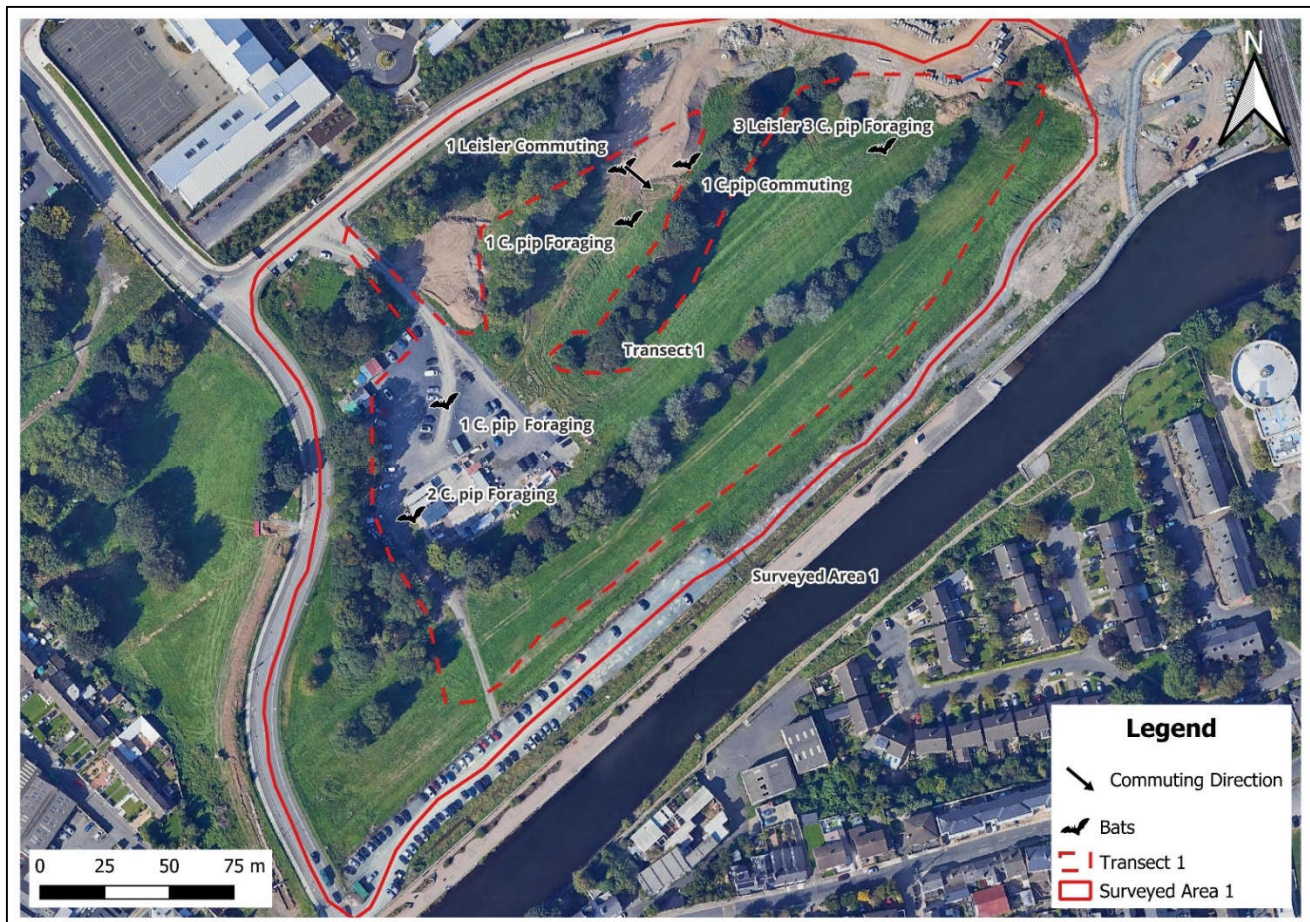


Figure 5-7 - Bat Activity Recorded in Transect 1

Activity Transect 2

This survey was conducted in the appropriate seasonal window and faced no limitations or constraints. A light drizzle occurred during this survey but due to its limited time and its light nature it is not considered a constraint. It was noted the light spill over from the street on the eastern side of the site was observed. Bat activity was noted to be similar both before and after the light drizzle. Two bat species were recorded during the survey Leisler's bat and Common Pipistrelle.

One instance of Leisler's bat was recorded during this survey. This bat was recorded but not observed likely commuting overhead out of eyeline.

Common Pipistrelle (4 no.) were both recorded and observed on site. At the commencement of the survey four pipistrelles were observed foraging along the north-western treeline for approximately thirty minutes in this area. Instances of common pipistrelles were recorded within the night as illustrated in Figure 5-8 below.

Outside of the initial foraging of the pipistrelles at the start of the survey the bat activity on the site was deemed to be low.

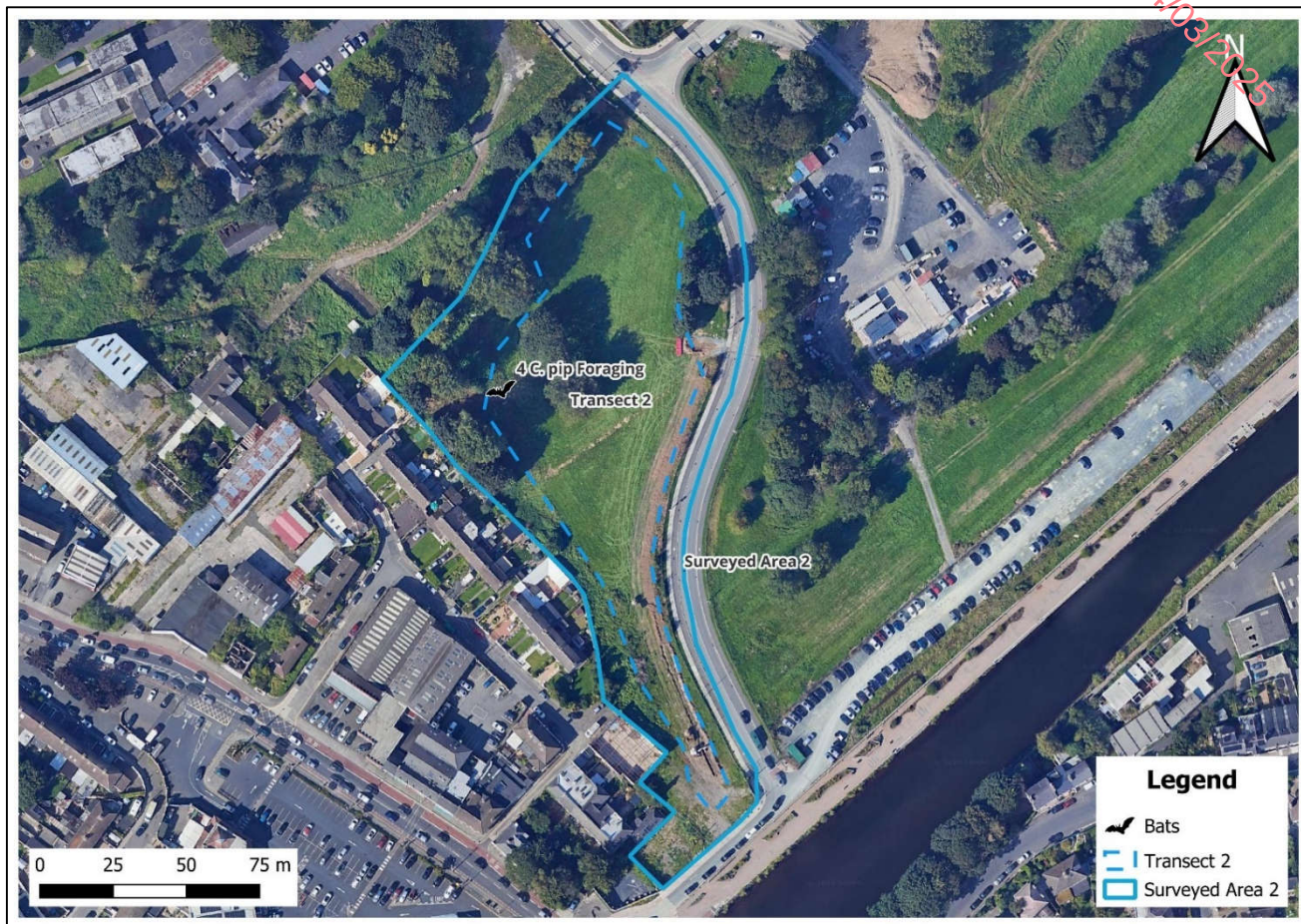


Figure 5-8 - Bat Activity Recorded in Transect 2

Activity Transect 3

This survey was conducted in the appropriate seasonal window and faced no limitations or constraints. Security lights were noted to have turned on at 22:39 and remained on for the duration of the survey. A single bat species was recorded during the survey; Common Pipistrelle.

Common pipistrelles were both observed and recorded on site. 2 no. pipistrelles were observed commuting from the western side of the transect in an easterly direction. Later in the survey a single bat was recorded foraging within this western area. An individual was also noted to forage on the eastern side of the transect. A single bat was also noted to commute from the woodland near the St John of Gods centre south towards the River Dargle as illustrated in Figure 5-9 below.

The bat activity in this area was deemed to be low.



Figure 5-9 - Bat Activity Recorded in Transect 3

3. Static Detectors

Static detectors were installed for an 18 day period in July, in the most suitable areas for bats (Refer to Figure 5-10 below), which recorded the species present and their activity within the area. These static detectors produced data detailing similar species profile and activity levels as was identified by the bat emergence and bat activity surveys and static detector data indicated that overall bat activity level across the development site was low. One additional species was recorded, the Brown Long Eared (*Plecotus auritus*). This bat was only recorded on three separate non-consecutive days and for individual calls suggesting it to be an occasional commuter within the area but not utilising the Site regularly.



Figure 5-10 - Static Bat Detector Locations

Terrestrial mammals

A NBDC records search of the Site and surrounding area was conducted to determine species presence within the last ten years. This search showed records no records of badger within the area. A record of badger was recorded in 1969. A lack of record does not necessarily indicate a species is not present as seen by the results above. As badger data is considered sensitive due to potential criminal behaviour towards the species records are often omitted from public forums and kept by appropriate bodies. NBDC records indicate that Otter (2017), Hedgehog (2022) and Fox (2015) have been previously recorded within or around the proposed development site. Invasive species Grey Squirrel have also been recorded within the Site

The Site and surrounding lands were surveyed for evidence of terrestrial mammal activity and mammal refugia (badger setts, fox dens) during the 22nd February, 22nd April and 24th May 2024. The Site was surveyed for evidence of badger, otter, fox, hedgehog, and squirrel activity as these species have been historically recorded within the environs of the Site. Surveys paid particular attention to any evidence of protected mammal species; badger as there is a known and recorded breeding/maternity sett located in lands to the north (c. 1km outside) of the proposed Site. A mammal hole was discovered outside of the developments redline boundary and a camera trap survey was undertaken between 22nd April and 24th June 2024.

Whilst there is no seasonally appropriate window for surveying for evidence of badger activity, surveying during the winter months (February) is preferable to assess the Site for its potential for accommodating a badger sett as ground cover vegetation has died back. Surveying for evidence of badger foraging activity and territorial range is preferable during the summer months (July / August) as badgers are more nocturnally active and as such there is greater potential for evidence of prints, faecal deposits, trails etc.

No badger sett was recorded within the Site nor within the scrublands to the east of the railway line during Site surveys.

The single mammal hole was discovered c. 30m outside of the developments redline boundary next to St John of God Community Services lands and a camera trap survey was undertaken between the 22/04/24 and the 24/05/24 to determine activity within the mammal hole. The camera trap survey consisted of the use of a single camera trap, which is triggered by movement, which was placed on a tree facing the mammal hole as this placement allowed for the capturing of images of anything that was utilising the mammal hole. This camera trap survey showed the hole was not being utilised by badgers but instead was being used by a fox. During this survey a single badger was photographed commuting near the Site. This evidence is reinforced by previous years surveys where sightings of a foraging adult badger accompanied by 3 no. badger cubs were observed. These sightings were for a period of 20 minutes in August 2020 during dawn surveys (undertaken for bat activity assessment).

Site surveys indicate the boundary fence line along the railway line on the eastern side of the Site is intact with no noticeable gaps which could provide mammal access to the Site. The large gap (used for public access) in the Site's northern fence line leading to Woodbrook Stream/woodlands and also the railway underpass on the east side of the Site are considered key areas which are currently providing access for badgers utilising the former Bray golf clubs lands as foraging areas.

Site survey evidence indicates the proposed development site is within the foraging territory and commuting area of badgers which have a sett located c. 1km north of the Site in the Woodbrook area. It is considered likely that the local badgers in this area have territorial range throughout the Site, all of the former Bray Golf Club lands, the wooded corridor along the Rathmichael Stream, scrub lands to the east of the railway line as well as across the extensive areas of agricultural lands and Woodbrook Golf Club lands located north of the proposed development site. Local badgers are likely to range across both sides of the railway line utilising gaps in railway fencing and significantly the railway underpass and level crossing at the Woodbrook Golf Club and likely use the railway underpass directly adjacent to the proposed development site. The large area of scrubland / undeveloped lands on the east side of the railway line (adjacent to the Site) with dense vegetative cover provides connectivity from the Woodbrook Golf Club lands (north of the Site) to the railway underpass adjacent to the Site.

Based on Site surveys and available information from other studies²³, the location of the badger sett being used by badgers observed near the Site is assumed to be the breeding sett located as part of surveys of the neighbouring Woodbrook Site. The location of the Woodbrook Site badger sett is not illustrated due to its sensitivity; however, details can be provided in confidence upon request.

Otters

Otter (*Lutra lutra*) is listed on Annex II and Annex IV to the Habitats Directive and is also protected under the Wildlife Acts. Otter feeds on aquatic prey (e.g. salmonids, eels and sticklebacks) and requires refugia (holts) along or near watercourses and associated riparian habitats.

An otter survey was undertaken on the 25th October 2024. The survey consisted of inspecting both banks of the River Dargle (c. 840m per bank) beginning at the Swan Sanctuary at Harbour Road extending as far as Lower Dargle Road. The area surveyed for field signs of otter such as prints, slides, holts, couches and spraints.

Along the northern bank of the Dargle off Ravenswell Road the bank is a concrete structure with no habitat suitable for otters. Two locations along this point were accessible for otters, a boat slip and a set of stairs. No field signs of otter were seen on these two entry points to the river. On the southern bank is approximately 2m of rock armour below a grassland bank. This habitat is suboptimal for otters.

²³ Stephen Little & Associates (2019) Environmental Impact Assessment Report – Residential Development Woodbrook (Planning ref: DO7A/1716)

The survey proceeded after the Fran O'Toole Bridge. Areas around the abutment's of these bridges were examined for the presence of otter prints but none were observed. Proceeding up this route the banks on both side on the river were noted to be manmade concrete structures with over a 4m drop to the river.

Across from the western side of the Peoples Park Bray on the southern side the bank becomes accessible to the river and the habitat becomes more semi-natural with the presence of grassland and trees. No field signs of otters were observed in this location.

No field signs of otters were observed during the survey. The bankside habitat along the river varied from unsuitable to sub-optimal for otters with the suboptimal areas located on the southern bank of the Peoples Park Bray which is remote from the proposed development site. The area would be suitable for otters to occasionally forage but the high level of anthropogenic disturbance and lack of areas to rest or create a holt would likely make otters favour other more suitable areas.

No evidence of otter activity was found during the survey and there are no otter holts located alongside the proposed development site. The man-made banks of the River Dargle next to the development site (concrete flood defence wall, promenade, rock armour) are not suitable habitats for holt establishment.

Marine Mammals

NBDC records identify the following marine mammals as having been recorded within the coastal waters directly around Bray Harbour; Common Porpoise (*Phocoena phocoena*), Bottle-nosed Dolphin (*Tursiops truncatus*), Common Dolphin (*Delphinus delphis*) and Grey Seal (*Halichoerus grypus*).

Birds

The following sections details bird species recorded within and round the development site from NBDC records, Irish Wetland Bird Survey records and as identified from Site specific bird surveys undertaken in 2024.

NBDC Species Records

The historical records of bird species recorded within and around the proposed development site are presented in Table 5-4 below, the table also details the conservation status of the birds (red and amber) as outlined in Birds of Conservation Concern in Ireland 4²⁴. The reviewed are encompasses a part of the Irish Sea, including Bray Harbour, and may of the waterbird species detailed below are noted to occur within the coastal waters as opposed to the Site.

Table 5-4 - NBDC records of bird species.

Species	Scientific Name	Protection Status	BOCCI	Year recorded
Alpine Swift	<i>Apus melba</i>			2023
Arctic Tern	<i>Sterna paradisaea</i>	Annex I	Amber List	2017
Barn Swallow	<i>Hirundo rustica</i>	Wildlife Acts		2016
Black Guillemot	<i>Cephus grylle</i>	Wildlife Acts	Amber List	2016
Black-billed Magpie	<i>Pica</i>			2023
Black-headed Gull	<i>Larus ridibundus</i>	Wildlife Acts	Amber List	2023
Black-legged Kittiwake	<i>Rissa tridactyla</i>	Wildlife Acts		2011
Blue Tit	<i>Cyanistes caeruleus</i>			2023

²⁴ Gilbert, G., Standbury, A. & Lewis, L. 2021. Birds of Conservation Concern in Ireland 4; 2020-2026.

Species	Scientific Name	Protection Status	BOCCI	Year recorded
Chaffinch	<i>Fringilla coelebs</i>			2023
Common Blackbird	<i>Turdus merula</i>			2023
Common Guillemot	<i>Uria aalge</i>	Wildlife Acts	Amber List	2016
Common Kestrel	<i>Falco tinnunculus</i>	Wildlife Acts	Red List	2010
Common Kingfisher	<i>Alcedo atthis</i>	Annex I	Amber List	2017
Common Linnet	<i>Carduelis cannabina</i>	Wildlife Acts	Amber List	2011
Common Moorhen	<i>Gallinula chloropus</i>			2011
Common Starling	<i>Sturnus vulgaris</i>	Wildlife Acts	Amber List	2023
Common Tern	<i>Sterna hirundo</i>	Annex I	Amber List	2016
Common Whitethroat	<i>Sylvia communis</i>			2016
Common Wood Pigeon	<i>Columba palumbus</i>	Wildlife Acts		2023
Eurasian Collared Dove	<i>Streptopelia decaocto</i>			2023
Eurasian Curlew	<i>Numenius Arquata</i>	Wildlife Acts	Red List	2023
Eurasian Jackdaw	<i>Corvus monedula</i>			2023
Eurasian Oystercatcher	<i>Haematopus ostralegus</i>	Wildlife Acts	Red List	2011
European Goldfinch	<i>Carduelis</i>			2023
European Robin	<i>Erithacus rubecula</i>			2023
European Shag	<i>Phalacrocorax aristotelis</i>	Wildlife Acts	Amber List	2023
Great Black-backed Gull	<i>Larus marinus</i>	Wildlife Acts		2023
Great Cormorant	<i>Phalacrocorax carbo</i>	Wildlife Acts	Amber List	2023
Great Tit	<i>Parus major</i>			2023
Grey Heron	<i>Ardea cinerea</i>			2023
Grey Wagtail	<i>Motacilla cinerea</i>		Red List	2017
Hedge Accentor	<i>Prunella modularis</i>			2023
Herring Gull	<i>Larus argentatus</i>	Wildlife Acts	Amber List	2023
Hooded Crow	<i>Corvus cornix</i>			2023
House Martin	<i>Delichon urbicum</i>	Wildlife Acts	Amber List	2016
House Sparrow	<i>Passer domesticus</i>	Wildlife Acts	Amber List	2023
Lesser Black-backed Gull	<i>Larus fuscus</i>	Wildlife Acts	Amber List	2011
Long-tailed Tit	<i>Aegithalos caudatus</i>			2023
Mallard	<i>Anas platyrhynchos</i>	Wildlife Acts	Amber List	2023
Mediterranean Gull	<i>Larus melanocephalus</i>	Annex I	Amber List	2011
Mew Gull	<i>Larus canus</i>	Wildlife Acts	Amber List	2023
Mistle Thrush	<i>Turdus viscivorus</i>			2016

Species	Scientific Name	Protection Status	BOCCI	Year recorded
Mute Swan	<i>Cygnus olor</i>	Wildlife Acts	Amber List	2023
Northern Wheatear	<i>Oenanthe</i>	Wildlife Acts	Amber List	2023
Pied Wagtail	<i>Motacilla alba subsp. yarrellii</i>			2023
Ring-billed Gull	<i>Larus delawarensis</i>			2016
Rock Pigeon	<i>Columba livia</i>	Wildlife Acts		2023
Rock Pipit	<i>Anthus petrosus</i>			2011
Rook	<i>Corvus frugilegus</i>			2023
Ruddy Turnstone	<i>Arenaria interpres</i>		Amber List	2023
Sand Martin	<i>Riparia riparia</i>	Wildlife Acts	Amber List	2016
Sandwich Tern	<i>Sterna sandvicensis</i>	Annex I	Amber List	2016
Swan Goose	<i>Anser cygnoides</i>			2011
Winter Wren	<i>Troglodytes troglodytes</i>			2023
Yellow-legged Gull	<i>Larus michahellis</i>			2016

Bray Harbour Swan Sanctuary and I-WeBS Monitoring Site

Bray Harbour is noted to a Swan Sanctuary. The harbour and the lower stretches of the River Dargle are also an I-WeBS (Irish Wetland Bird Survey) monitoring site which is located adjacent to the proposed development along the River Dargle²⁵. This site is home to a high number of mute swans. Figure 5-11 below illustrates the proximity of the proposed development site to Bray Harbour I-WeBS count site as well as the Swan Sanctuary.

The latest bird count data for the Bray I-WeBs site was requested from BirdWatch Ireland and was received on 5th November 2024. Table 5-5 below lists the latest available bird count data and details the annual peak waterbird counts between 2018-2024 (data deficient for 2020) for I-WeBS count site; Bray Harbour (0T907).

Table 5-5 – Annual Peak Waterbird counts for I-WeBS site Bray Harbour (0T907).

Species Name	Scientific name	2018/2019	2021/2022	2022/2023	2023/2024
Mute Swan	<i>Cygnus olor</i>	47	87	59	68
Light-bellied Brent Goose	<i>Branta bernicla hrota</i>		0	0	5
Mallard	<i>Anas platyrhynchos</i>	31	16	13	48
Red-throated Diver	<i>Gavia stellata</i>		0	0	2
Cormorant	<i>Phalacrocorax carbo</i>	3	13	1	4
Shag	<i>Phalacrocorax aristotelis</i>		3	1	24
Little Egret	<i>Egretta garzetta</i>		0	1	0
Grey Heron	<i>Ardea cinerea</i>	2	1	0	2
Oystercatcher	<i>Haematopus ostralegus</i>		0	0	15
Ringed Plover	<i>Charadrius hiaticula</i>		0	0	1

²⁵ https://birdwatchireland.ie/app/uploads/2023/08/iwebs_trends_0T907_Bray_Harbour.html

Species Name	Scientific name	2018/2019	2021/2022	2022/2023	2023/2024
Curlew	<i>Numenius arquata</i>	1	0	0	0
Turnstone	<i>Arenaria interpres</i>	64	63	32	87
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	98	376	133	183
Common Gull	<i>Larus canus</i>	2	5	3	16
Lesser Black-backed Gull	<i>Larus fuscus</i>	1	0	0	0
Herring Gull	<i>Larus argentatus</i>	187	142	25	410
Great Black-backed Gull	<i>Larus marinus</i>	3	1	0	7
Mediterranean Gull	<i>Larus melanocephalus</i>				28
Greylag Goose (domestic)	<i>Anser anser</i>	3	0	0	0
Mallard (domestic)	<i>Anas platyrhynchos</i>	2	0	0	0
Ring-billed Gull	<i>Larus delawarensis</i>	1	0	0	0



Figure 5-11 - Proximity of Bray I-WeBS monitoring site to the proposed development

2024 Site Survey Evidence

2024 Site surveys included dawn, day and dusk surveys and assessed bird activity and species numbers both within and overflying the proposed development site.

2 no. Vantage Points were employed for each survey; the Swan sanctuary at Bray Harbour was used as Vantage Point 1 and the River Dargle walkway parallel to the Site was used as Vantage Point 2. Each dawn and dusk survey lasted 4 hours and daytime surveys lasted 2 hours.

It was noted that the waterbirds found in Bray Harbour, in particular the Mute swans and gulls, are habituated to human activity with pedestrians and cars noted within c. 2m of the swans and gulls roosting location on the beach within the harbour walls. 1 no. Mute Swan and 1 no. mallard were noted overflying the railway bridge adjacent to Bray Harbour, both birds flew from the harbour to the River Dargle and did not cross the proposed development Site. No geese species, such as Light-bellied Brent Geese, were noted during surveys. Long-term data for the past 23 years suggests that turnstone, mallard, and mute swan numbers are stable or increasing for Bray Harbour²⁶.

Table 5-6 below outlines the bird species observed during the survey.

Table 5-6 - Bird species noted during 2024 surveys.

Species	Scientific name	Max Number Recorded in Bray Harbour I-WeBs site	Number Overflying Development Site	Number Recorded Within Development Site
Blackbird	<i>Turdus merula</i>	2	3	
Wood pigeon	<i>Columba palumbus</i>	60+	15	
Hooded Crow	<i>Corvus cornix</i>	100+	3	7
Herring gull	<i>Larus argentatus</i>	150+/-	6	
Mute Swan	<i>Cygnus olor</i>	57		
Heron	<i>Ardea cinerea</i>	1	1	
Mallard Duck	<i>Anas platyrhynchos</i>	60		
Common Gull	<i>Larus canus</i>	21		40
Turnstone	<i>Arenaria interpres</i>	80		
Mediterranean Gull	<i>Ichthyaetus melanocephalus</i>	20		
Black-Headed Gull	<i>Larus ridibundus</i>	150	5	
Cormorant	<i>Phalacrocorax carbo</i>	2	1	
Jackdaw	<i>Coloeus monedula</i>	10		
Wagtail	<i>Motacilla alba yarelli</i>	4		
Lesser Black-Backed Gull	<i>Larus fuscus</i>	120		
Shag	<i>Gulosus aristotelis</i>	1		
Magpie	<i>Pica pica</i>	2		
Great Black-Backed Gull	<i>Larus marinus</i>	1		
Oystercatcher	<i>Haematopus ostralegus</i>	1		

²⁶ https://birdwatchireland.ie/app/uploads/2023/08/iwebs_trends_OT907_Bray_Harbour.html

5.3.4 Overall Evaluation of the Proposed Development Site

In summary, the proposed development site does not lie within any area that has been designated for nature conservation at an international or national level. There are no habitats listed on Annex I of the Habitats Directive or records of rare or protected plants within the Site. There is one singular invasive plant, Japanese Knotweed which is listed as legally restricted invasive species within the Site boundary ²⁷ (a stand of knotweed is located outside the boundary of the Site). Boundary features and scattered trees within the Site are of local significance for a range of fauna, including protected species; bats, badgers and passerine birds.

Significance criteria are available from guidance published by the National Roads Authority (NRA, 2009). The ecological evaluation of the various habitats found within the Site is detailed in Table 5-7 below.

Table 5-7 - Ecological evaluation of habitats within the proposed development site.

Habitats	Evaluation
Amenity Grassland (GA2)	Local Importance (Lower Value)
Dry Meadow and Grassy Verges (GS2)	Local Importance (Higher Value)
Scrub (WS1)	
Scattered Trees and Parkland (WD5)	
Treelines (WS1)	
Artificial surfaces (BL3)	No ecological importance

Adjacent to the Site, the River Dargle (main channel) is a designated salmonid watercourse which likely hosts a range of protected species. Salmon are listed as a protected species within Annex II of the Habitats Directive. This river also accommodates local otter populations. Otter is a species which is protected under the Wildlife Act, 1976 (as amended) and listed on Annexes II and IV to the Habitats Directive (92/43/EEC), and so is strictly protected under Section 51 of the Habitats Regulations (SI No. 477/2011, as amended). As such the River Dargle is considered to be of national importance and is noted to be a sensitive ecological receptor.

The Site is of importance for commuting and foraging bats. The level of bat activity is considered as low at a Site local level. The Site is of Local Importance (Higher Value) for bats and breeding birds and these species are considered to be sensitive ecological receptors.

Given the presence of an active 'main' badger sett in lands to the north of the Site (Woodbrook area) along with evidence of badger foraging activity within and around the Site, the Site is considered to be of Local Importance (Higher Value) for badgers, which are considered to be sensitive ecological receptors.

Whilst rare Lepidoptera and Hymenoptera have been historically recorded within the surrounding area only 2 no. Meadow brown butterflies were noted throughout the entire site, Meadow brown butterflies are noted to be widespread

²⁷ As listed on the third schedule of the EC (Birds and Natural Habitats) Regulations 2011 S.I. No. 477/ 2011.

throughout Ireland²⁸. Given the Site is largely comprised of relatively well-maintained amenity grassland, the Site is not considered to be highly favourable habitat for butterflies and bees.

5.4 Predicted Impacts

The potential impacts arising from the construction and operation of the proposed development at Bray are discussed in the following sections.

5.4.1 Potential impacts assessed

In the absence of mitigation measures the proposed project could have a range of potential impacts on the ecological receptors within the zone of influence of the proposed project during the construction and operational phases. The categories below describe the possible impacts which may occur through development onsite. These impacts are assessed considering desktop and field survey data.

5.4.1.1 Physical Damage/ Habitat Loss

Physical damage includes the degradation to, modification, fragmentation or loss of habitats. Direct physical damage of habitats could occur within working areas of the proposed development and along access routes where construction works are undertaken. Physical damage of habitats can also be an indirect impact and could occur, for example, through the introduction of fine sediments into an aquatic system, causing changes to the particle composition of the benthic habitats. Physical damage may be temporary or permanent in nature.

5.4.1.2 Disturbance

Disturbance can cause sensitive species to deviate from their normal and preferred behaviour, resulting in stress and increased energy expenditure. Disturbance can result in species being displaced from suitable habitat areas that provide areas for feeding and foraging, commuting routes, and resting and breeding sites. Physical disturbance of species can also result in direct mortalities of species and thus, disturbance impacts can be both direct and indirect and may be temporary or permanent in nature. Examples of direct disturbance includes activities such as damage to a breeding or resting site of a protected species, e.g. a badger sett. Indirect disturbance may result from the presence of works crews and personnel on site during construction, noise emanating from a construction site or artificial lighting of a bat foraging area, causing bats to avoid the area.

5.4.1.3 Changes in Water Quality

The release of pollutants to water can impact upon the relevant waterbodies and the species they support. This can result in impacts such as increased turbidity of the water column, a reduction in photosynthesis, contribution to eutrophication and changes to the species composition of the system as a result. The degree of impact depends on the type of pollutant released and the nature of the receiving receptor. For example, the release of fine sediments to a stream or river is likely to cause siltation of the river bed and interrupt the functioning of species, from aquatic plants to macroinvertebrates to fish, and larger predators that depend on these biotic groups as a food supply, e.g. otter. Impacts to water quality could be temporary in the form of surface water runoff during construction, or permanent in the form of a continued discharge impacting negatively on the receiving environment during the operation of the development.

²⁸ http://www.irishbutterflies.com/meadow_brown_butterfly_of_ireland.html

5.4.1.4 Dispersal of Invasive Species

Non-native invasive species can have negative impacts on biodiversity. Negative impacts of non-native invasive species on native biota occur through competition, predation, herbivory, habitat alteration, disease and genetic effects such as hybridisation. In the cases of non-native invasive species such as Japanese knotweed, the main impacts are a reduction in species diversity due to dense plant growth, heavy shading and disruption of trophic levels. These species can potentially be spread via plant fragments and soil containing plant material, and by vectors such as machinery and personnel.

5.4.2 Do-Nothing Scenario

In the absence of development, in the short-term it is assumed that the Site will remain as amenity grassland, scattered trees and parkland if left unmanaged and the 'Do-Nothing' Impact is likely to be continued semi-natural habitat on Site. The potential value of the Site to species such as nesting birds, foraging mammals and commuting bats would continue, provided that the linear landscape features (hedgerows/treeline) would not be lost due to other forms of development.

Currently, the Site is not under any significant threats and there are no apparent threats to the fauna that utilise the land, such as commuting bats, foraging badgers and nesting birds.

Should no development be undertaken on the Site it could be expected that these species would remain. However, the development area is a significant part of the Bray Municipal District Local Area Plan 2018-2024 and as such development is highly likely to take place within the Site in the near future.

5.4.3 Development Design

Where possible the design of the proposed development has been informed on an iterative basis by the findings of the baseline ecological assessment. The following design principles and "designed-in" mitigation have informed the assessment of impacts

5.4.3.1 Landscape Design

There will be loss of some improved amenity grassland, parkland trees, a treeline and small areas of scrub and grassy verges within the Site during the construction phase. However, potential impacts have been minimised where possible via ecological input into the landscape design plan prepared by Bernard Seymour Landscape Architects (included within the design documents for the proposed development submitted as part of this planning application). The design calls for the retention of a 45 no. existing parkland trees within the Central Park and Entrance Road areas of the Site boundary. The landscape design also calls for extensive planting including standard sizes trees (c. 3-4m in height), semi standard sized trees (c. 2m in height), extensive areas of herbaceous perennial shrubs, numerous ground cover plants, grass lawns, rain garden areas, wildflower areas and green roofs with sedum carpets and wildflower planting. Details of the numbers of plants is provided in Table 5-8 below.

The design of the development also includes for 7 no. bird boxes to be installed on the retained trees within the Central Park area. The design also includes 5 no. insect boxes to be installed in herbaceous shrub and wildflower areas within the Central Park. Bird and insect boxes will be spread throughout the park area providing additional nesting and refuge for local passerine and insect species.

The landscape design will deliver extensive planting including the following features and planting schedule;

Table 5-8 - Planting Schedule.

Area	Planting Schedule
Western Gateway	65 no. standard size trees (3-4m) 3345 no. herbaceous shrubs 279 no. climbers Grass lawns
Central Park	163 no. standard sizes trees 125 no. semi-standard sizes trees (2m) 7725 herbaceous perennial shrubs 102 no. trees and shrubs in rain gardens 3250 no. ground cover plants 47,000 bulbs Wildflower areas Grass lawns
Coastal Gardens	70 no. standard sizes trees 65 no. semi-standard sizes trees 3080 no. herbaceous perennial shrubs Wildflower areas Screen planting
Residential Area	196 no. no. standard sizes trees 174 no. semi-standard sizes trees 580m of hedging 160,000 no. herbaceous shrubs 34 no Fruit Trees and Bushes in Community gardens
Entrance Road	68 no. standard sizes trees 23 no. multi-stem trees 15 no. shrubs / herbaceous perennials 1140m ² of Woodland Screening Planting 75m of hedging Amenity grasslands
Apartment Blocks	Green Roofs with sedum and wildflowers

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5.4.3.2 Lighting Design

The design of the lighting within and around the proposed development has also been designed to be cognisant of minimising effects on local nocturnal species, such as bats and badgers, and has been developed so as to allow for a dark ecological corridor around eastern boundary of the Site. The lighting scheme for the Site has been developed with the following principals to the fore; only illuminating what needs to be illuminated (e.g. light directed to the path only), reducing night time light levels, reducing the height of the luminaires, shielding of luminaires and correct choice of light (e.g. a warm white spectrum <2700 Kelvins).

The lighting scheme has been designed in accordance with guidance contained in; *Guidance Note 08/23; Bats and Artificial Lighting at Night- Institute of Lighting Professionals*.

Project specific lighting designs has included: -

- Column height ≤6m
- Directional lighting to prevent light spillage & light pollution.
- All street lanterns calculated at 0° tilt in relevant areas
- All street lanterns available in 2700K LED (warm White)
- Modern light technology to restrict the horizontal plane of luminaires.

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5.4.3.3 Drainage Design

Sustainable urban Drainage Systems (SuDS) is also a key focus for the entire design of the development. Along with permeable paving for parking areas, the landscape design includes for attenuation areas throughout the development by channelling runoff to planted areas and tree pits. This has the added benefit of reducing surface water runoff rates. In addition, planted swales will be created areas to aid with storm water flow and these planted areas will contain suitably water tolerant plant species. The roof areas of apartment blocks which will include sedum green roof treatments will further slowdown the flow of water from areas that traditionally contribute to high runoff flow rates during rainfall events. Section 5.4.5.5 below outlines the SuDS drainage features in greater detail.

5.4.4 Construction Phase

The potential impacts likely to arise during construction of the proposed development are discussed in the following sections.

5.4.4.1 Impact on Sites Designated for Nature Conservation

Potential negative impacts on European sites are discussed in the accompanying Natura Impact Statement (AtkinsRéalis, 2025). As noted, the proposed development is not located within the boundaries of any European site. There will be no direct impacts to European sites; i.e. no land take or the permanent removal of habitat supporting qualifying interest and ecological features of the designated sites.

There are 14 no. European sites within 15km of the development site. The proposed development site is bordered to the south by the River Dargle which outfalls to the Irish Sea. The proposed development will involve construction of a surface water / storm water drainage outfall on the banks of the River Dargle. Drainage during the operational phase of the proposed development will outfall to the River Dargle and Irish Sea. Given that a number of the European sites within the potential zone of influence of the proposed development are coastal or marine in nature, potential hydrological connectivity exists from the development site to the coastal and marine based European sites via the River Dargle and Irish Sea. The closest European sites with potential indirect connectivity via the River Dargle and Irish Sea are; Bray Head SAC (ca. 1.7km) and Rockabill to Dalkey Island SAC (ca. 4.1km).

The NIS considers the potential for impact on European sites via the Irish Sea. Bray Head SAC is the closest European site with potential hydrological connectivity and this SAC is designated for the protection of heath and cliff habitats. The NIS outlines that potential indirect impacts via the hydrological pathway of the Irish Sea on terrestrial heath and cliff habitats are not considered likely. Also, given the dilution and dispersal that would occur within the Irish Sea this is not considered a viable pathway through which the conservation objectives of the SAC could be affected.

Potential impacts on SPAs have also been considered. The development is sufficiently remote that there is no risk of disturbance to waders and wildfowl within any SPA. The proposed development will not impact upon the migratory flight paths of SPA species nor restrict their passage and mobility between wetland sites. The accompanying NIS (AtkinsRéalis 2025) concludes that there will be no likely significant effects on Dalkey Islands SPA, Wicklow Mountains SPA, South Dublin Bay and River Tolka Estuary SPA, The Murrough SPA and North-West Irish Sea SPA bird populations from potential collision with proposed apartment buildings. The development site is not a terrestrial site known for supporting roosting or foraging waterbirds. I-WeBs data identifies waterbird species that habitually field feed only occur in small numbers within the coastal waters of the Bray Harbour I-WeBs count site. The only SPA bird

species noted within the development site during surveys undertaken in winter 2025 was small numbers of Common gull. No impacts to SPAs are anticipated as a result of the proposed development.

Rockabill to Dalkey Island SAC and Wicklow Mountains SAC are considered the only designated conservation sites within the zone of influence of the proposed development. The Rockabill to Dalkey Island SAC is designated for the protection of qualifying interests; Reef habitats and marine mammal; Harbour porpoise. No impacts are anticipated upon reef habitats, either during the construction or operation of the proposed development. Porpoise have been recorded within coastal waters around Bray Harbour and potential impacts on this species from the proposed development via hydrological pathways has been assessed within the NIS (AtkinsRéalis 2025). Mitigation measures have been developed within the NIS for the construction phase of the proposed development to ensure there will be no adverse effects on the integrity of the Rockabill to Dalkey Island SAC qualifying interest species; Harbour porpoise. Wicklow Mountains SAC is designated for a range of lake and terrestrial habitats and otters. There is no connectivity from the proposed development site to any SAC habitats and as such there will be no effects on mountainous habitats. Following a precautionary approach the NIS has assumed that otters from Wicklow Mountains may range c.14km downstream to the River Dargle estuary adjacent to the development site and mitigation measures have been developed for the construction phase of the proposed development to ensure there will be no adverse effects on the integrity of the Wicklow Mountains SAC qualifying interest species; Otter.

Note: As detailed in Section 5.3.2.1 above, in light of the 'proceedings' it was considered prudent to screen in otters which are a QI of Wicklow Mountains SAC for full Appropriate Assessment in respect of the present application for permission for the avoidance of any doubt as to potential impacts arising from the Proposed Development. This is done on a precautionary basis without prejudice to any arguments made in opposition to the grounds pleaded by the Applicant in the 'proceedings' and is done without prejudice to the conclusions reached in the Appropriate Assessment Screening and NIS carried out in respect of the Coastal Quarter Phase 1B development.

The NIS concludes;

'Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests of Rockabill to Dalkey Island SAC and Wicklow Mountains SAC and the implementation of the proposed mitigation measures, it has been concluded by the authors of this report that there will be no residual impacts and the proposed project will not have an adverse effect on the integrity of the Rockabill to Dalkey Island SAC, Wicklow Mountains SAC or any other European site.'

5.4.4.2 Impacts on Habitats

The development will result in a permeant loss of areas of Amenity grassland (GA2), Scattered trees and parkland (WD5), a treeline (WL2), a small area of scrub (WS1) and a small area of grassy verges (GS2). These habitats range in value from Local Importance (Lower Value) to Local Importance (Higher Value). Predevelopment there is a total of 302 no. trees within the development site, 45 no. trees will be retained and 257 no. will be lost. Refer to Figure 5-12 below for locations of trees retained and lost.

At the southern extents the Site has been previously largely cleared of all vegetation and consists predominantly of hard standing areas and gravelled surfaces associated with the construction of the River Dargle flood defence and promenade works. Whilst the development site is predominantly separated from the watercourse by the physical barrier of public promenade and flood defence wall, the Site boundary does extend to the edge of the River Dargle and incorporates a small area of the riverbank of ca. 5m length. The surface water drainage network design for the development will involve the construction of an outfall pipe connecting to/outfalling at the northern bank of the River Dargle. This stretch of the river has been previously cleared of all natural habitats and consists of hardstanding areas/artificial surfaces (BL3) only, in the form of river walkway, promenade and flood defence walls. There are no natural / semi-natural riparian habitats or natural / semi-natural river banks along the River Dargle connecting to or directly adjacent to the proposed development site.

There are no habitats on Site of greater than local value. No ecological features of regional, national or European importance will be directly impacted by the proposed development. Semi-natural habitat of similar ecological value will be replaced as part of the landscape strategy and there will be a net gain in terms of tree numbers and thus the habitat loss impact will be temporary.

Negative impacts to semi-natural habitats would be restricted to within the development site. The habitats would therefore be assessed overall as important at a Site level and the effect of the habitat loss during the construction phase of the development would be adverse temporary significant at Site level only.

There will be no long-term significant impacts as a result of this habitat loss, however the amenity grasslands of the former golf club lands are of importance for foraging badgers, bats and passerine birds. These potential impacts are discussed below.



Figure 5-12 - Locations of trees retained and trees lost

5.4.4.3 Indirect habitat loss/damage via proximity of construction works

Due to works being close to biodiversity features adjoining the Site, such as the River Dargle and associated aquatic habitats to the south, there is potential for a slight negative impact from construction activities to these features along the Site's boundaries.

At the south of the Site, the construction phase of the proposed development could have potential impacts upon aquatic environment of the River Dargle and also upon the downstream benthic habitats associated with the Dargle estuary via contaminated run-off or sediment from excavation materials entering the watercourse. However, instream works are not necessitated for the installation of the outfall pipe. Works on the artificial river bank will be of small scale, in a small work zone (c. 2m by 2m) and of short duration (estimated 1 day). Any impacts as a result of sediment in the River Dargle will be imperceptible and temporary in nature at a local level and in turn the potential for sediment

to reach to the benthic / estuarine habitats is not likely. As a result, sedimentation from the Site would not result in significant impacts to the River Dargle and estuary.

All construction activities will proceed in line with the surface water mitigation measures detailed in Section 5.5 below. Contamination of the aquatic environment from construction related activities such as excavated materials, silt, sediment or other pollutants will be prevented by these mitigation measures. Therefore, impact on the aquatic environment is mitigated so as to be not significant.

5.4.4.4 Indirect habitat/species loss/damage via spread of invasive species

A single high impact invasive plant, 1 no. Japanese knotweed plant, has been recorded during ecological surveys within the extents of the proposed development site. Site biosecurity measures to remove the plant and that knotweed stand outside the Site will be monitored and measures will be put in place to prevent any potential spread into the Site. Measures will also be put in place to reduce the introduction of invasive species, which can occur for example through the importation of soil materials, are included in Site mitigation measures (Refer to Section 5.5 below) and as such this impact is mitigated to not significant.

5.4.4.5 Impacts on bats

This section details the principle potential impacts of the proposed residential development during the construction phase on bats.

Loss of Foraging and Commuting Habitat

It is noted that Site surveys in 2024 determined bat activity across the Site was low. Loss of grassland, trees and treeline areas during construction will impact on commuting and foraging bats and may reduce the available insect prey species and also reduce the feeding area available for bats in some locations. In the absence of mitigation, it is considered that the removal of foraging and commuting habitat would be a long-term significant negative impact at the local scale.

Loss of Bat Roosts

No bat roosts were recorded within the Site during 2024 surveys and as such there will no loss of bat roosts. Notwithstanding this, as a precautionary measures, pre-construction bat surveys are included for in Section 5.6 Monitoring below.

Lighting

Lighting can cause avoidance of an area for commuting bats and can prevent or reduce foraging for some species, including *Myotis* species²⁹. Studies have also found that pipistrelle and Leisler's bat can congregate around white mercury street lights and white metal halide lamps feeding on the insects attracted to the light, however, even bat species that have been shown to opportunistically forage in lit conditions have subsequently been recorded being impacted by artificial lighting. In cities, for example, common pipistrelles have been recorded avoiding gaps that are well illuminated, thereby creating a barrier effect³⁰. Temporary lighting measures which may be required during the construction phase may affect bats commuting through or feeding within the proposed Site.

In the absence of mitigation, disturbance to bats from lighting during the construction phase would have short-term significant adverse impact at the local geographic scale.

5.4.4.6 Impacts on badgers and other large mammals

Terrestrial mammal surveys undertaken within the proposed development site did not find any evidence of badger setts, otter holts or protected mammal refugia within the Site extents. A fox den was noted c. 30m north, outside of the development site which will not be lost, it is noted that foxes are not subject to protection under the Wildlife Act. The location of a badger 'main' sett in lands to the north of the project (north of Woodbrook residential area) and the

²⁹ Stone E.L. (2013). Bats and Lighting: Overview of current evidence and mitigation.

³⁰ Bat Conservation Trust and Institute of Lighting Professionals (2018) Guidance Note 08/18: Bats and artificial lighting in the UK. ILP, Rugby.

camera trap evidence of an adult badger foraging near the west of the proposed development site indicates that the Site is foraging and commuting area for local badgers. During the construction phase there will be a loss of grassland and trees which will lead to a reduction in foraging habitat for badgers. The construction phase may also temporarily disrupt foraging habits and commuting routes.

In the absence of mitigation, it is considered that the removal of foraging and commuting habitat would be a long-term significant adverse impact on badgers at the local geographic scale.

No evidence of otters activity was noted along the banks of the River Dargle and there are no habitats suitable for holts along the man-made (concrete) riverbanks adjacent to the development site. It is presumed that otters use the main river channel for hunting and commuting and there are proposed construction works that have the potential to affect the water quality and subsequently otters of the River Dargle.

All construction activities will proceed in line with the surface water mitigation measures detailed in Section 5.5 below. Contamination of the River Dargle from construction related activities such as excavated materials, silt, sediment or other pollutants will be prevented by these mitigation measures. Therefore, potential adverse impacts to otters using the River Dargle are mitigated so as to be not significant.

No significant impacts to any other protected mammals are expected as a result of the proposed development.

5.4.4.7 Impacts on birds

Bird species recorded during site surveys (2024) are common and no rare or uncommon species or species of high conservation value were recorded (small numbers of Common gulls loafing were noted during Site surveys). Historic records of protected bird species within the area are associated with the coastal waters around Bray Harbour. Waterbird species that habitually field feed only occur in small numbers within the Bray Harbour I-WeBs count site. I-WeBs do not include the terrestrial lands of the project site within the Bray Harbour I-WeBs count site and the development site is not a terrestrial site known for supporting roosting or foraging waterbirds. Site surveys undertaken in winter 2024 did not record any field feeding wintering waterbirds or wildfowl within the proposed development site. Given the high public usage of the Site, the lack of usage of the Site by wintering waterbirds and wildfowl (Site survey evidence), it is considered not to be of value as a roosting or feeding area for waterbirds associated with the coastal waters. Given the location of the Site in relation to areas of high avian usage, during the construction phase, the physical erection of buildings and usage of cranes will not impact upon the migratory flight paths of waterbirds or wildfowl nor restrict their mobility between wetland sites. The usage of cranes and the erection of highly visual structures/buildings will not present a collision risk to birds during the construction phase of the proposed project (potential bird collision risk during the operational phase is assessed below).

There will be a net loss of semi-natural habitats within the proposed development area (grassland, trees) and the loss of trees in particular will have a localised effect on nesting and feeding resources for local passerine species.

In the absence of mitigation, the loss of habitat for breeding birds within the development site is considered a permanent slight negative effect on passerine bird species at a local geographic scale. No impacts on wintering and native waterbirds and wildfowl are anticipated.

5.4.4.8 Impacts on water quality

Indirect impacts to watercourses via surface-water run-off

During wet conditions sediment can mobilise in the form of over-ground run-off during excavations and/or movement of heavy machinery through the Site. Sediment is of particular concern for aquatic species within receiving water bodies.

However, the only works near the River Dargle are those involving the installation of the surface water drainage network for the proposed development. All other construction activities are remote from the watercourse and there is the physical barrier of the flood defence walls and public promenade separating the Site from the watercourse.

Given the physical barrier the flood defence walls and promenade will present and the distance between the development works areas and the watercourse, the potential for large volumes of sediment to reach the River Dargle as a result of construction activities is precluded.

Any impacts as a result of sediment in the River Dargle will be imperceptible and temporary in nature at a local level and in turn the potential for sediment to reach the estuary is not likely.

In addition, mitigation measures as set out in Section 5.5. below and in and Chapter 7- Water and Chapter 6 - Land, Soils and Geology will be implemented during the Construction phase.

Indirect Impacts during construction phase via groundwater (hydrogeological pathway)

Water Chapter 7 details the potential impacts on the water quality of the River Dargle via groundwater pathways and outlines mitigation factors and measures for the control of pollution and protection of surface water and groundwater quality. The assessment anticipates adverse impacts on surface water or groundwater will be short-term and not significant during the construction phase of the proposed development, given the mitigation measures proposed. During the construction phase impacts on aquatic species accommodated within the River Dargle will be short term imperceptible.

No impacts to groundwater are anticipated from works associated with underground connections to local infrastructure; foul network connections and potable water connections.

5.4.4.9 Disturbance and/or displacement of faunal species

Bats

The reduction in trees and grassland habitats during the construction phase can lead to reduced insect abundance in the short term which will result in a loss of foraging prey for bats. No roosting bats were recorded during Site surveys and as such there will be no displacement or disturbance to roosting bats.

Nesting Birds

Some disturbance/displacement of passerine birds may occur during construction due to increased noise and disturbance. The loss of trees will also cause a reduction in bird nesting and feeding sites. In the absence of mitigation this will be a permanent moderate negative impact at a local scale.

Terrestrial mammals

While evidence of badger has been recorded onsite, no signs of badger refugia (setts) were recorded or within the Site boundary. Other mammal species historically recorded within the proposed development lands include Fox, Grey Squirrel and Hedgehog. During construction activities there is the potential for disturbance and disruption to the foraging habits and commuting routes of terrestrial mammals, in particular to local badgers.

It is considered that the disruption to foraging and commuting for terrestrial mammals would be a short-term moderate adverse impact on badgers at the local geographic scale.

Other Species

Protected butterfly and bee species have been recorded within the wider area, outside of the development site. It is not expected that impacts on Hymenoptera and Lepidoptera species will be significant, and the open space and landscaped areas provided as part of the proposed development will incorporate features suitable for use by these species.

It is considered that disturbance or displacement of insect species will be short term imperceptible at a local geographic level.

5.4.5 Operational Phase

5.4.5.1 Impact on Sites Designated for Nature Conservation

There is no direct connectivity from the proposed development site to any internationally or nationally designated sites and as such during the operational phase of the development there will be no direct impacts on European sites or nationally designated conservation sites.

During the operational phase, storm water / surface water from the development will outfall to the River Dargle and as such there is potential hydrological connectivity to marine / coastal based designated conservation sites via the River Dargle and Irish Sea. The closest designated sites with indirect connectivity via the Irish Sea are Bray Head SAC/pNHA (ca. 1.7km) and Rockabill to Dalkey Island SAC (ca. 4.1km). SuDS measures have been employed in the design of the surface water drainage network and there will be no significant water quality impacts on the River Dargle from rainfall / surface water run-off when the development site is in use. The AA Screening Report (AtkinsRéalis 2025) concludes that there will be no likely significant effects on any European site via the hydrological pathway of the River Dargle during the operational phase of the proposed development.

The proposed development once completed may lead to an increase in public footfall within Bray Head SAC/pNHA. There are formalised and managed pathways through Bray Head some of which are through heath habitats and along cliff tops. Bray Head was subject to a Special Amenity Area Order in 2007. The objectives and principles of Bray Head Special Amenity Area Order detail extensive measures for the management of increased public access as well as for the maintenance of recreational walkways to be undertaken in combination with the protection of the heath and cliff habitats. Given that the formalised paths through Bray Head are already heavily utilised by the public, and given the paths and protected habitats (heaths and cliffs) are subject to continued management and maintenance measures, it is considered that any increase in footfall that may occur along Bray Head's formalised pathways as a result of the proposed development will not likely effect Bray Head's heath and cliff habitats.

During the operational phase, foul effluent from the proposed development will be treated at Shanganagh WwTP. Following treatment, discharge from the plant is to the Irish Sea. Discharge from the WwTP is not anticipated to have any impact on any habitats or species associated with any designated conservation site given that it will be treated and given the dilution and dispersal that will occur within the Irish Sea.

No direct or indirect impacts are anticipated on internationally or nationally designated conservation areas during the operational phase of the proposed development.

5.4.5.2 Impacts on Habitats

No further impacts on terrestrial habitats are predicted during operation of the proposed scheme. Landscaping proposals are discussed under Section 5.5 Mitigation Measures, below.

Impacts on aquatic / marine environment

Once built, surface water drainage from the development will discharge to the network which ultimately joins the River Dargle to the south of the Site. The proposed surface water drainage system for the development has been designed with the inclusion of SuDS and in accordance with the Greater Dublin Regional Code of Practice for Drainage Works and Sewers (GDSDS). Refer to Stormwater Impact Assessment Report³¹ for discussion of surface water drainage, the use of SuDS and surface water attenuation.

The SuDS features to be used in the drainage network include modular permeable paving, swales; filter drains; tree pits and underground storage capacity with discharge to the River Dargle. There are green roofs on the development

³¹AtkinsRéalis Document Reference; 0088726DG0007

units (apartments) and much of the rainfall for this side of the Site will be absorbed by these sedum and wildflower areas. For areas of soft landscaping, e.g. tree and shrub mix planting, rain gardens, wildflower meadows, grassland areas and residential gardens the rainfall will drain to ground mimicking nature and managing rainfall close to where it falls. The permeable paving similarly allows for localised management of rainfall where during low rainfall events surface water will infiltrate to ground. For larger rainfall events the permeable paving will have an outlet to allow storm water to discharge into the proposed surface water network. The soft landscaping and drainage designs also includes for swales which will also minimise surface water runoff to the local network by allowing rainfall to be slowed and soaked to ground. The SuDS drainage design allows for opportunities for using runoff rainfall where it falls which will ultimately allow for greatly reduced surface water outfall to the River Dargle whilst also providing for watering of extensive areas of soft landscaping. The drainage design also includes for underground attenuation systems and flow controls to slow and manage surface water drainage before final outfall to the River Dargle which will ensure there is protection to the natural flow regimes of the watercourse.

Surface water runoff from the development will be attenuated to greenfield rates in accordance with GDSDS using a hydrobrake on the surface water outlet from each catchment. Surface Water flow exceeding allowable outflow rates will be stored in underground storage units (for rainfall events up to 1 in 100-year return period, with a 30% allowance for climate change). Adoption of a SuDS design also allows for treatment of surface water flow as close to source as possible.

The operational foul sewer amenities of the proposed development will connect to the existing operational Bray foul water network which is processed by the Shanganagh Wastewater Treatment Plant. Uisce Eireann has confirmed that the plant has capacity to adequately process the additional input from the operational demand presented by the proposed development. Following treatment discharge from the plant is to the Irish Sea. Discharge from the WwTP is not anticipated to have any impact on the aquatic environment given that waters are treated at the plant before discharge and given the dilution and dispersal which will occur within the Irish Sea.

It is therefore considered that the operational phase of the proposed development will not negatively impact, directly or indirectly, any of the habitats or species accommodated within the aquatic environments of the River Dargle or Irish Sea.

5.4.5.3 Impacts on bats

Lighting

The street and domestic lighting proposed for the development will increase light levels within the proposed development area. Increased lighting may reduce the availability of feeding sites for bats and would be a long-term significant adverse impact at the local geographic scale. As a consequence, specific mitigation measures have been incorporated into the design in order to avoid such impacts (see Section 5.5).

Foraging and commuting routes

The connectivity of the habitats located to the north (Rathmichael woodlands/stream) and the south (River Dargle dark corridor) of the Site is of importance to local bat populations. The loss of connecting features, such as hedgerows and treelines, would have a long-term significant adverse impact at the local geographic scale. The specific landscaping design incorporates additional planting along an ecological buffer zone along the east side of the development lands (entire Masterplan lands). These measures are included in the design so as to ensure connectivity between habitats and will ensure important bat flight lines, foraging areas and commuting routes are provided for to avoid impact on foraging and commuting bats.

5.4.5.4 Impacts on badgers and other large mammals

There will be a loss of foraging habitat associated with the construction of the development in the form of grassland areas, treeline and small areas of scrubland. Badgers are known to be located near Woodbrook golf club lands to the north of the Site. There are large areas of undeveloped lands, primarily along the east side/coast side of the railway line, and it is important to ensure there is continued connectivity to available foraging habitats. The landscaping design

calls for an ecological buffer zone along the eastern side of the development Site connecting to the Phase 1 Site ecological buffer zone which will provide foraging and commuting routes for badgers known to be located in lands to the north. Refer to Landscape Planting Plans (Drawings Nos. 2301-PA-00 to 10) for details of the landscaping design. The connectivity of landscaping features from the Rathmichael Stream and woodlands (north of Site extents) to the railway underpass adjacent to the Site (Phase 1 Site) will also provide commuting routes from/to the large areas of scrub habitat and golf course lands to the east of the railway.

Whilst mitigation measures will ensure connectivity of habitats and some foraging habitat, there will be a loss of green field areas which are badger foraging habitat. The operational phase of the development will lead to a long-term moderate impact on badgers at a local level.

5.4.5.5 Impacts on water quality

Indirect damage to the aquatic environment via surface-water run-off

During the operational phase, surface-water run-off associated with the Site will be collected by a new water drainage system for the development which has been designed in accordance with the Greater Dublin Regional Code of Practice for Drainage Works and Sewers (GDSDS). No significant impacts to aquatic species accommodated within the River Dargle are anticipated during the operational phase of the development.

Indirect damage to environment via discharge of treated foul effluent

Wastewater/foul effluent from the constructed development, will be collected via new sewer infrastructure at Site that will connect to an existing foul sewer associated with the operation of the Bray development. The foul sewer will discharge wastewater into existing public waste-water sewer network. This will ultimately be treated at the Shanganagh Plant (WwTP) and the treatment infrastructure has the capacity to deal with effluent arising from the proposed development. No impacts to ecological features are anticipated as a result of foul water generated from the use of the proposed development given that it will be treated and given the dilution and dispersal that will occur within the Irish Sea with treated discharge from the WwTP.

5.4.5.6 Impacts on birds – collision risk

With urbanization, collision with man-made structures/buildings has become a threat for birds. Of key consideration when assessing collision risk is the location and design of the structure and how and where birds will fly through the wider landscape. In the case of the birds (waterbirds and wildfowl) using the Bray Harbour I-WeBs count site, their movement would be expected to be within the marine environment, along the coastline, within estuarine areas, along river channels and between wetland sites. The project site does not proffer any of the aforementioned habitats, nor does the Site lie between Bray Harbour I-WeBs count site and any of these habitat types. The Site is not situated between Bray Harbour I-WeBs count site and any sites of high avian use. The waterbirds and wildfowl accommodated within the Bray Harbour count site will not have regular or repeated passage across the Site in order to reach preferred habitats. Site survey evidence (2024) did not note any passage of waterbirds across the proposed development site. As such the project will not restrict bird mobility between wetland sites and there will be no likely significant effects on the Bray Harbour's bird populations from potential collision with proposed apartment buildings. The accompanying AA (AtkinsRéalis 2025) concludes that there will be no likely significant effects on the bird populations associated with Dalkey Islands SPA, Wicklow Mountains SPA, South Dublin Bay and River Tolka Estuary SPA, The Murrough SPA and North-West Irish Sea SPA from potential collision with proposed apartment buildings.

In addition, the design of the proposed apartment blocks has been cognisant of bird collision risk and does not include for large, uninterrupted expanses of glass (as for example is often the case with office block design) which due to the extensive areas of reflection can confuse birds and exacerbate collision risk for local passerine and near passerine species. Local bird species recorded flying across the Site (crows, pigeons etc., Refer to Table 5-6 above) are largely habituated and accustomed to foraging, roosting and nesting within the urban environment and are regularly found within built up cityscapes. Given the design of the taller apartment blocks; balconies, solid surfaces/walls between windows with no uninterrupted expanses of glass, the built up nature of the surrounding landscape (including existing

apartment blocks and tall buildings) and that local native bird species are accustomed to the urban environment, the proposed buildings within the Site present an extremely low collision risk to local bird species. Moreover, it is considered likely that local bird species will utilise the taller buildings for roosting and potentially nesting (e.g. gulls, rooks, pigeons nesting on green roof areas).

Given the location and design of the buildings, the lack of likely waterbird and wildfowl passage across the Site, that local native Passerines (e.g. rooks, blackbirds), Columbiformes (pigeons) and Charadriiformes (gulls) species are accustomed to the 'built-up' nature of the surrounding landscape, it is considered that potential the collision risk of waterbirds, wildfowl, near passerine and passerine species will be imperceptible at a local level. Given the location of the Site in context with the I-WeBS count site, the proposed project will not impact upon the migratory flight paths of wintering waterbird bird species nor restrict their mobility between wetland sites.

5.4.5.7 Disturbance and/or displacement of faunal species

The proposed development when operational will be sufficiently distant from the River Dargle and Bray harbour so not to cause disturbance to wintering and native waterbirds, which are noted from I-WeBS counts to be predominantly gull species. Given that the harbour and estuary areas are heavily utilised by the public already, bird species accommodated within the coastal waters are very habituated to human presence. As such disturbance related impacts on waterbirds is considered imperceptible.

As noted above, local passerine bird populations may be displaced off Site during the construction stage. Once works have finalised and landscaping becomes established common bird species will use the area again. During the operational phase, the levels of activity will stabilise and birds in the surrounding landscape will be expected to habituate to the volume of activity proposed.

The design calls for the establishment of landscaping areas which will include for wildflower areas and pollinator species which could lead to an increase in insect availability for birds (refer to Landscape Planting Plans Drawings Nos. 2301-PA-00 to 10). Mitigation measures also include for the installation of bird nesting boxes throughout the planted areas of the Site. Given the mitigation measures, the impact on local passerine birds is therefore predicted to be neutral during operation.

5.4.6 Risk of Major Accidents and Disasters

The risk of a major accident onsite is low and would be confined to the construction phase of the development (e.g. there will be no oil storage tanks on site, removing the risk of oil spills associated with the finished development). Events such as a large hydrocarbon spill or release of high volumes of contaminants during the construction phase could potentially have a negative impact on high value sensitive sites such as the River Dargle and estuary. However, given the location of the Site relative to watercourses, and given the surface water mitigation measures as outlined in Water Chapter 7, it is unlikely that an accident of sufficient scale would occur that would negatively impact on surface water features or aquatic habitats. While impacts to local soil and groundwater could conceivably occur, the preventative measures and emergency response measures will limit the potential scale of this impact (refer to Chapter 6 Land, Soils & Geology and Chapter 7 Water for mitigation measures). Thus, allowing for the above, the magnitude of a major accident on site is likely to be significant at a Site level only and imperceptible in relation to ecologically important features such as the nearby River Dargle.

5.5 Mitigation Measures

5.5.1 Construction Phase Mitigation

The appointed Contractor shall ensure specialist ecological surveying is undertaken where required i.e. mammal surveys, bat surveys, and nesting bird surveys as detailed further below. Construction phase ecological mitigation

measures shall be developed and undertaken in coordination with ecological specialists (i.e. bat specialist and suitably qualified ecologist) as required.

5.5.1.1 Protection of Sites Designated for Nature Conservation

Protection of sites designated for conservation, and the features of interests associated with designated sites, is through prevention of potential impacts to surface waters and the aquatic environment during the construction phase, refer to Section 5.5.1.7 below.

Mitigation measures as set out in Chapter 6 – Land, Soils and Geology; and Chapter 7 – Water will also be implemented during the Construction phase.

Works will follow best practice guidance as outlined in *Guidelines on the Protection of Fisheries during Construction Works in and Adjacent to Waters* (IFI, 2016).

5.5.1.2 Mitigation of habitat loss/damage during construction

45 no. trees are to be retained on-site; trees will be protected from any accidental damage during construction by means of exclusion through use of fencing. This is set out in full in the accompanying Tree Survey Report and Landscape Planting Plan. Measures will be taken to ensure that trees being retained are incorporated into the development without being impacted upon. Protective fencing will be provided around retained trees and fencing will be erected so as to encompass the Root Protection areas (RPAs) of trees and hedgerows. The fencing will be at least 2m high and constructed in accordance with the RPA outlines in the Tree Survey Report (Appendix 5.1).

Site clearance of potential bird nesting habitat is detailed below.

To compensate for the loss of trees substantial native tree planting will be planted on the Site. This will reduce the impact of the proposed development upon habitats in the area and there will be no significant operational impact upon habitats due to the provision of substantial native and pollinator friendly habitats proposed for the Site (refer to Landscape Planting Plan Drawings Nos. 2301-PA-00 to 10). Landscape enhancement measures are outlined in greater detail below in Section 5.5.1.11.

5.5.1.3 Bats

Loss of Foraging and Commuting Habitat

Loss of commuting and foraging habitat at the Site will be mitigated by the landscaping proposals, which include extensive tree, shrub and wildflower planting. Planting schemes should ensure connectivity to linear/woodland habitats in the wider landscape. Trees that are being retained in the Site shall be protected during clearance and construction works in line with current guidelines e.g. British Standard 5837:2012 and National Roads Authority 2006a.

Lighting

To minimise disturbance to bats and other fauna (badger and otter) that are roosting/resting or active at night, no construction operations will be undertaken during the hours of darkness during spring and summer months (i.e. when bats are active). If construction lighting is required during the bat activity period (dusk April to September), lighting shall be directed away from all boundary habitats. This can be achieved by using directional lighting (i.e. lighting which only shines on the proposed works and not nearby countryside) to prevent overspill.

5.5.1.4 Birds

Removal of nesting habitat (scattered trees and treeline by local and common bird species) will be carried out outside the breeding bird season from 1st March to 31st August inclusive. Where nesting habitat clearance cannot be avoided

during this period the NPWS will be consulted in advance and if, in consultation, it is deemed necessary then a suitably qualified ecologist will be appointed by the Contractor to oversee clearance of nesting habitat and ensure the area is free of nesting birds. The appointed ecologist will develop a method statement for the nesting habitat clearance in consultation with local NPWS staff. The comprehensive landscaping design calls for the planting of native trees and plant species suitable for pollinating insect species. The landscape design should provide for a net gain in suitable bird nesting and foraging habitat. The landscaping design has followed the principles outlined in the All-Ireland Pollinator Plan 2021-2025.

5.5.1.5 Badgers

During the construction phase the Contractor will adhere to the '*Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes*' (NRA 2006). The Site and all areas within 150m around the perimeter of the Site will be resurveyed for badger activity and the presence of setts by a suitably qualified ecologist (appointed by the Contractor) prior to the commencement of construction activities. Should an active sett be noted within the Site or survey area, NPWS will be informed and consulted. The suitable qualified ecologist will develop a method statement in agreement with NPWS for construction activities near an active badger sett. Method statement for works near an active sett will include; there shall be no blasting or pile driving within 150m of an active sett during the breeding season (December to June) or construction works within 50m of such an active sett during the breeding season.

The creation of an ecological buffer zone along the eastern boundary of the overall Masterplan Lands will allow for connectivity of habitats and the continuance of the site to be used as a badger foraging area. The buffer zone allows for connectivity between Rathmichael woodlands/stream and the River Dargle and includes easy access for mammals to the railway underpass which leads to scrub habitat and Woodbrook golf club lands which are known to be badger foraging territory. During the construction phase no works will be undertaken during night time hours and as such the construction activities will not take place whilst local badgers are foraging. During the construction phase an access track will be in situ along the northern and eastern boundaries which will allow for continued connectivity from Rathmichael woodlands to the railway underpass and to the important foraging habitats to the east of the railway line.

During the construction phase the following standard management and protection measures will be implemented during the construction works and monitored by the project ecologist:

- No excavations are to be left uncovered overnight or without a means of egress (e.g. a ramp or sloped plank) to prevent badgers from falling in or entering in search of food and becoming trapped;
- No buildings or storage units are to be left open overnight to prevent badgers from entering in search of food and becoming trapped;
- All food waste is to be properly secured and disposed of to avoid attracting badgers to the Site;
- No toxic, poisonous or potentially harmful substances or materials are to be left unsecured overnight; and,
- Should any new badger setts or mammal burrows be discovered within the Site or immediately adjoining areas the project ecologist is to be contacted for immediate inspection, advice and liaison with NPWS as necessary.

5.5.1.6 Otters

Protection of otters is through prevention of potential impacts to surface waters and the aquatic environment during the construction phase, refer to Section 5.5.1.7 below.

5.5.1.7 Prevention of pollution to surface waters

With regard to potential surface water quality impacts the following construction phase mitigation measures are proposed: -

- The construction management of the Site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guidelines '*Control of Water Pollution from Construction Sites*' and

'Groundwater control - design and practice' and CIRIA 2010 'Environmental Good Practice on Site' to minimise as far as possible the risk of pollution.

- Works will follow best practice guidance as outlined in Guidelines on the Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016).
- The existing drainage network, specifically along the existing road, and as required elsewhere across the site, will be suitably protected (via. the use of physical barriers and / or the implementation a Site-specific water run-off management plan as required).
- A response procedure will be put in place to deal with any accidental pollution events. Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of in accordance with all relevant waste management legislation: -
 - All Site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area;
 - All oil stored on Site for construction vehicles will be kept in a locked and bunded area;
 - Generators, pumps and similar plant will be placed on drip-trays to prevent contamination;
 - All Site vehicles used will be refuelled in bunded areas;
 - All temporary construction fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. Relevant Material Safety Data Sheets along with oil absorbent materials will be kept on Site in close proximity to any fuel storage tanks or bowsers during proposed Site development works; and,
 - All fuel / oil deliveries to on-Site oil storage tanks will be supervised, and records will be kept of delivery dates and volumes.
- In order to prevent any potential surface water impacts via release of cementitious materials the following measures will be implemented where poured concrete is being used on Site;
 - The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out on Site and therefore these aspects will not pose a risk to the waterbodies present, namely the River Dargle or the Irish Sea;
 - Shutters will be designed to prevent failure. Grout loss will be prevented from shuttered pours by ensuring that all joints between panels achieve a close fit or that they are sealed;
 - Any spillages will be cleaned up and disposed of correctly;
 - Where concrete is to be placed by means of a skip, the opening gate of the delivery chute will be securely fastened to prevent accidental opening;
 - Where possible, concrete skips, pumps and machine buckets will be prevented from slewing over water when placing concrete;
 - Mixer washings and excess concrete will not be discharged directly into the drainage network, or any drainage ditches, surface water bodies or exposed groundwater; and,
 - Surplus concrete will be returned to batch plant after completion of a pour.

Surface Water Drainage Outfall Installation Works

The construction methodology for the installation of the surface water drainage outfall on the River Dangle's flood defence wall / promenade will include the following measures to ensure there are no adverse water quality impacts which could affect the aquatic environment:-

- The installation of the surface water drainage outfall pipe on the man-made northern bank of the River Dargle shall follow the same construction methodology as was utilised during the Phase 1 Coastal Quarter Development for outfall pipe installation.
- The flood defence / sea defence wall directly alongside the river channel will remain entirely in situ and intact whilst the promenade path and subbase materials on the landside / northside of the flood defence wall are being excavated to create a pipeline route. There will be no excavation or breaking up of the flood defence wall itself.

- A working platform using scaffolding framework (or similar) shall be hung / suspended from flood defence wall on the river channel side to create a works area for core drilling through the flood defence wall. The scaffolding framework shall be covered to prevent rainfall ingress and dust and debris egress from the working platform area. The working platform will be hung / suspended above water level.
- The flood defence wall will be core drilled (225mm diameter) from the working platform, i.e. drilling direction will be towards landside, so that no drilled materials fall into the river channel.
- Following completion of the core drilling, the outfall pipe will be installed through the hole and grouted followed by bolting on the non-return valve.
- No excavations within or above the river channel will be permitted.
- No mechanical equipment bar the core drill shall be used above the river channel.
- No cement or viscous substances, bar grouting material, shall be used above the river channel.

Mitigation measures as set out in Chapter 6 – Water and Chapter 7 – Land, Soils and Geology will be implemented during the Construction phase.

Works will follow best practice guidance as outlined in *Guidelines on the Protection of Fisheries during Construction Works in and Adjacent to Waters* (IFI, 2016).

5.5.1.8 Biosecurity Measures

One singular Japanese knotweed plant was found on Site along the proposed entrance roadway (northwest Site boundary). The excavation works in the area of the knotweed plant will be supervised by the Contractor appointed suitably qualified ecologist or an Invasive Plant Species Specialist. The Contractor's ecologist or specialist shall supervise the excavation works to ensure the development site is free from all Japanese knotweed plant material prior to road construction in the northwest of the Site. Surface plant materials and all knotweed rhizomes will be excavated and removed off Site by an appropriately licenced haulier for disposal to a licenced waste facility (e.g. IMS³² in Naul). The Contractor's ecologist / specialist will develop Site biosecurity methodologies to ensure plant and equipment is clean and free of knotweed plant material post knotweed excavation works. It is recommended that a herbicide spraying programme is undertaken for the knotweed stand located in the lands Off Site (subject to landowner agreement).

Strict bio-security protocols will be implemented during the construction phase so as to ensure no imported materials potentially contaminated with invasive plant species are brought to Site. All imported soil materials will be visually inspected by the Contractor's ecologist for signs of invasive plant contamination (such as root fragments, rhizome material) prior to arrival on Site.

The area of knotweed will be inspected one year after works are complete to ensure that there has been no re-establish of knotweed within the Site.

5.5.1.9 Disturbance of faunal species mitigation

Removal of nesting habitat (scattered trees and woodland) will be carried out outside the breeding bird season from 1st March to 31st August inclusive. Where nesting habitat clearance cannot be avoided during this period the NPWS will be consulted in advance and if, in consultation, it is deemed necessary then a suitably qualified ecologist will be appointed by the Contractor to oversee clearance of nesting habitat and ensure the area is free of nesting birds. The appointed ecologist will develop a method statement for the nesting habitat clearance in consultation with local NPWS staff.

³² <https://www.imsirl.ie/>

5.5.1.10 Additional Construction Phase Ecological Mitigation Measures

With regard to potential impacts on ecological features the following mitigation measures are proposed:

- The Contractor shall engage a suitably experienced and qualified ecologist and/or specialist ecologist to undertake the required ecological surveying prior to construction activities. Pre-construction ecological surveys should include; terrestrial mammal surveys, bat roost surveys and breeding bird surveys (breeding bird surveys will be required if vegetation clearance is to be undertaken within nesting season 1st March – 31st August);
- The Contractor shall employ good practice environmental and pollution control measures with regard to current best practice guidance such as Environmental Good Practice On-site Guide (CIRIA, 2018);
- The construction management of the Site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guides 'Control of Water Pollution from Construction Sites' and 'Groundwater control - design and practice' to minimise as far as possible the risk of pollution;
- All of the mitigation measures for the protection of soils listed in Chapter 6 will be implemented onsite during the construction phase;
- The Contractor shall take all necessary precautions to potential impact upon aquatic species of the River Dargle from construction activities. The mitigation measures for prevention of potential surface water impacts as detailed in Water Chapter 7 shall be implemented;
- The Contractor shall take all necessary precautions to prevent potential impact upon aquatic species of the River Dargle via the local groundwater body. All groundwater mitigation measures as outlined in Chapter 7 - Water shall be implemented; and,
- The Contractor shall take all necessary precautions to prevent potential impact upon habitats and species from dust generated during the construction phase. All air quality mitigation measures as outlined in Chapter 8- Air Quality shall be implemented.

The above mitigation measures will form part of the Construction Environmental Management Plan (CEMP) submitted as part of this planning application, and which will be further added to by the Contractor within the project-specific Detailed CEMP which will be in operation during the construction phase.

5.5.1.11 Design Measure Mitigation

Landscaping

A comprehensive landscaping design has been developed for the Site which will include for the creation of an ecological buffer zone along the eastern boundaries of the Site. In line with WCC Biodiversity Action Plan and the All Ireland National Pollinator Plan and in order to create a biodiversity net gain at the Site the landscaping plan will include areas of ecological enhancement such as substantial areas of tree planting and wild flower areas. The planted areas will link with the Rathmichael woodland and the River Dargle. The landscape design includes for linear shrub planting along the eastern boundary adjacent to the railway line to provide cover for the movement of terrestrial mammals and to provide for habitat suitable for local passerine bird species. This planting will comprise an appropriate mixture of trees and shrubs, preferably of local provenance, and including species attractive to pollinators. The planting will incorporate a range of species that will attract feeding invertebrates, including moths, butterflies and bees. Refer to Landscape Planting Plans (Drawings Nos. 2301-PA-00 to 10) for details of the landscaping design.

The landscape planting design provides for a net gain in number of trees within the Site. There are 535 no. standard sized trees (3-4m height) and 447 no. of semi-standard sized trees (c. 2m) within the planting schedule. Included within the proposed design including species:- *Pinus nigra subsp. nigra* (Black Pine), *Betula pendula* (Silver Birch), *Magnolia grandiflora* (Southern Magnolia), *Arbutus unedo* (Strawberry Tree), *Tamarix tetrandra* (Four-angled Tamarisk), *Gleditsia triacanthos* (Honey Locust), *Tilia tomentosa* (Silver Lime), *Pinus sylvestris* (Scots Pine), *Quercus cerris* (Turkey Oak), *Crataegus leavigata* (Crimson Hawthorn) and *Prunus 'Accolade'* (Accolade Cherry). Small trees; *Pinus Chamaerops humilis cerifera* (Mediterranean Fan Palm), *Syringa vulgaris* (Common Lilac), *Cotinus coggygria* (Smoke Tree), *Argyrocytisus battandieri* (Moroccan Broom), *Erica arborea* (Tree Heath), *Sambucus nigra black lace* (Black Lace Elderberry), *Ceanothus arboreus* (California Lilac), *Pinus mugo* (Mugo Pine), *Crataegus monogyna* (Common Hawthorn) and *Cornus florida* (Flowering Dogwood).

The soft landscaping design includes for extensive areas of herbaceous shrub planting; c.174,150 no. including species:- *Achillea ptarmica flore pleno* (Sneezewort), *Agapanthus africanus albus* (White Agapanthus), *Agapanthus africanus 'big blue'* (Big Blue Agapanthus), *Alcea rosea spotlight blacknight* (Blacknight Hollyhock), *Armeria maritima* (Thrift), *Anemanthele lessoniana* (Wind Grass), *Anthriscus sylvestris ravenswing* (Ravenswing Chervil), *Bupleurum fruticosum* (Shrubby Hare's Ear), *Crambe cordifolia* (Giant White Crambe), *Chasmanthium latifolium* (Northern Sea Oats), *Dierama pulcherrimum* (Angel's Fishing Rod), *Dryopteris filix mas* (Male Fern), *Echinops ritro* (Globe Thistle), *Erigeron karvinskianus* (Mexican Fleabane), *Eryngium big blue* (Big Blue Sea Holly), *Eryngium yuccifolium* (Rattlesnake Master), *Euphorbia wulfenii* (Wulfen's Spurge), *Foeniculum vulgare 'Smoky'* (Smoky Fennel), *Francoa bridal wreath* (Bridal Wreath), *Geranium rozanne* (Rozanne Geranium), *Grevillea canberra gem* (Canberra Gem Grevillea), *Helianthemum the bride* (The Bride Rock Rose), *Helleborus hybridus* (Lenten Rose), *Helleborus niger* (Christmas Rose), *Hemerocallis black emanuelle* (Black Emanuelle Daylily), *Hydrangea quercifolia* (Oakleaf Hydrangea), *Hydrangea serrata blue bird* (Blue Bird Hydrangea), *Iris barbata elatior louvois* (Louvois Bearded Iris), *Kniphofia 'Bees Lemon'* (Bees Lemon Torch Lily), *Lobularia maritima* (Sweet Alyssum), *Limonium gmelinii* (Gmelin's Statice) and *Lychnis coronaria alba* (White Champion).

The soft landscaping design includes for extensive areas of bulb planting, 47,000 no., including species; *Allium purple sensation* (Allium), *Camassia leichtlinii 'alba'* (White Camas), *Camassia leichtlinii caerulea* (Blue Camas), *Eremurus cleopatra* (Cleopatra Foxtail Lily), *Fritillaria persica 'minaret'* (Persian Fritillary), *Galanthus nivalis* (Snowdrop), *Galtonia candicans* (Summer Snowflake), *Hyacinthoides non-scripta* (Bluebell), *Iris hollandica 'black beauty'* (Black Beauty Dutch Iris), *Iris hollandica 'lion king'* (Lion King Dutch Iris), *Leucojum aestivum* (Summer Snowflake), *Muscari magic mix* (Grape Hyacinth), *Narcissus 'Thalia'* (Thalia Daffodil), *Nerine bowdenii 'alba'* (White Nerine), *Tulipa ballerina* (Ballerina Tulip), and *Tulipa 'purissima'* (Purissima Tulip).

Extensive areas of wildflower meadows are also included in the soft landscaping design including species: - *Black veris* (Cowslip), *Knautia arvensis* (Field Scabious), *Lotus pedunculatus* (Greater Bird's-foot Trefoil), *Eupatorium cannabinum* (Hemp Agrimony), *Lesser Knapweed* (*Centaurea nigra*), *Ranunculus acris* (Meadow Buttercup), *Leucanthemum vulgare* (Ox-eye Daisy), *Lythrum salicaria* (Purple Loosestrife), *Silene flos-cuculi* (Ragged Robin), *Plantago lanceolata* (Ribwort Plantain), *Hypochaeris radicata* (Rough Hawksbit), *Prunella vulgaris* (Selfheal), *Malva moschata* (Musk Mallow), *Daucus carota* (Wild Carrot), *Oenothera biennis* (Wild Primrose), *Stachys sylvatica* (Hedge Woundwort), *Achillea millefolium* (Yarrow), *Rhinanthus minor* (Yellow Rattle), *Agrostis capillaris* (Browntop Bentgrass), *Agrostis stolonifera* (Slender Creeping Red), and *Festuca rubra* (Chewings Fescue).

There is 1140m² of woodland screen planting for the new access road area including the following species; Alder (*Alnus glutinosa*), Silver Birch (*Betula pendula*), Hawthorn (*Crataegus monogyna*), Burning Bush (*Euonymus alatus*), Sweet Box (*Sarcococca confusa*), Siberian Dogwood (*Cornus alba sibirica*), Tatarian Dogwood (*Cornus alba kesselringii*), Juneberry (*Amelanchier lamarckii*), Dogrose (*Rosa canina*), Wild cherry (*Prunus avium*) and Black Elder (*Sambucus nigra* 'Black Lace'). Alder catkins provide an early source of nectar and pollen for bees, and the seed are eaten by birds³³. Silver birch provides food and habitat for more than 300 insect species. Seeds are often eaten by a range of birds. Hawthorn is a food plant for the caterpillars of many moths, its flowers also provide nectar and pollen for bees and flies to enable pollination. Burning bush can be found at a woodland edge or an exposed or coastal location. Sweet box plant provides nectar and pollen for bees and other pollinating insects. Siberian dogwood can be used as a hedgerow plant and is provides berries for birds and small mammals in late summer³⁴. Juneberry blossom in the spring and its berries are foraged by birds. Dog rose can be found in hedgerows, woodland edges and on scrubland and small birds are able to extract the seeds³⁵. Wild cherry, the spring flowers provide an early source of

³³ <https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/a-z-of-british-trees/alder/#:~:text=Value%20to%20wildlife,the%20siskin%2C%20redpoll%20and%20goldfinch.>

³⁴ <https://www.fernhill.ie/news/762/dramatic-dogwoods-winter-s-best-friend?srsId=AfmBOqavoxOI1QM2IYq3BRLsyrUM-5RuTcyW6ara7jfbmFNfmKUUPF>

³⁵ <https://www.treecouncil.ie/native-irish-tree-item/dog-rose->

nectar and pollen for bees; while the cherries are eaten by birds, its hollow branches provide nest chambers for bumble bee larvae, and shelter for hibernating insects³⁶

There is 674m of hedging proposed within the landscaping design including the following species; *Fagus sylvatica* (European Beech), and *Crataegus monogyna* (Hawthorn).

Bats

The following recommendations for enhancement are adapted from Landscape and Urban Design for Bats and Biodiversity (BCT, 2012). To attract nocturnal flying insects, plant:

- Mixtures of flowering plants, trees and shrubs to encourage a diversity of insects to sustain bats and other wildlife throughout the year. New planting will include pollinator-friendly tree species (Refer to Landscape Planting Plan);
- Hedgerows will include a range of different species to provide food throughout the year, for example blackthorn for early season nectar; hawthorn and bramble for summer flowers and autumn berries; ivy for autumn nectar and later winter berries;
- Flowers that vary in colour, fragrance, shape, amount of nectar and time of flowering;
- Pale flowers that are more easily seen in poor light, so attracting insects at dusk;
- Single flowers, which tend to produce more nectar than double varieties; and
- Flowers with insect-friendly landing platforms and short florets, like those in the daisy families.

Birds

Within the landscape plan wildflowers, shrubs and trees which have the potential to support foraging populations of birds are proposed in the landscape plan and include (non-exhaustive list): -

Common Name	Scientific Name	Location
Hawthorn	<i>Crataegus monogyna</i>	Central Park, Residential
Holly	<i>Ilex aquifolium</i>	Central Park
Rowan/Mountain Ash	<i>Sorbus aucuparia</i>	Residential
African lily	<i>Agapanthus africanus</i>	Central Park, Residential
Thrift	<i>Armeria maritima</i>	Western Gateway, Residential
Honeysuckle	<i>Lonicera periclymenum</i>	Residential
Crab apple	<i>Malus sylvestris</i>	Residential
Silver Birch	<i>Betula pendula</i>	Central Park, Residential
English Oak	<i>Quercus robur</i>	Central Park
Hazel	<i>Corylus avellana</i>	Central Park
Common vetch	<i>Vicia sativa</i>	Central Park, Coastal Gardens
Elder	<i>Sambucus nigra</i>	Central Park, Residential
June berry	<i>Amelanchier spp.</i>	Central Park, Residential
Knapweed	<i>Centaurea</i>	Central Park, Coastal Gardens

³⁶ <https://www.treecouncil.ie/native-irish-tree-item/elder->

The development design also includes for 7 no. bird nesting boxes to be erected in the woodland area to the northwest of the Site as well as along the ecological buffer zone along the northern and eastern boundaries of the Site.

Invertebrates

The Landscape design for the proposed development includes for the creation of wildflower areas to incorporate plant species which will attract pollinating insects. The installation of 5 no. insect hotels will also form part of the wildflower and shrub landscaping measures and these insect boxes will allow for insects to establish and have refuge in the landscaped areas.

The planting schedule contains a mix of native species and emphasis has been placed on adhering to the objectives outlined in the All-Ireland Pollinator Plan 2021-2025 with the aim of planting species which are beneficial to pollinator species. Pollinator beneficial plant species include (non-exhaustive list): -

Common Name	Scientific Name	Location
English Lavender	<i>Lavandula angustifolia</i>	Residential
Thrift	<i>Armeria maritima</i>	Western Gateway, Residential
Hemp Agrimony	<i>Eupatorium cannabinum</i>	Central Park, Coastal Gardens
Black Meddick	<i>Medicago lupulina</i>	Central Park, Coastal Gardens
Hedge woundwort	<i>Stachys sylvatica</i>	Central Park, Costal Gardens
Yellow-rattle	<i>Rhinanthus minor</i>	Central Park, Coastal Gardens
Selfheal	<i>Prunella vulgaris</i>	Central Park, Coastal Gardens
Ox-eye Daisy	<i>Leucanthemum vulgare</i>	Central Park, Coastal Gardens
Meadowsweet	<i>Filipendula ulmaria</i>	Central Park, Coastal Gardens
Devils Bit Scabious	<i>Succisa pratensis</i>	Central Park, Coastal Gardens
Knapweed	<i>Centaurea</i>	Central Park, Coastal Gardens
Rowan/Mountain Ash	<i>Sorbus aucuparia</i>	Residential
Elder	<i>Sambucus nigra</i>	Central Park, Residential
Hawthorn	<i>Crataegus monogyna</i>	Central Park, Residential
Ragged Robin	<i>Silene flos-cuculi</i>	Central Park, Coastal Gardens

In addition, the roof level of apartment blocks will be developed into green spaces to have a mix of sedum and wildflowers to further benefit pollinating species.

5.5.2 Operational Phase Mitigation

The following operational mitigation measures will be implemented either through the design of the proposed development (e.g. lighting, foul drainage, landscaping etc.), or by those in charge of maintenance and management of the development.

5.5.2.1 Lighting

The design of the lighting within and around the proposed development has been designed to be cognisant of minimising effects on local nocturnal species, such as bats and badgers, and has been developed so as to allow for a dark ecological corridor around the eastern boundary of the Site. The lighting scheme for the Site has been developed with the following principals; only illuminating what needs to be illuminated (e.g. light directed to the path only), reducing night time light levels, reducing the height of the luminaires, shielding of luminaires and correct choice of light (e.g. a warm white spectrum <2700 Kelvins).

The lighting scheme has been designed in accordance with guidance contained in; *Guidance Note 08/23; Bats and Artificial Lighting at Night- Institute of Lighting Professionals*.

Project specific lighting designs has included: -

- Column height ≤6m
- Directional lighting to prevent light spillage & light pollution.
- All street lanterns calculated at 0° tilt in relevant areas
- All street lanterns available in 2700K LED (warm White)
- Modern light technology to restrict the horizontal plane of luminaires.

Lights on environmentally sensitive pathways for bats are 5m in height and have a warm white colour (2700K LED). The eastern boundary of the Phase 2 development has 'bat friendly' lighting (as detailed above) which will be a continuance of the bat friendly lighting along the eastern boundary of the Phase 1 development (which is under construction). This will provide a darker corridor along the eastern boundary ecological buffer zone which will allow for bats to commute between the River Dargle to the south and Rathmichael woods to the north.

In addition, the lighting design calls for bat friendly lighting within the entirety of the Central Park area which will create additional areas for commuting and foraging bats. The low height and low Kelvin lights are placed along the edge of Central Park, allowing the middle of this area to be in complete darkness. These lights are also placed around the perimeter of the community garden.

All LED lights will have Constant Light Output (CLO) and the lights used in environmentally sensitive pathways will have a CLO of 7w LED. The lights will be automatically dimmed to 75% each night from 12 midnight to 6am.

5.5.2.2 Surface water drainage

Sustainable drainage (SuDS) is also a key focus for the entire design of the development. Along with permeable paving, the landscape design includes for attenuation areas throughout the development by channelling runoff to planted areas and tree pits. This has the added benefit of reducing surface water runoff rates. In addition, planted swales will be created to aid with storm water flow and these planted areas will contain suitably water tolerant plant species. The roof areas which will include sedum and wildflower green roof treatments will further slowdown the flow of water from areas that traditionally contribute to high runoff flow rates during rainfall events.

5.5.2.3 Foul Disposal

Mains infrastructure for foul sewage disposal has been designed in accordance with Irish Water Code of Practice. All wastewater streams will be collected within the local foul water network and will be transferred to Shanganagh Wastewater Treatment Plant (WWTP). Uisce Eireann has confirmed that the existing foul network has sufficient capacity to meet the wastewater discharge volumes expected from the proposed development, once operational.

5.5.2.4 Landscaping Establishment

The landscape design calls for an ecological buffer zone around the eastern boundary of the Masterplan Lands. This planted buffer zone will ensure the area provides for bat flight lines and badger foraging connectivity to/from the ecological features to the north (Rathmichael woodlands), east (scrub habitat and golf club lands) and south (River Dargle). Once operational the implementation of the landscape plan and compensatory habitat such as wild flower meadows and additional planting will be inspected by the Contractor within one year post planting. If measures have failed due to lack of management an alternative solution will be proposed by the Contractor. Operational phase monitoring (in order to ensure the continued success of the landscape features, specifically in relation to biodiversity enhancement measures) shall be undertaken by those in charge of the maintenance and management of the development.

5.5.2.5 Refuge Habitats

The design of the development calls for the installation of bird nesting boxes and insect boxes. Refuge boxes will be checked and maintained to ensure they do not fall into disrepair. It is recommended that bird boxes are checked and cleared of remnant nests during the winter season (as required). Operational phase monitoring in order to ensure the success of the refuge habitats shall be undertaken by those in charge of the maintenance and management of the development.

5.6 Monitoring

Pre-construction / pre-Site clearance bat surveys by the Contractor appointed suitably qualified ecologist to assess if bats have established roosts within the Site. If protected bats roosts are found within the Site, then consultation with NPWS will be undertaken by the project ecologist and associated method statements and mitigation will be proffered and derogation sought from NPWS.

Pre-construction / pre-Site clearance terrestrial mammal surveys will be undertaken by the Contractor appointed suitably qualified ecologist to assess if badgers, or any other protected mammals, have established refugia (e.g. a badger sett) within the Site. If protected mammal refugia is found within the Site, then consultation with NPWS will be undertaken by the project ecologist and associated method statements and mitigation will be proffered and derogation sought from NPWS.

Removal of nesting habitat (trees and woodland) must be carried out outside of the bird breeding season (from 1st March to 31st August). Consultation must be undertaken with the National Parks and Wildlife Service for any nesting habitat clearance works outside of this seasonal window (as detailed in the Construction phase mitigation measures above).

One year after the entrance roadway has been constructed, the Contractor's ecologist will inspect the area where the knotweed plant was located to ensure the Site is free from invasive plants.

Once operational the implementation of the landscape plan and compensatory habitat such as wild flower meadows and additional planting should be inspected by the Contractor within one year post planting. If landscaping measures have failed an alternative solution should be proposed by the Contractor.

Operational phase monitoring (in order to ensure the continued success of the landscape features, specifically in relation to biodiversity enhancement measures) shall be undertaken by those in charge of the maintenance and management of the development. Operational phase monitoring in order to ensure the success of the refuge habitats shall be undertaken by those in charge of the maintenance and management of the development.

5.7 Residual Impacts

The proposed development will result in the loss of grassland and scattered trees. Mitigation by avoidance is proposed for breeding birds, bats, trees and to prevent the spread of invasive species. Measures to reduce the effects of artificial lighting and loss of habitats are also proposed. Planting of numerous trees and shrubs and wildflower meadows in public spaces is also proposed as mitigation in the Landscape Masterplan (refer to accompanying Planning Pack).

Enhancement proposals incorporated into the Site landscape masterplan will improve the Site potential for foraging bats and birds and will increase the potential for nesting and roosting opportunities for both. There will be a loss of foraging area for badgers but no loss of habitat connectivity between foraging areas. The introduction of wildflower areas and insect boxes will lead to an increased availability for pollinating insects and food source for local bat and passerine bird populations.

This assessment has demonstrated that through iterative project design and assessment, and the identification of appropriate ecological mitigation measures, the residual ecological impacts of the development proposals are not expected to be significant and are expected to be localised to the Site and immediate environs. Local populations of bats, badgers and birds may suffer some disruption and habitat loss in the short term but, as the greater part of the Site is of low ecological value, habitat losses to development are not significant. Some minor beneficial effects are expected and some opportunities for enhancement measures are presented. Provided ecological mitigation measures and monitoring are implemented correctly no cumulative impacts are expected.

6. Land, Soils & Geology

6.1 Introduction

This chapter describes the type of land, soils, and geology likely to be encountered beneath and in the general area of the proposed Bray Sea Gardens development at Ravenswell, Bray, Co. Wicklow. It also addresses the potential impact of the proposed development on land, soils and geology together with the mitigation measures that will be employed to eliminate or reduce any potential impacts. A more complete description of the Proposed Development is presented in Chapter 2 of the EIAR.

6.2 Study Assessment and Methodology

The following scope of works was undertaken by AtkinsRéalis in order to complete the land, soils and geology assessment presented in this chapter.

- Desk-based study including review of available historical and relevant ground investigation information from the Geological Survey of Ireland (GSI); and,
- QGIS Site Setting Map by an experienced Geo-environmental engineer.

This assessment has been completed in accordance with relevant best practice guidance from the Institute of Geologists of Ireland (IGI), '*Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements*' (IGI, 2013). The IGI guidance document is an updated version of the 2002 guidelines, '*Geology in Environmental Impact Statements, A Guide*' (IGI, 2002), which was revised to take account of legislative changes, and the operational experience developed by geoscientists in the production of relevant environmental assessments. This assessment has also been prepared in accordance with the relevant Environmental Protection Agency (EPA) guidance, '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' published in May 2022.

The desk-based study involved reviewing information from the following sources: -

- GSI Datasets Public Viewer and Groundwater web-mapping (consulted 21/02/2025).
- Ordnance Survey web-mapping to assess the surface topography and landforms (consulted 21/02/2025).
- EPA Public Viewer and web-mapping (consulted 21/02/2025).
- Google Maps Aerial photography (consulted 21/02/2025).

A comprehensive ground investigation for the proposed Phase 2 development was carried out by IGSL Ltd. (IGSL) between October 2023 and February 2024 in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007), BS 5930:2015, and BS 1377 (Parts 1 to 9). The following scope of work was completed:

- 15no. cable percussive boreholes;
- 7no. rotary coreholes at selected borehole locations;
- 1no. monitoring well drilled using "open hole" techniques;
- 8no. core penetration tests (CPT);
- 6no. mechanically excavated trial pits;
- 6no. window samples;
- 6no. dynamic cone penetrometer (TRL DCP) tests at trial pit locations;
- Groundwater and gas monitoring; and,
- A programme of geotechnical, chemical and environmental laboratory testing.

The trial pits (TP301-TP306) were excavated using a JCB excavator to depths between 1 and 4.6 meter below ground level (mbgl). Hand shear vane tests were performed within upper soils of each trial pit. Window sample boreholes (WS6A, 6B, 7A, 7B, 8A and 8B) were drilled using a Dando Terrier rig to a maximum depth of 5mbgl, all of which had standpipes installed to allow for long term groundwater monitoring wells with gas valves installed at WS06A, 07A and 08A. Cable percussive boreholes (BH301 to BH315) were drilled using a Dando 2000 drilling rig to a maximum depth of 14.2mbgl. 7no. Rotary coreholes were drilled using a Beretta T-440 tracked coring rig to a maximum depth of 25mbgl. 3no. Rotary coreholes (RC302, 304 and 308) were subsequently converted to groundwater monitoring wells for environmental monitoring purposes. Exploratory locations are presented in Figure 6-9.

Gas level measurements were taken in accordance with CIRIA C665:2007 and performed using a calibrated GA5000 gas monitor. Both steady state and peak gas results were recorded during each of the 7no. monitoring events undertaken. The flow rate measurements recorded by the GA5000 were logged after the initial gas quantification readings were taken. During the gas monitoring, the Geotech GA5000 portable gas analyser was used as per the guidelines whilst conforming to the on-screen notifications (IGSL, 2024).

Representative environmental soil samples were collected in accordance with relevant best practice standards (BS10175 – 2011) from selected window sample boreholes, trial pits and boreholes across the Site. Soil samples were taken at regular depth intervals for environmental testing. 15no. soil samples were subsequently scheduled for laboratory analysis for a comprehensive suite of parameters. All soil samples were stored in chilled cooler boxes, prior to dispatch to a UKAS accredited laboratory.

Full details of the ground investigation are presented in the 'River Quarter Bray Ground Investigation Report – Factual' prepared by IGSL (2024) and presented in Appendix 6.1.

No difficulties were encountered during the data collection and assessment stages of this land, soils and geology assessment.

In addition, a previous phase of ground investigation was undertaken for the Phase 1 development which is currently under construction. Full details of the phase 1 ground investigation are presented in the 'Harbour Point Bray Ground Investigation Report – Factual' prepared by IGSL (2021) and presented in Appendix 6.2.

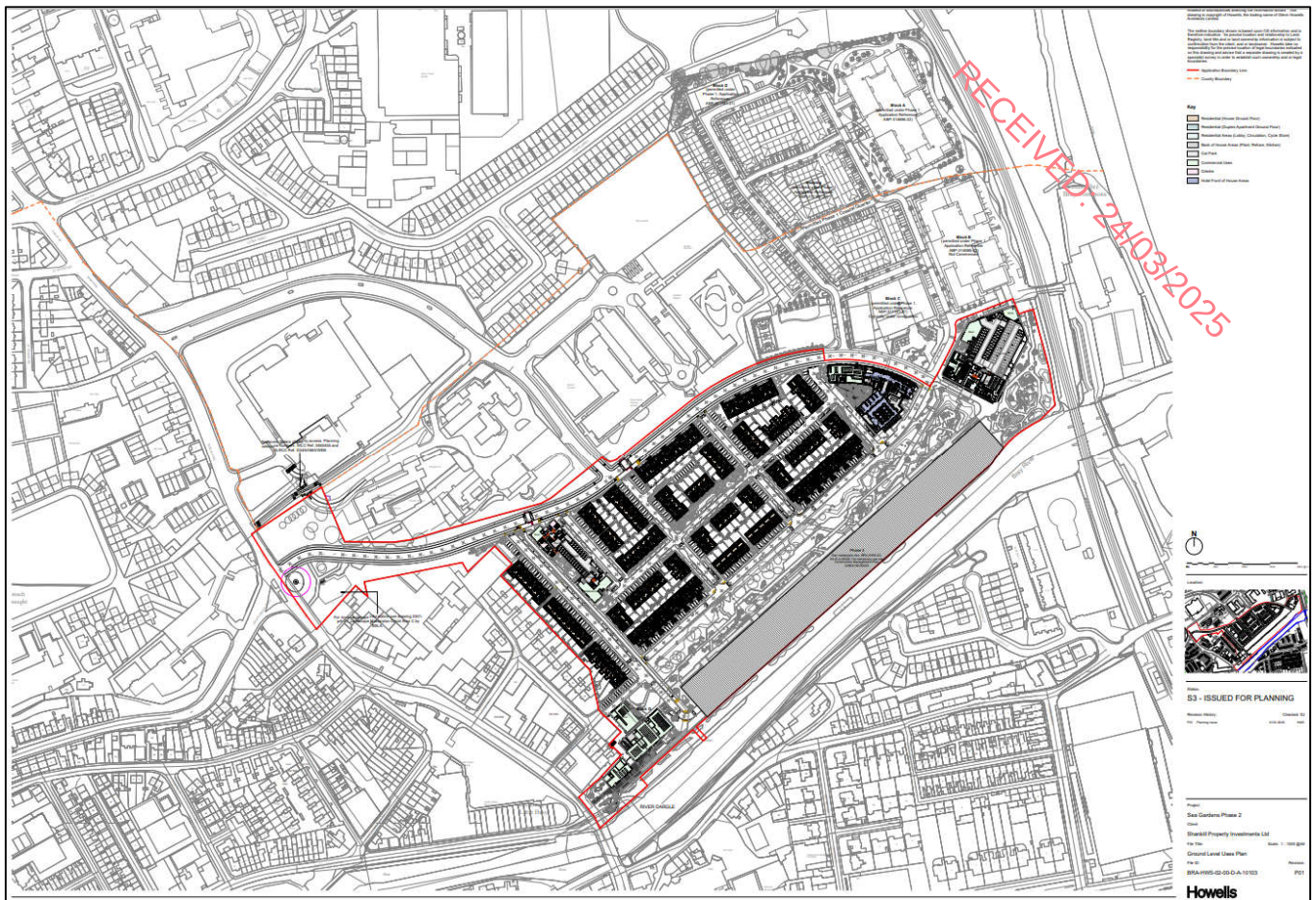


Figure 6-1 - Proposed Phase 2 Sea Gardens Development (Site boundary denoted in red)

6.3 Receiving Environment

This section provides a description of the land, soils and geology in the general region of the proposed development and also takes account of the current and historic uses of the proposed development (hereafter referred to as the Scheme).

6.3.1 Site Development

A review of historic maps (including available 6-inch historic maps, 25-inch historic maps, and aerial photographs (1995 to 2018) from the Ordnance Survey of Ireland) (OSI, 2025) and current aerial photography (Bing Maps, 2025) confirms that land use along the Scheme has generally been transformed over the years from greenfield use. The surrounding lands have developed considerably since the late twentieth century.

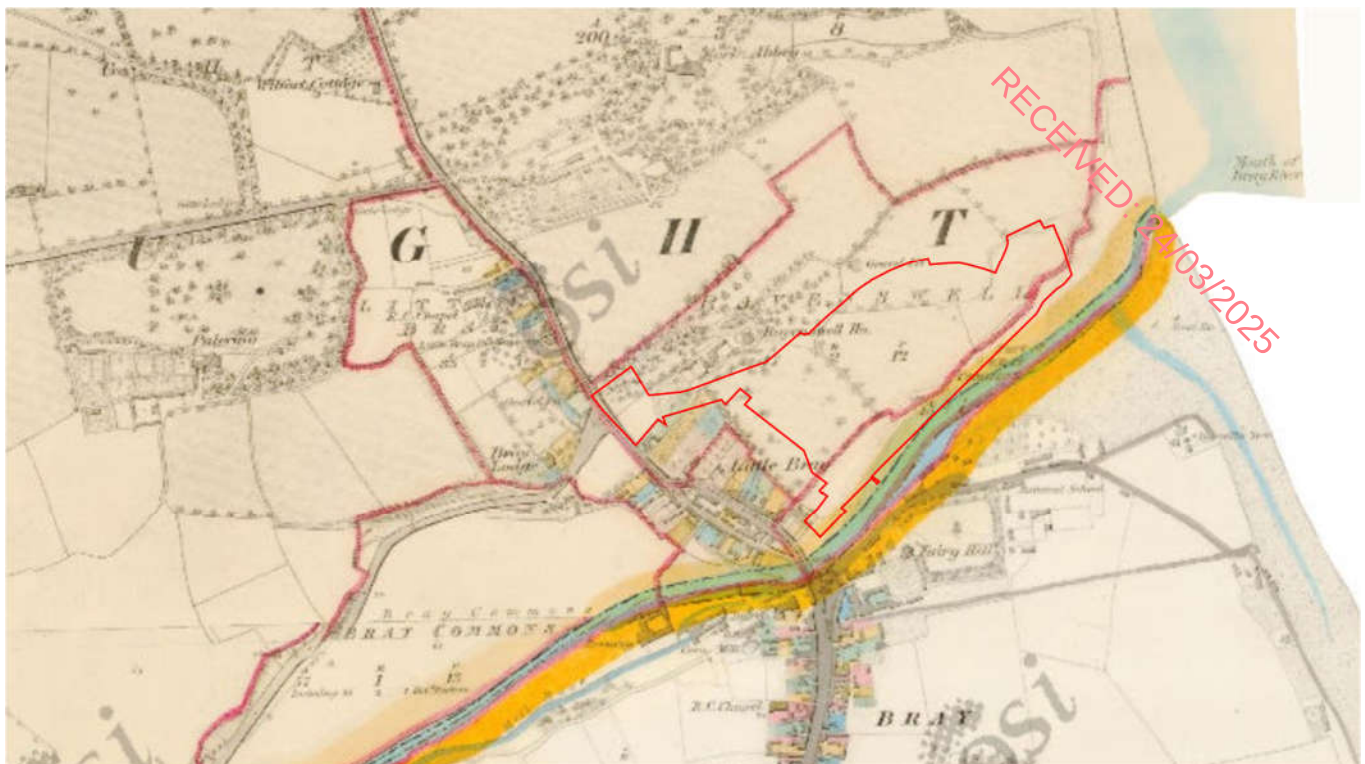


Figure 6-2 - Map Genie 6 Inch First Edition 1829-1841 (OSI, 2025)

The area along the Scheme is dominated by greenfield sites in agricultural use with the Great Northern Railway Line running in a north/south direction to the east of the proposed Scheme.



Figure 6-3 - Map Genie 25 Inch BW 1995 (OSI, 2025)

Urban expansion is seen along the western portion of the Scheme associated with the growth of Little Bray. The surrounding area of the scheme shows significant urban development dominated by housing estates in the town of Bray.



Figure 6-4 - Map Genie 1996-2000 (OSI, 2025)

No significant change noted.



Figure 6-5 - Aerial Map 2001-2005 (OSI, 2025)

No significant change noted.



Figure 6-6 - Aerial Map 2001-2005 (OSI, 2025)

No significant change noted.



Figure 6-7 - Aerial Map 2013-2018 (OSI, 2025)

The aerial photography between 2013 – 2018 shows more development of commercial establishments, access roads, carparks and residential units.

6.3.2 Current Site Setting (and Topography)

The Site is bound by the permitted Phase 1 Coastal Quarter SHD (Phase 1A: Reference ABP-311181-21 & Phase 1B: ABP-314686-22) part of which is currently under construction in the North, by the Irish Rail Dublin-Rosslare main rail line in the East, by the River Dargle in the South and by existing residential developments to the West.

Most of the proposed development lands are located within a former golf course, Bray Golf Club, first established in the late nineteenth century and characterised by open ground covered by short grass with mature trees and scrub in places. The southern and eastern portions of the Site are located on low-lying level ground, while the ground rises slightly towards the north elsewhere. A temporary construction compound and car park occupy the centre of the Site while the northern portion of the Site contains some stockpiled soil. The western extent of the Site is located within the former garden of Ravenswell House as depicted on the historic OS maps. An existing road orientated north-south divides the eastern and western portion of the development Site. The southeast margin of the Site, adjacent to the River Dargle, is occupied by a car park and access road (now closed). The boundary to the river is defined by a modern concrete flood relief wall and drainage ditch.

There is significant existing foul drainage infrastructure present within Site. A foul rising main and a trunk foul sewer enter the Site at the northern boundary of the Phase 1 lands and turns east then south along the Site boundary where it finally crosses the River Dargle at the south of the Site. There are also two gravity foul sewers to the south of the Site. These sewers run from west to east across the Site where they outfall to the trunk sewers previously discussed.

There is an existing Uisce Éireann underground foul water storage tank close to the western boundary of the proposed development Site. The existing tank was constructed by Dun Laoghaire Rathdown County Council in 2007 – 2008 and is a critical piece of infrastructure associated with the Bray Pumping Station to the south of the River Dargle. As confirmed by Shankill Property Investments Ltd., this tank was installed under a 999-year subterranean lease allowing the surface area above to be incorporated into the future build out of the lands including capacity to accommodate substantial fill and an Uisce Éireann service vehicle driving above it.

6.3.3 Ground Investigation

6.3.3.1 Regional Setting

The basic site geology is obtained from the Geological survey of Ireland (GSI, 2025) and the map below shows that the existing geological layers are predominately Deep marine; Slate, schist & minor greywacke and made ground deposits in the site area.

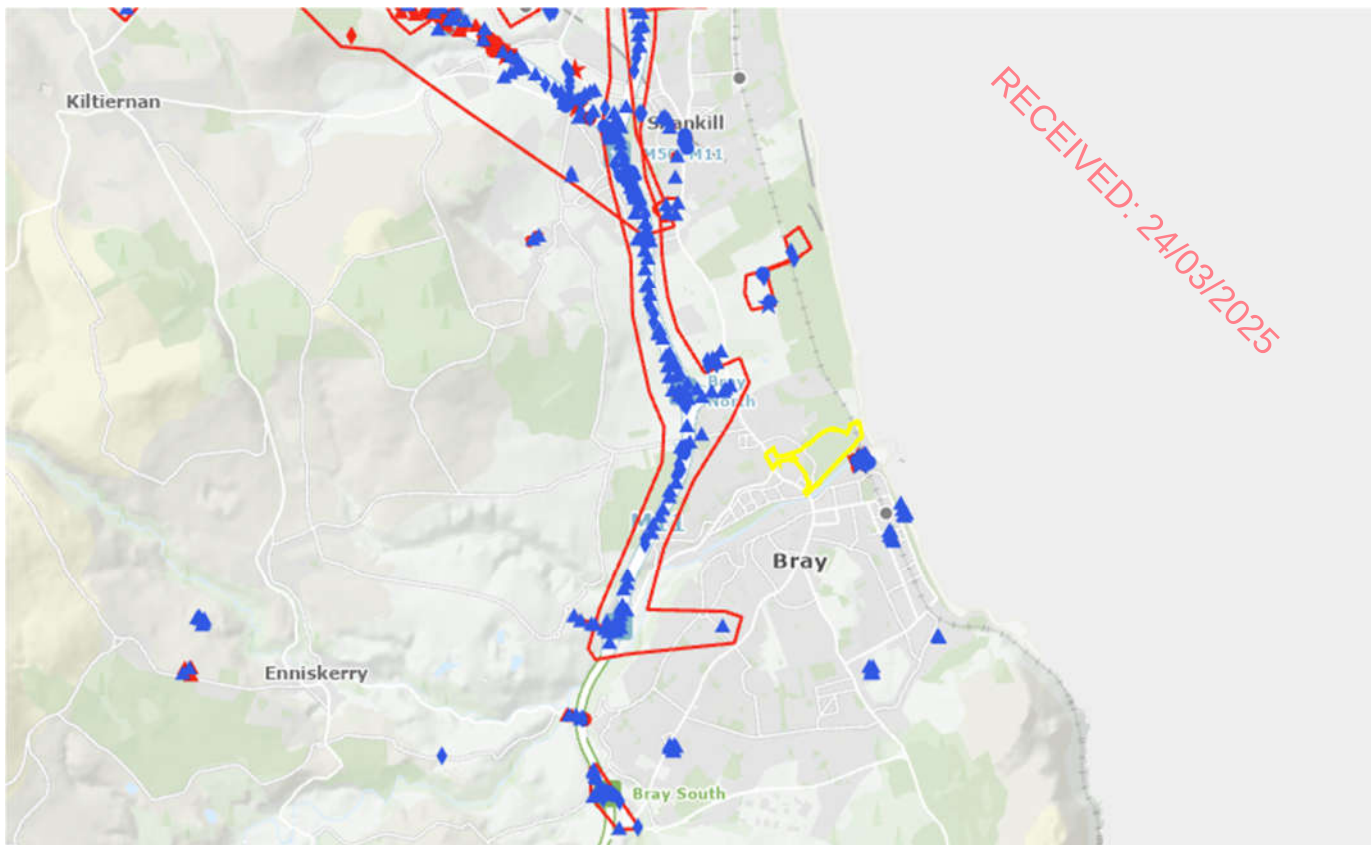


Figure 6-8 - Existing Boreholes (GSI, 2025)

A Ground Investigation was conducted over three phases, from February 1984 to Jan 1986 for the Bray, County Wicklow, Sewerage Scheme. Phase 1 was conducted in February and March 1984 and comprised of 3no. investigations as follows; Foul Sewer on the Esplanade, Storm Relief Sewer at People's Park and Pumping Station at Seapoint Road. Phases 2 and 3 were conducted at the site of the proposed Pumping Station as a result of adverse conditions being encountered here during the initial investigation. The aim of phases 2 and 3 was to delineate ground conditions beneath the pumping station and ascertain the permeability of gravel deposits. Phase 2 was conducted between January to March 1985 and Phase 3 between November 1985 to January 1986. A summary of the investigations are detailed below.

Foul Sewer on the Esplanade (Phase 1)

6no. cable tool boreholes were drilled along the line of the proposed sewer and were taken to a depth of 10mbgl (metres below ground level). A sandy gravel top layer of fill or topsoil was encountered in all boreholes with this stratum continuing to the final level with occasional thin layers of sand in boreholes 1, 3 and 4. Hard, brown clay / gravelly clay was found from 5.5-8.3mbgl underlain by gravel in borehole 2. A layer of stiff gravelly clay was found to a depth of 4.4mbgl in borehole 5 and the top layer in borehole 6 was underlain by silty sand to a depths of 3.7mbgl underlain by stiff silt and coarse gravel. Groundwater rose to within 2-3m of ground level in all boreholes with the exception of borehole 5 which ended in boulder clay with a minimum depth to water of 6.5m.

Storm Relief Sewer at People's Park (Phase 1)

5no. cable tool boreholes were drilled along the line of the proposed sewer, 4 taken to depths of 10mbgl and ended at an obstruction at 7mbgl. Borehole 1 consisted of gravels to 10m. Boreholes 2, 3 and 5 consisted of layers of soft silt or clay with some organic materials found in the gravel layers. These layers varied in thickness with a maximum depths of 4mbgl in borehole 3. A layer of topsoil overlying gravels was found in boreholes 1 – 3 and a layer of brown or black gravelly clay was found to depths of 1.2-1.5mbgl in boreholes 4 and 5. Groundwater in all boreholes was

encountered in the gravel layers at depths between 2-2.5mbgl with groundwater sealed off in boreholes 3 and 4. There was a second strike below the silty clay layer in borehole 3 with the potential of 2no. separate water tables.

Pumping Station at Seapoint Road (Phase 1, 2 and 3)

Phase 1 consisted of 9no. cable tool boreholes were drilled to depths between 14.5-19mbgl with the site found to divide naturally into two sections. The southern part of the site, boreholes 1, 2, 4 and 5 consisted of medium dense to dense sandy gravels with some sand layers, all boreholes ended in this type of material at 15mbgl. A layer of fill from 2.2-4.3mbgl was found to be overlying the gravels with layers of stiff gravelly clay at various levels within the sand and gravel layer. Groundwater in all boreholes sealed off in the boulder clay layer and was struck again below this layer. The groundwater rose to 2-3mbgl.

The northern part of the site, boreholes 3, 6, 7, 8 and 9 consisted of a 2-3m thick layer of fill overlying the site underlain by medium to coarse sandy gravel to depths between 5.75 -7.3mbgl. A layer of soft silt with peat was found up to 12mbgl with sandy gravels found to depths between 16.5-17.5mbgl where hard brown boulder clay was met in boreholes 3, 8 and 9. Groundwater in all boreholes generally rose to 2.5-3mbgl.

Phase 2 (January – March 1985) consisted of 10 boreholes with standpipes installed and phase 3 (November 1985-January 1986) consisted of the drilling of 6 boreholes. Across these phases, fairly consistent ground conditions were found over the site with fill underlain by gravel and silt underlain by gravel and boulder clay overlying rock with an occasional gravel layer found between the boulder clay and rock. The rock encountered between 21.22mbgl comprised green greywacke with interbedded red shales and marl. Groundwater was struck in association with each gravel layer and rose to between 2-3mbgl. The groundwater strikes in the upper and lower gravels was found to be tidal however the 3 groundwater strike between the boulder clay and rock was not.

6.3.3.2 Site-Specific Ground Investigation

The Phase 2 ground investigation for River Quarter Bray Co. Wicklow (Report No. 24991) was conducted by IGSL (2024). All exploratory locations completed during the Phase 2 ground investigation are presented in Figure 6-9 below. Refer also to Appendix 6.1.



6.3.4 Soils

Based on the Teagasc soils database available on the GSI public data viewer, the dominant soil type underlying the Site and surrounding area is made ground. Refer to Figure 6-10.

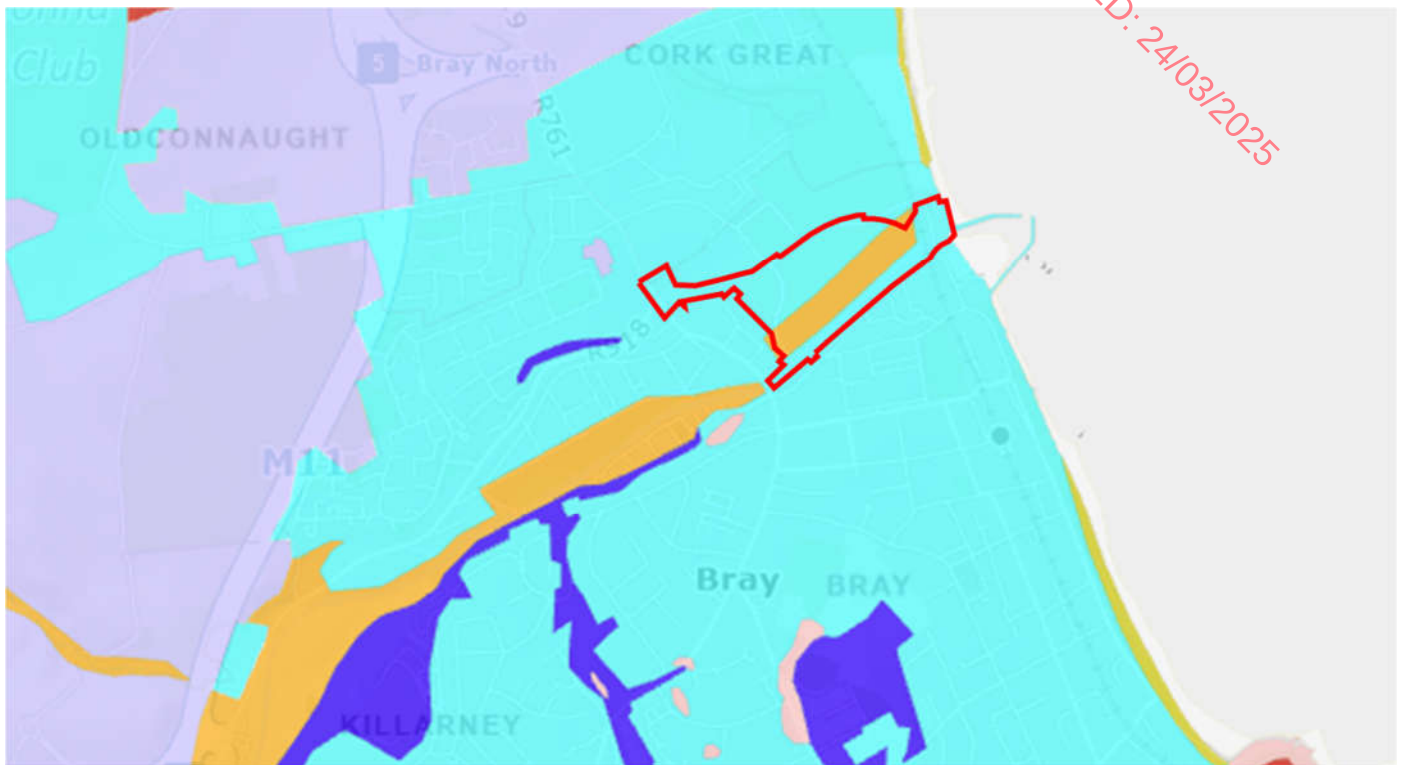


Figure 6-10 - Teagasc Soil Maps (GSI, 2025)

According to the GSI public data viewer (GSI, 2025), the primary superficial / quaternary sediments underlying the vicinity of the Site comprise Gravels derived from Limestones and Urban. It is also noted that Alluvium is present along River Dargle (GSI, 2025). Refer to Figure 6-11.



Figure 6-11 - Superficial / Quaternary Deposits (GSI, 2025)

Site specific soils records, as observed during the Phase 1 ground investigation (IGSL, 2021) are summarised as follows;

- Topsoil was encountered at most locations across the Site and ranged from ca. 0.1 to 0.3mbgl.
- Made Ground was encountered at various locations across the Site to a maximum depth of 2.3mbgl at TP211. Made ground beneath the Site generally comprised reworked soil or gravel fill material; however rare to occasional inclusions of red bricks, wood and plastic were identified at 4no. locations (TP211, BH219, WS04B and WS05B).
- Till encountered across the Site has been described primarily as firm to very stiff, brown, sandy Silt / Clay with occasional cobbles.
- This is generally underlain by loose to dense grey sandy gravel / gravelly sand, to a maximum depth of 13.8mbgl, beneath which very soft peaty silt / clay was identified within localised areas to a maximum depth of 13.3mbgl. This material was further underlain by gravelly clay and gravel to a maximum depth of 23.8mbgl.

Site specific soils records, as observed during the Phase 2 ground investigation (IGSL, 2024) are summarised as follows;

- Topsoil was encountered at most locations across the Site and ranged from ca. 0.1 to 0.3mbgl.
- Made Ground comprised of hardcore stone or gravel fill material was encountered in 3no. boreholes (BH303, BH307 and BH310). Made ground at TP304 and TP306 was found to have more than 2% non-natural material with inclusions of red bricks concrete pieces, and plastic and glass fragments.
- Till encountered across the Site has been described primarily as very soft or soft brown and grey sandy silt or clay, and is interbedded with peat layers.
- This is generally underlain by dense grey fine to coarse sandy silty gravel with some cobbles, and peat layers, to a maximum depth of 14.2mbgl in BH306.

6.3.4.1 Soil Quality / Contaminated Land

On a regional scale there are two EPA licenced facilities within the vicinity of the Scheme (refer to Figure 6-12):

- Packaging Laundry Limited (site code: W0304), located 2.4km southwest; and,
- Fassaroe Waste Recovery Facility (site code: W0269), located 3.129km southwest.

On a regional scale there are 7No. IEL, IPC & IPPC licenced facilities within the vicinity of the Scheme:

- Nypro Limited (site code: P0567), located 0.4km from the site;
- Bray Chemicals Ltd. (site code: P0129), located 0.4km from the site;
- Lithographic Universal Ltd. (site code: P0154), located 1.9km from the site;
- A. O. Smith Electric Motors (Ireland) Limited (site code: P0105), located 2.2km from the site;
- Starrus Eco Holdings Limited (Fassaroe) (site code: W0053), located 2.4km from the site;
- Alert Packaging Limited (site code: P0366), located 2.8km from the site; and,
- International Coatings Limited (site code: P0122), located 5km from the site;

On a regional scale there are five Section 4 Discharges licenced facilities within the vicinity of the Scheme:

- Woodlands Academy (site code: WPL31), located 2.5km from the site;
- Peter Deigan Cars (site code: WPL51), located 2.6km from the site;
- Dargle Valley Nursing Home (site code: WPL/54), located 2.8km from the site;
- E&O Kennedy, Bray (site code: WPL/40), located 3km from the site; and,
- Knocksink Conservation Centre (site code: WPL/40), located 4.8km from the site.

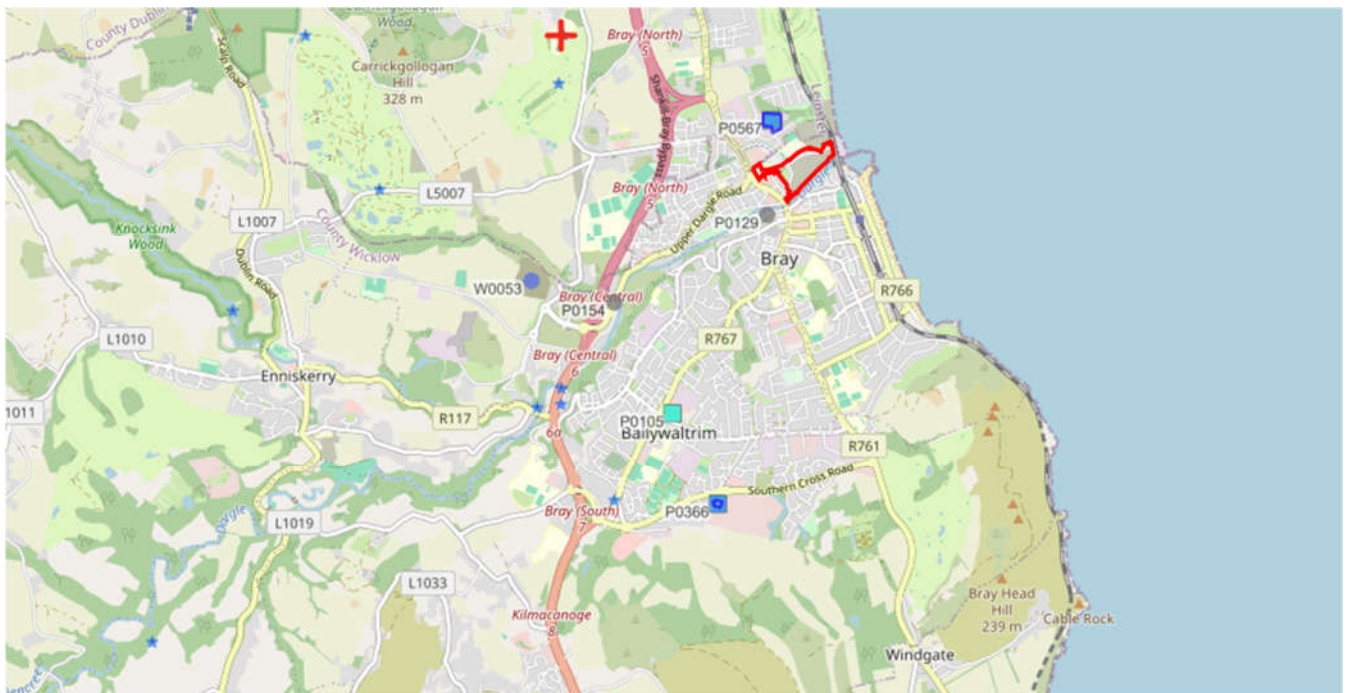


Figure 6-12 - EPA Licenced Facilities in the Vicinity of the Site (EPA, 2025)

15no. representative environmental soil samples were collected during the Phase 2 ground investigation at representative locations across the Site and analysed for a comprehensive suite of analytical parameters by a UKAS accredited laboratory (including asbestos containing material, heavy metals, key indicator parameters, petroleum hydrocarbons, polyaromatic hydrocarbons (PAHs), Volatile Organic Compounds (VOCs including tentatively identified compounds (TICs)), Semi Volatile Organic Compounds (SVOCs including TICs), Polychlorinated Biphenyls (PCBs)

and the full Rilta Waste Acceptance Criteria (WAC) soil disposal suite). All soil analytical results were subsequently evaluated.

Risk of Potential Current or future impacts to the receiving environment - Based on the soils analytical data presented in Appendix 6.1, no contaminants of potential concern with regards to environmental risk have been identified within the soils and made ground beneath the Site. Results are summarised as follows:

- No detection of asbestos containing material was identified within any of the 15no. samples analysed;
- No detection of PCBs, VOCs (including TICs) or SVOCs (including TICs) with the exception of PAHs, were identified within any of the samples analysed;
- None of the samples analysed showed any significantly elevated heavy metal, indicator parameter or Total PAH concentrations;
- Elevated hydrocarbon (Total Extractable Petroleum Hydrocarbons (EPH)) concentrations of 76mg/kg (TP-302, 2.6m), 370mg/kg (TP305A, 2.7m), 25mg/kg (WS06B, 1.4m), and 63 mg/kg (WS07B, 2.4m) were identified, and are generally consistent with observations of 'organic odours' at discrete layers within these GI locations, as well as at the following locations: TP306 (2.4m), TP304 (1.15m), TP303 (1.10m), TP302 (2.60m). Made ground was also identified at TP304 (0-1.15m).

Risk of Potential Current or future impacts to Human Health - Based on the soils analytical data presented in Appendix 6.1 one contaminant of potential concern (naturally occurring Barium) with regards to human health risk has been identified within the soils and made ground beneath the Site, at locations TP305 (0.6m) and TP306 (0.5m).

Barium is a naturally occurring trace element in Ireland. According to Teagasc and the EPA (2007), typical background concentrations in soil were previously determined to be ca. 100mg/ kg and based on a geochemical review undertaken by Teagasc and EPA (2007), typical background concentrations can range from 6.6mg/kg to 1,297mg/kg in Irish soils. Therefore, the source of Barium in soils and made ground beneath the Site is considered likely to be naturally occurring soils. Based on the reported concentrations (99mg/kg and 89mg/kg respectively) and the proposed land use in these areas, these concentrations do not pose a future human health risk, and no further consideration is required with respect to human health risk posed by soils beneath the site.

Waste soil classification for offsite disposal (as required) – Based on the laboratory analytical data presented in Appendix 6.1, soil beneath the Site, if removed offsite for disposal, should be suitable for disposal as inert material to an appropriate local authority permitted / EPA licenced waste facility (subject to acceptance by the facility) - with the exception of soils in the vicinity of TP305 (0.6m) and TP306 (2.9m). Soils in these 2no. localised areas would be considered to be suitable for disposal as non-hazardous material to an appropriate EPA licenced waste facility (subject to acceptance by the facility).

Results are summarised as follows:

- Of the 15no. samples analysed for asbestos containing material (ACM), no ACM or asbestos was detected;
- Of the 15no. soil samples analysed, 2no. exceeded the relevant inert soil WAC screening values (with respect to antimony (TP306, 2.9m, TP305, 0.6m) and Phenol Index (TP305, 0.6m)
- For the purposes of offsite disposal:
 - The laboratory results for 13no. soil samples indicate that soils in these areas are suitable for disposal as inert material to an appropriate local authority permitted / EPA licenced waste facility (subject to acceptance by the facility), under the following EWC Code - 17 05 04 (soil and stones other than those mentioned in 17 05 03*).
 - The laboratory results for 2no. soil samples (TP306, 2.9m, TP305, 0.6m) indicate that soils in these areas (i.e. TP306, TP305) are suitable for disposal as non-hazardous material to an appropriate EPA licenced waste facility (subject to acceptance by the facility), under the following EWC Code - 17 05 04 (soil and stones other than those mentioned in 17 05 03*).

Site-specific Soil Quality – Summary of Baseline Conditions

The extensive Phase 2 ground investigation across the Site verified the results of the historical mapping review, namely that the Site has been used historically for agricultural purposes, prior to being developed into a golf course.

6.3.5 Bedrock Geology

The GSI bedrock geology 100k map and 500k, presented in Figure 6-13 and Figure 6-14, identifies the predominant underlying bedrock of the route as the Maulin Formation, which is made up of Dark blue-grey slate, phyllite & schist. There is a small part of Bray Head Formation mapped within the Scheme. The structural geology mapping (GSI, 2025) shows that a thrust fault (orientated southeast to northwest) generally separates Maulin Formation from the Bray Head Formation.

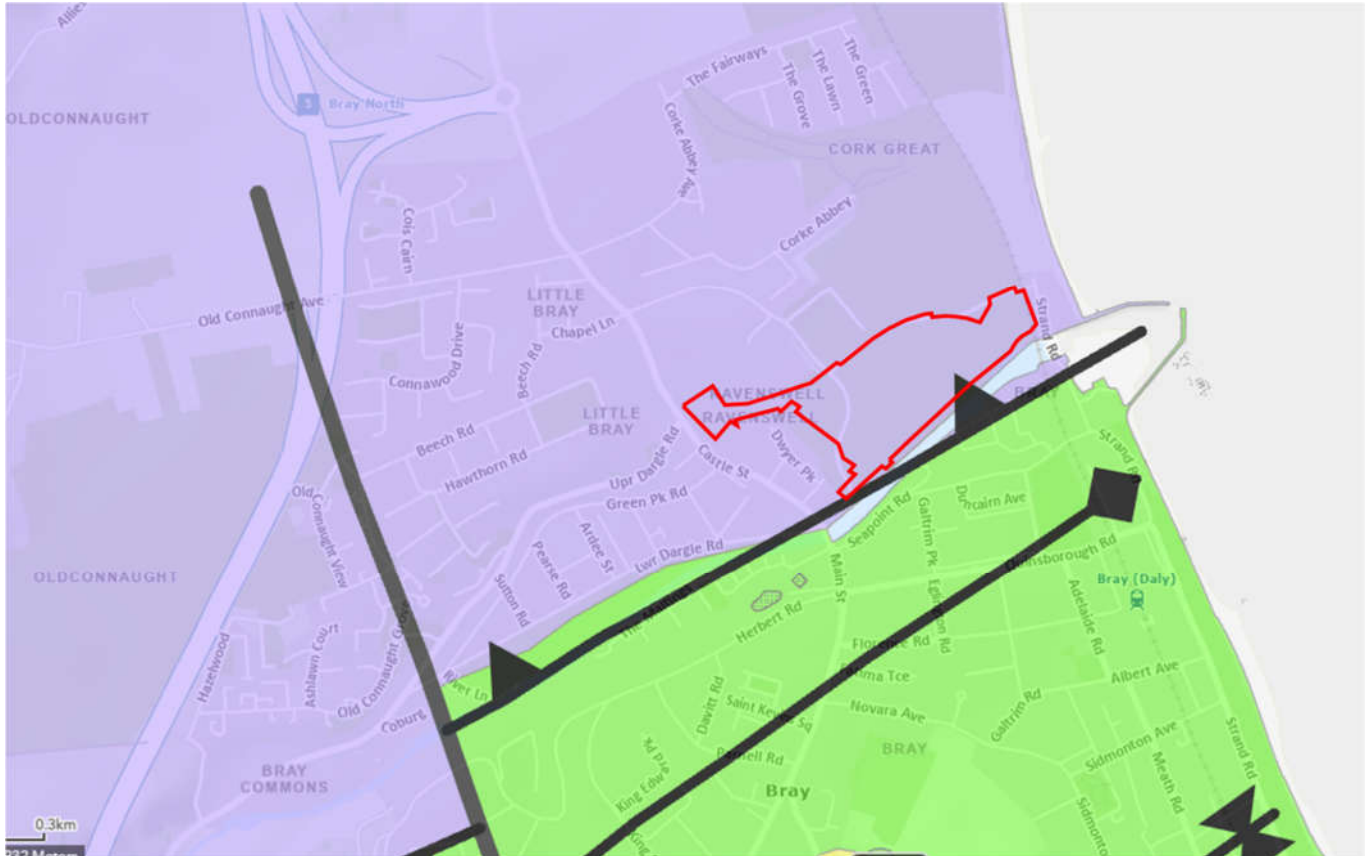


Figure 6-13 - Map showing bed rock geology (100K) (GSI, 2025)

In Figure 6-14, the majority part of the Scheme is underlain by Deep marine; Slate, schist & minor greywacke while the south is underlain by of Marine; Greywacke & shale. A map showing Karst features is presented in Figure 6-15. It is understood that there are no caves or springs across the Scheme area or at close proximity.

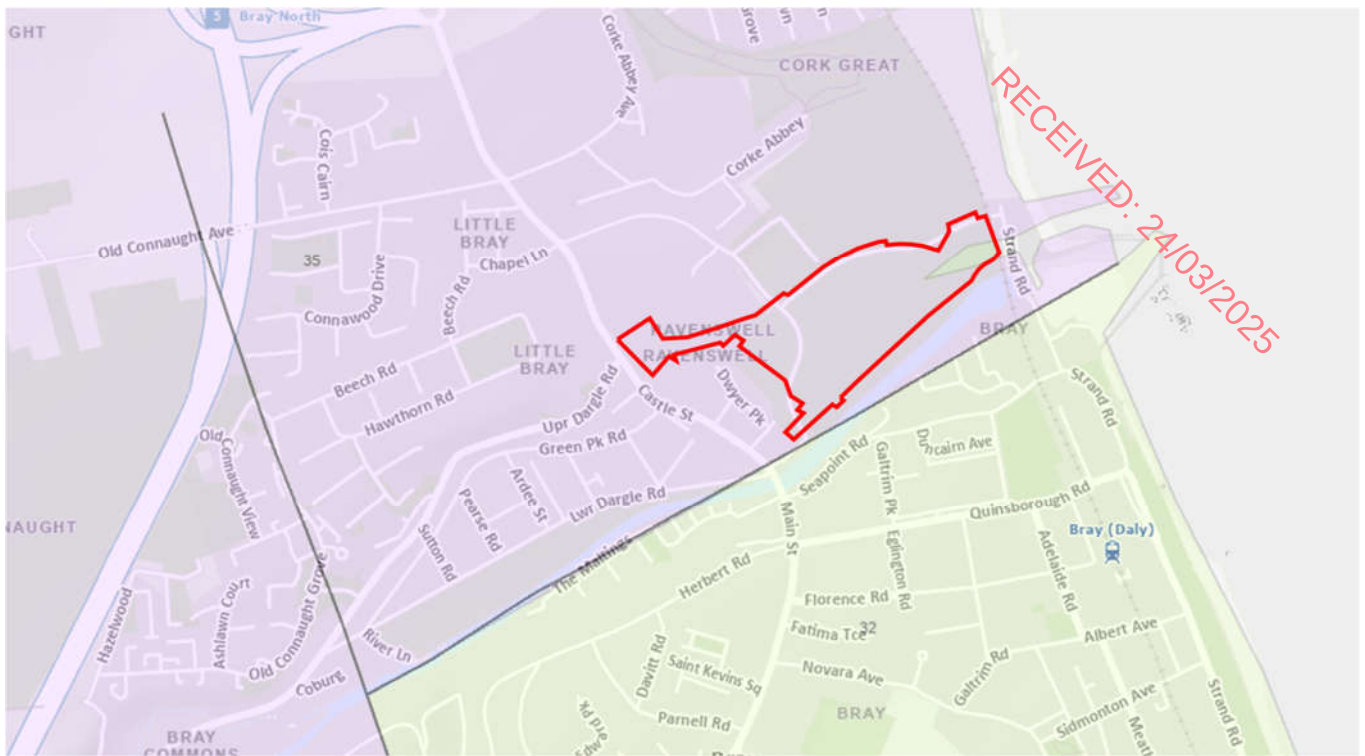


Figure 6-14 - Bedrock Geology from GSI (500K) (GSI, 2025)

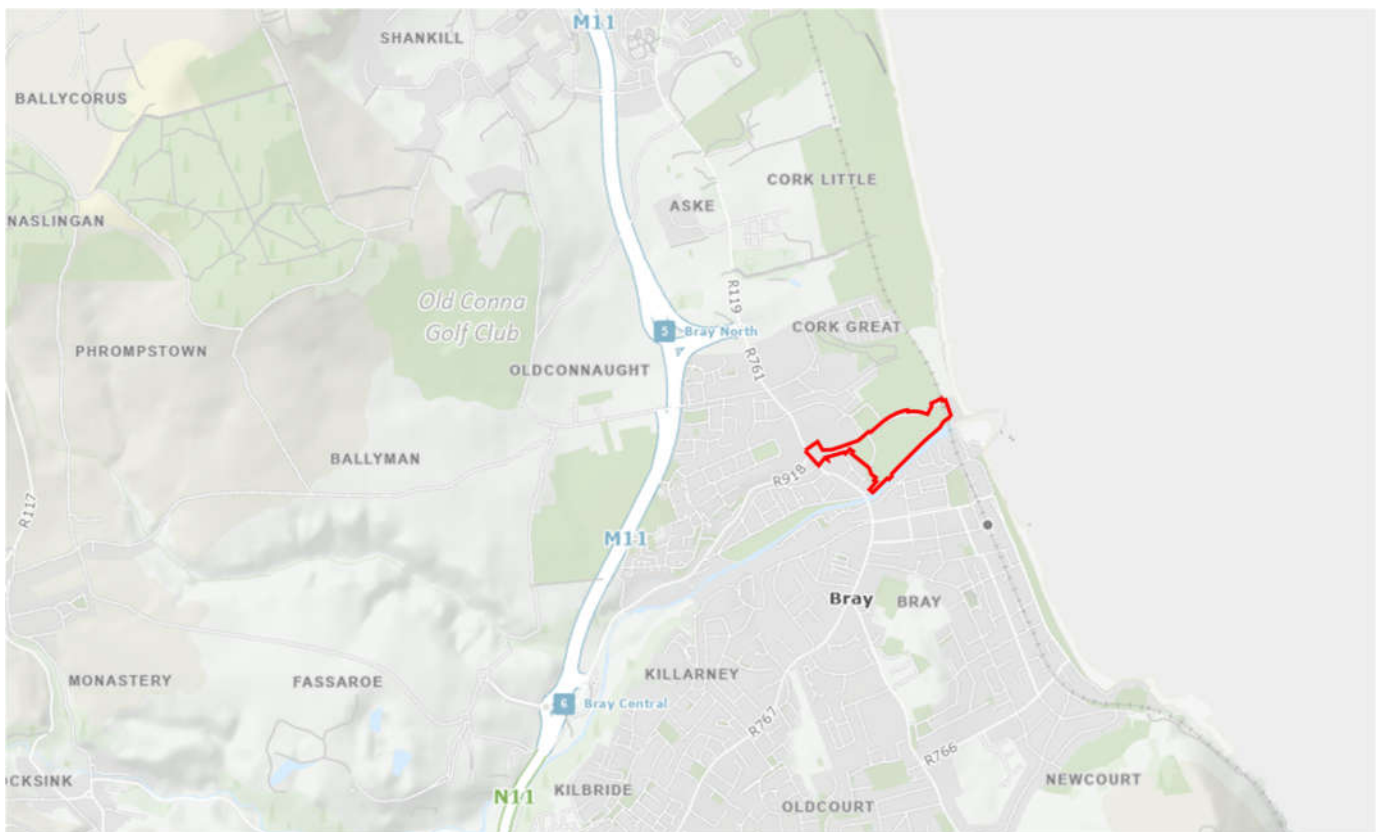


Figure 6-15 - Map showing the Karst features in the study area (GSI, 2025)

6.3.6 Geo-hazards

Figure 6-16 shows the landslide susceptibility classification across the Scheme. The bulk of the Scheme falls under a made classification, with several localised areas to the north showing a low (interred) risk, as shown in Figure 6-16. Landslide events in the general vicinity of the Scheme area are presented in Figure 6-17 and Table 6-1 below.

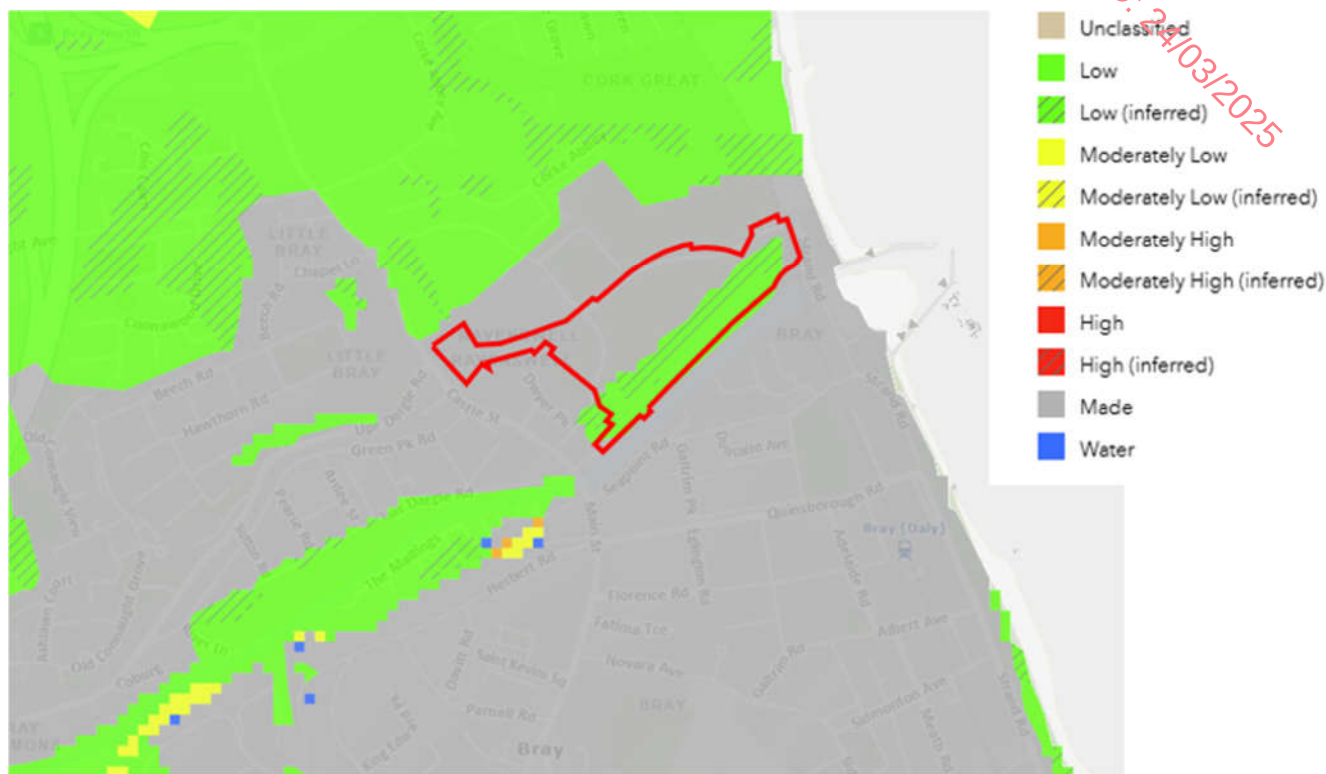


Figure 6-16 - Landslide susceptibility classification map (GSI, 2025)

Table 6-1 - Landslide events showing distance from the Scheme

Landslide events	Distance from the site scheme (km) (from google earth 2024)
Hazelwood Crescent landfill	1.69
Dargle1998	1.85
Bray 1840	2.78
Bray2003	2.8
Cookstown1_2013	3.8
Cookstown2_2013	3.82
Cookstown2012	3.96

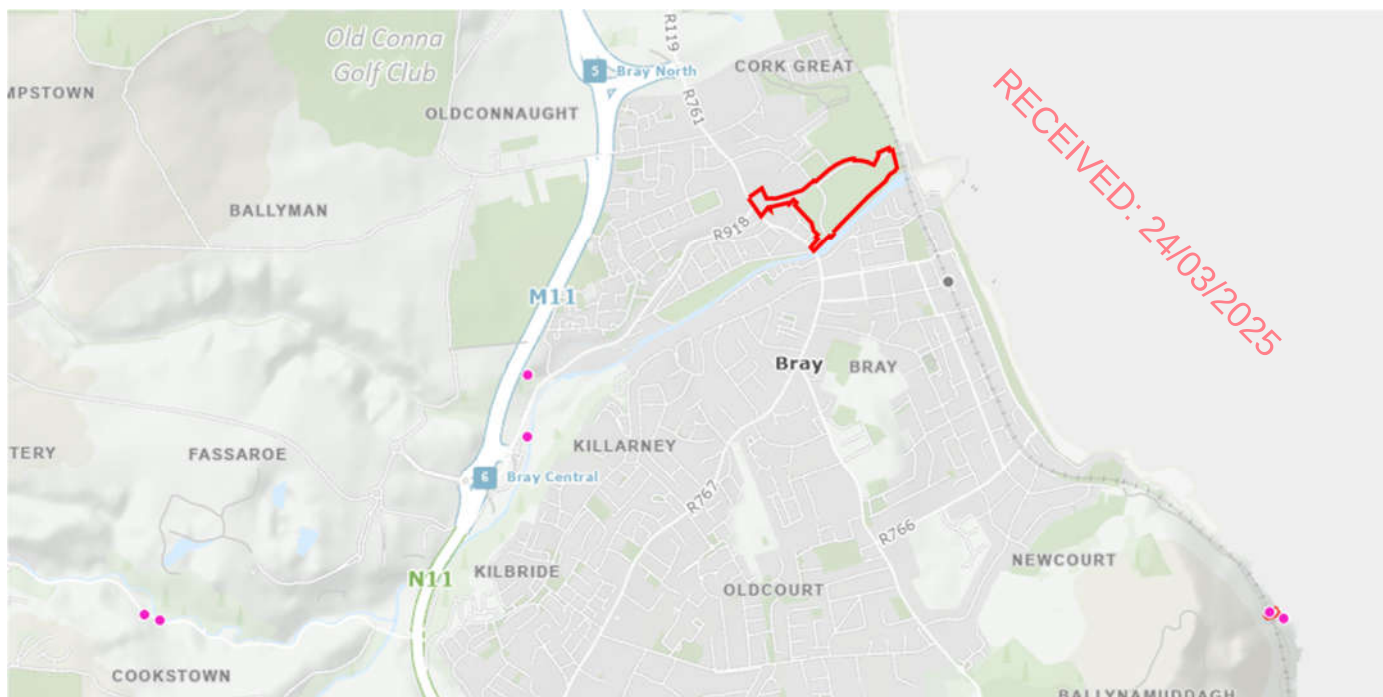


Figure 6-17 - Landslide events map (GSI, 2025)

Ground gas sampling was carried out at 3no. representative boreholes across the Site (WS08A, WS07A, WS06A) as shown on Figure 6-9. 7no. gas monitoring events were carried out between January and April 2024. Gas monitoring data (including CH₄ (%), CO₂ (%), O₂ (%), CO (%), H₂S (%), Balance (%), Barometric Pressure (mb) and Gas Flow (l/hr)) is presented in Appendix 6.1. The gas monitoring results were classified according to the Characteristic Situations outlined in CIRIA C665 (2007) documentation 'Assessing Risks Posed by Hazardous Ground Gases to Buildings'.

Based on the results of the gas monitoring programme, the majority of the Site is deemed to be at 'very low risk' (Characteristic Situation (CS)1) with respect to ground gases, with one area (WS08A) which is been deemed to be 'at low risk' (CS2), with respect to ground gas, due to elevated concentrations of carbon dioxide. According to CIRIA C665 the typical sources of gases associated with CS1 is 'Natural soils with low organic content, typically made ground' and CS2 is 'Natural soils with high organic content, typically made ground' (CIRIA 665, 2007).

Refer to ground gas monitoring results presented in Appendix 6.1. The borehole (WS08A) where elevated concentrations of carbon dioxide were observed is located in the western portion of the Site, in the vicinity of proposed Block H.

6.3.7 Geological Heritage

Figure 6-18 and Table 6-2 show there are a number of Geological Heritage Areas (GHA) in close proximity to the Scheme. However based on the nature of the Scheme, the designation criteria and locations of each of the relevant GHAs, and specifically for the Killiney Bay GHA, the Scheme will not result in any likely environmental effects to designated GHAs.

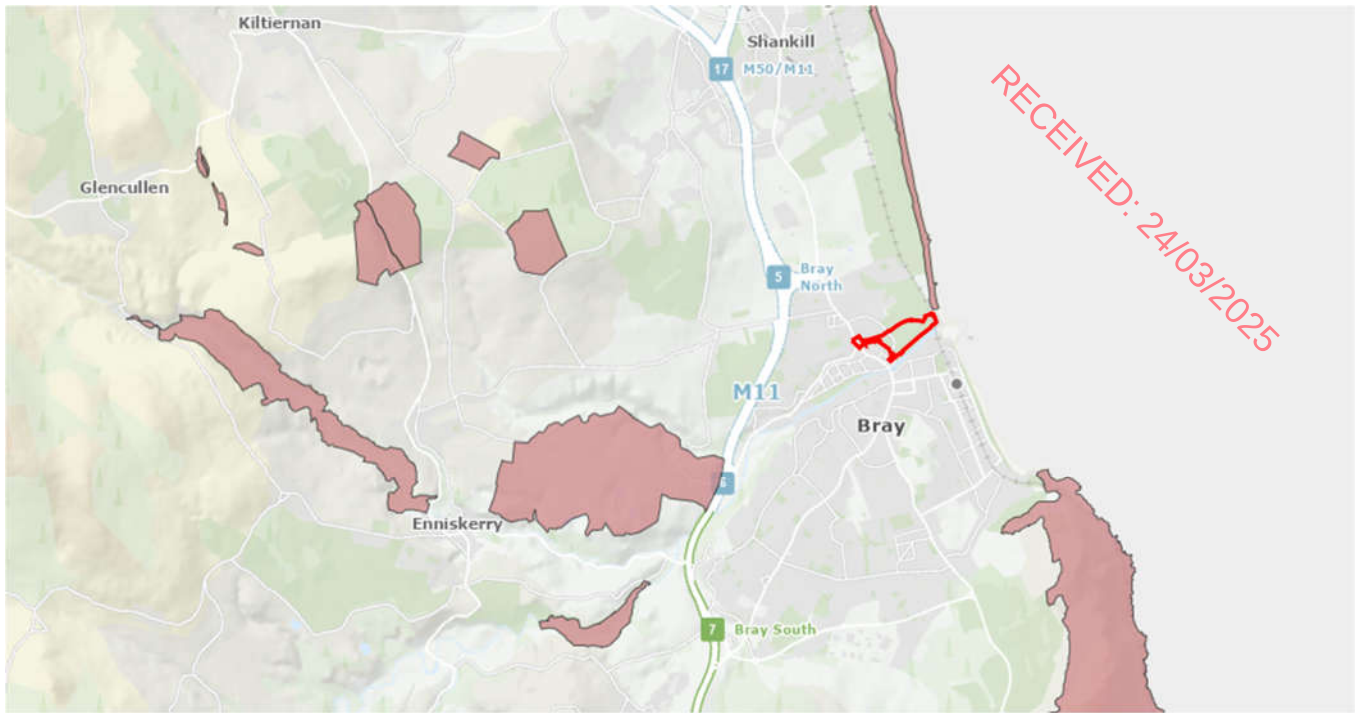


Figure 6-18 - Geological Heritage Areas (GSI 2025)

Table 6-2 - Heritage Sites showing distance from the Scheme

Heritage sites	Distance from the site scheme (km) (from google earth 2024)
Killiney Bay	0.1
Bray Head	2.24
Enniskerry Delta	2.9
Carrickgollogan	3.56
River Dargle Valley	3.68
Ballycorus	4.43
The Scalp	4.86

6.3.8 Mineral Occurrences

Figure 6-19 shows there are a number of Mineral Localities within and in close proximity to the Scheme.

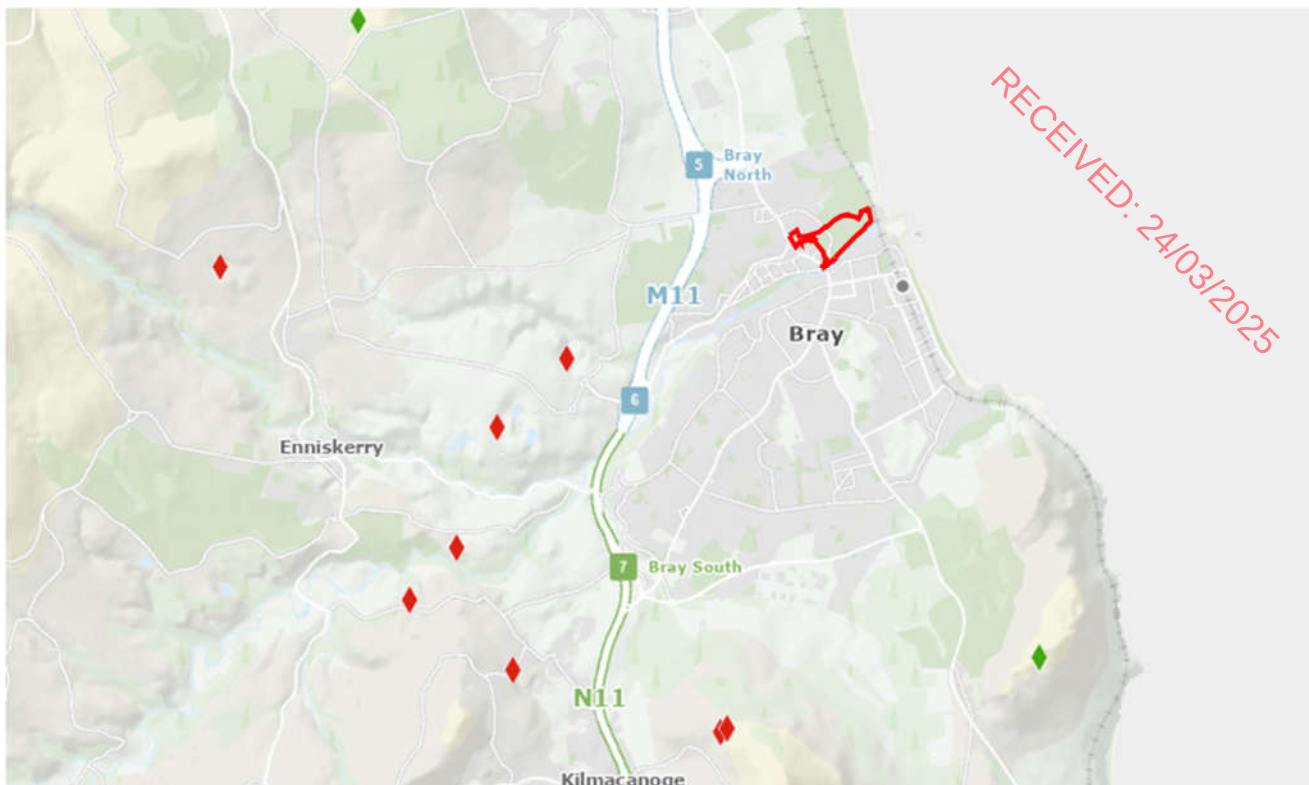


Figure 6-19 - Mineral Localities (GSI 2025)

6.3.9 Radon

The EPA radon map for the area is presented in Figure 6-20 which shows that towards the north of the Scheme 'about 1 in 10 homes in this area is likely to have high radon levels'. Localised small areas 0.3km in the southern section of the Site show an elevated risk of radon with 'about 1 in 5 homes in this area is likely to have high radon levels'. The southern section of the Scheme shows 'about 1 in 20 homes in this area is likely to have high radon levels'.

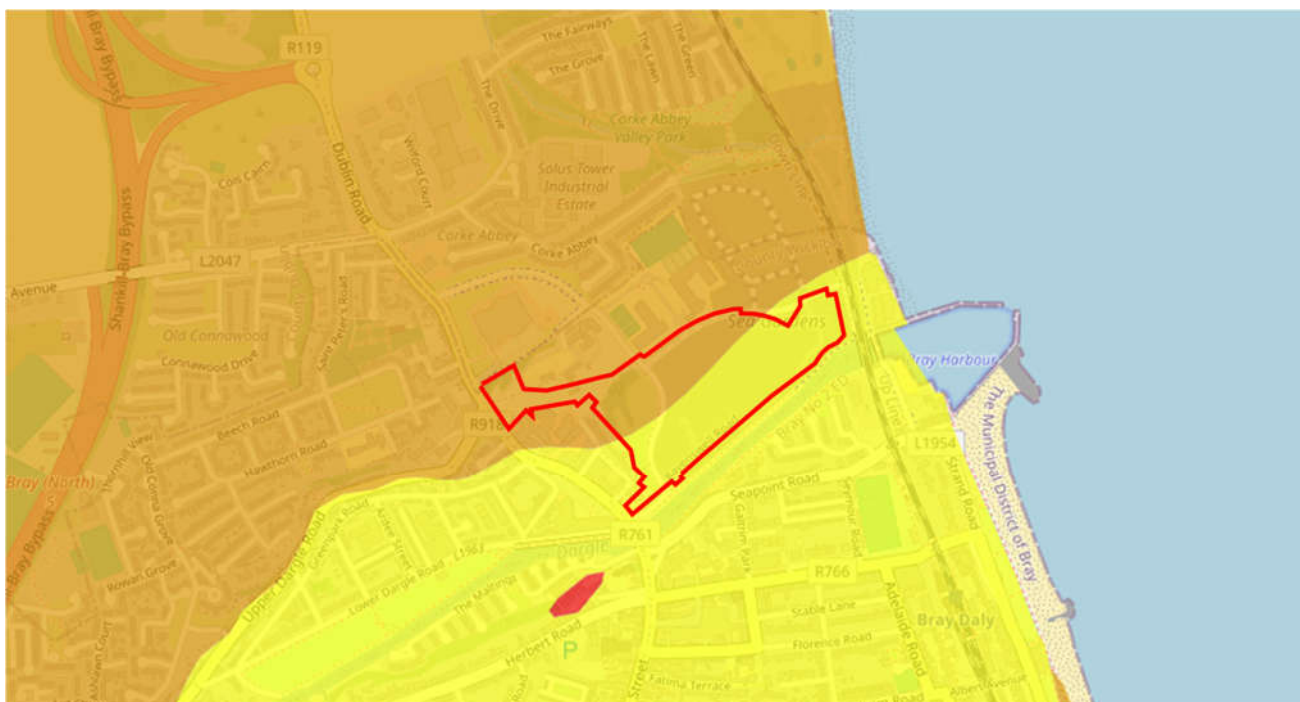


Figure 6-20 - Regional Radon Levels (EPA, 2025)

6.4 Potential Effects of the Proposed Development

6.4.1 Demolition and Construction Phase

6.4.1.1 Land (Including Land Take)

The impact of on land take is likely to have a slight negative impact on the receiving environment. This will be a permanent impact. However, the Scheme is in a zoned residential area with existing housing and commercial land use within the immediate vicinity of the Site.

6.4.1.2 Soils and Geology

Activities during construction will primarily comprise of the demolition of 1 no. structure (old cottage) and construction of the new Scheme as described in detail in Chapter 2. It is anticipated that ca. 5,026m³ of C&D waste and ca. 19,366 m³ of waste soils will require offsite disposal.

Given the existing ground conditions, particularly adjacent to the River Dargle, ground improvement works are required to facilitate the construction stage of the proposed development. The preliminary ground improvement strategy for the proposed development is described as follows:

- A test phase will be completed in advance (refer to Figure 6-21):
 - Terram 1000 membrane will be laid down;
 - Inclinator, settlement plates and piezometer will be installed;
 - Mat installation fill & will be placed and compacted in line with TII Series 600 Specification;
 - Installation of Vertical drain;
 - Surcharge material will be placed and compact in line with TII Series 600 Specification;
 - Surcharge material will be monitored to be topped up to maintain top level;
 - Surcharge material will be removed once settlement has been achieved as directed by the engineer.
- **Ground Improvement – Houses & Apartments:**
 - Following site strip, vertical drains will be installed into the ground below the proposed houses and rear gardens. A reusable surcharge fill will be placed over the footprint of the proposed building structures. Ground settlement will then be monitored through a series of survey points. Once settlement has stabilised, the surcharge fill can then be removed, and the foundations can be constructed. Outside the footprint of the structures there is no need to surcharge. The surcharged areas will be monitored for settlement over a 1-to-3-month period. Once the acceptable levels of are achieved, all surcharge material will be removed. Combined with the surcharged fill, the drains will ensure the settlement associated with the fill dissipate during the construction period and reduces the geotechnical risks under the structural footprint.
- **Ground Improvement – Roads:**
 - Following site strip, vertical drains will be installed into the ground below the proposed roads. Controlled Modulus Columns (CMC) and Vibrostone Column will be installed to satisfy road and services design. Services will be installed within the vibrostone column area and then build up road to design levels.

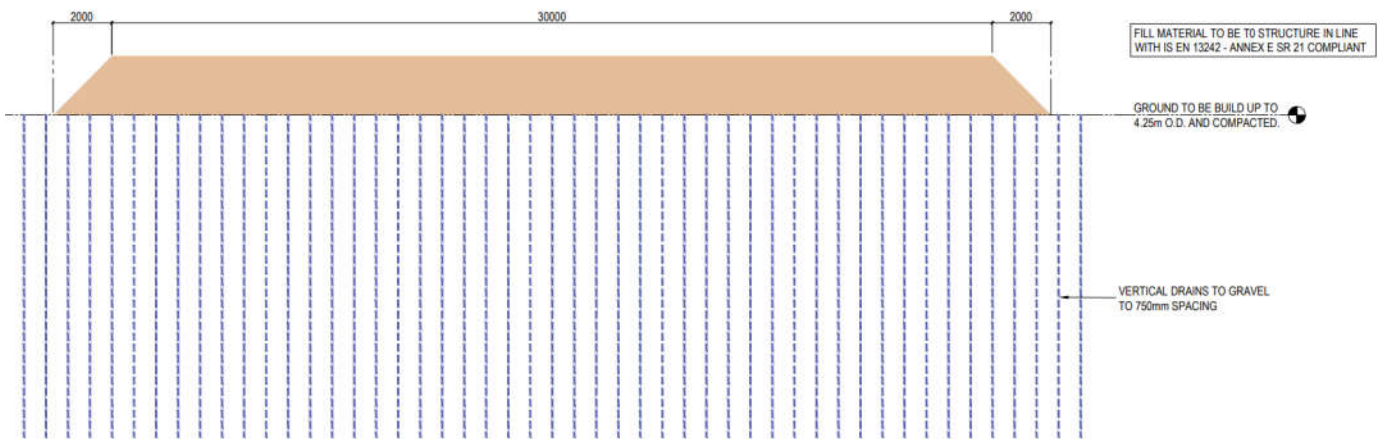


Figure 6-21 - Schematic Configuration of Proposed Ground Improvement Works (Test Phase)

During the construction stage, tracked excavators will likely be sufficient to excavate soils to a maximum depth of 4m across the Site. The extent of excavation for service / utility trenches will vary. All excavations are anticipated to encounter made ground / sandy silt / clay and/or gravel. No rock breaking will be required as bedrock will not be encountered.

The total volume of soil requiring excavation for the proposed development is presented in Table 6-3 below. Based on preliminary engineering calculations it is anticipated that ca. 5,026m³ of C&D waste and ca. 19,366 m³ of waste soils will require offsite disposal. All such material will be removed and disposed of offsite to a suitably permitted / licenced waste recovery / disposal facility in accordance with relevant waste management legislation (including but not limited to the Waste Management Act of 1996, 2001 and 2003 and all subsequent waste management regulations as amended).

Table 6-3 - Preliminary Cut and Fill Volumes (m3)

Scheme Totals	Total (m3)
Total cut material to be Exported off site	
Demolition Waste	5026
Soil to be taken off site (40%)	19366
Total (Excess soil & C&D waste to be removed from site)	24,392
Total fill material to be Imported to site	
Total Imported Fill Material (net)	75,484
Fill material (grey slab)	8473
Total (Material to be imported to site)	83,957
Total movements volume (Total Imported + Total Exported)	108,349
Total material to be retained onsite (fill)	
Total Soil to be retained (60%)	29049
Total Cut Volume Engineering Works	1500
Stockpile on Site	19400
Total (material to be retained onsite) (fill)	49,949

It is anticipated that ca. 83,957m3 of suitable engineering grade fill material (subbase / capping/building hardcore) and grey slab will need to be imported to the Site.

Piling will be required primarily to facilitate the foundations for Blocks E, H and I. Piling may be carried out via. Bored Piles, Continuous Flight Auger (CFA) Piles or Driven Piles. A brief description of the typical methodology for each piling type is provided as follows:

- Bored piles are carried out where the removal of spoil forms a hole for a reinforced concrete pile which is poured in situ. They are drilled using buckets and/or augers driven by percussion boring which involves a cutting tool which is dropped using a winch to cut out a cylinder of earth. The operation is repeated until the hole has been sunk to the required depth. At the required depth, concrete is poured using a tremie pipe method and the reinforcement is lowered into the concrete. As the concrete reaches the hole's upper level, the temporary casing is withdrawn.
- CFA piles are a type of bored pile where boring and pouring takes place simultaneously. A hollow stemmed auger is screwed into the ground by the piling rig and upon reaching the required depth, concrete is pumped through the hollow stem of the auger whilst it is slowly extracted. Positive pressure in the concrete being pumped into the ground is maintained throughout the placement as this prevents the hole from collapse. Extracted material brought to the surface is removed and the shaft is left full of concrete into which steel reinforcement can be placed.
- For driven piles, a pile hammer is used to drive piles into the ground by either impact hammering, vibrating or pushing it into the ground to an agreed set or refusal. Where there are variations in the subsurface conditions, pile lengths may have to be cut-off and the excess disposed of off-site.

The specific methodology will be determined during the detailed design / pre-construction phase. For the purposes of this assessment all piling scenarios have been considered. Piling to a maximum depth of 14m is anticipated, with a conservative assumption of the installation of 1no. piles per day. Groundwater control would be required (for any bored piles) (this will be further assessed in Chapter 7 – Water). Soil disposal (albeit for minimal volumes) may be required (for bored piles and possibly for driven piles). All such material will be removed and disposed offsite to a suitably permitted / licenced waste recovery / disposal facility in accordance with relevant waste management legislation (including but not limited to the Waste Management Act of 1996, 2001 and 2003 and all subsequent waste

management regulations as amended). The specific methodology will be determined during the detailed design / pre-construction phase.

During the construction phase of the development, the following potential impacts on soils and bedrock could occur and have been assessed accordingly;

- Proposed ground improvement works, as previously described, could result in dust generation;
- Stripping of hardstanding and made ground may result in exposure of the underlying subsoil layers to the effects of weather and construction traffic and may result in subsoil erosion and generation of sediment laden runoff;
- Soils beneath the proposed development may become unnecessarily compacted by machinery during construction;
- Topsoil and subsoil may become rutted and deterioration of the topsoil layer and any exposed subsoil layers may result in erosion and generation of sediment laden runoff;
- Dust generation can also occur during extended dry weather periods as a result of construction traffic;
- Soil may be at risk of becoming contaminated through Site construction activity; in particular the risk of spillages and leakage of any fuel oils and paint. Potential human health risks to construction workers could also occur associated with any such spillages and leakage; and,
- Temporary onsite groundwater and gas monitoring wells could provide a conduit for potential contamination of soils and bedrock through Site construction activity; in particular the risk of spillages and leakage of any fuel oils and paint.

These are likely to result in moderate negative impacts on receiving soils and/or bedrock; however, any impacts are considered to be short-term and localised. Furthermore, mitigation measures will be implemented during the Construction Phase to reduce and/or avoid these potential impacts, and to address any potential waste soil management issues.

6.4.2 Operational Phase

The impact on land take is likely to have a slight negative permanent impact on the environment of the area; however, this change is consistent with existing and emerging trends

During the operational phase of the development, the following potential soil associated impact could occur and has been assessed accordingly:

- Potential ground gas issue due to elevated levels of carbon dioxide within one localised area, deemed to be 'at low risk', in the western portion of the Site, in the vicinity of proposed Block H. This could result in a moderate negative, and permanent impact.

6.5 Mitigation Measures

6.5.1 Demolition and Construction Phase

Stripping and management of hardstanding, made ground, subsoil and C&D waste materials (arising from the demolition of the derelict cottage and associated outbuildings, and the removal of existing roads and hardstanding surfaces / base slab) will be carried out in a controlled way, coordinated with the proposed staging for the development, and will be removed from Site as soon as possible. All waste material will be removed for offsite disposal to a suitably licenced / permitted waste facility. The Contractor, in consultation with the Client and the Engineer, will be responsible for removing and replacing with suitable material as required.

The design of road levels and finished floor levels has been carried out in such a way as to minimise cut/fill type earthworks operations. The duration that subsoil layers are exposed to the effects of weather will be minimised.

Disturbed subsoil layers will be stabilised as soon as practicable (e.g., backfill of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping).

The excavation of material will be minimised as much as possible to reduce the impact on soils and geology. All waste soils (including made ground) will be classified in accordance with the EPA Guidance Document '*Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous*' (2019). It will be the Contractors responsibility to ensure that all waste soils are classified correctly and managed, transported and disposed of onsite in accordance with the requirements of the Waste Management Act 1996, as amended, the Waste Framework Directive 2008/98/EC of the European Parliament and Council on waste and any relevant subsequent waste management legislation.

Based on CIRIA 665 guidance, gas protection measures would be required in the vicinity of proposed Block H, based on this part of the Site being CS2. The typical scope of protective measures for residential buildings (not low rise traditional housing), such as apartment blocks (for CS2) is as follows (CIRIA 665, 2007):

- **Option a)** - Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g damp proof membrane (DPM) and underfloor venting; or;
- **Option b)** - Beam and block or pre-cast concrete and 2000g DPM / reinforced gas membrane and underfloor venting; and,
- All joints and penetrations sealed.

Gas protection measures (based on the above scope) for Block H will be incorporated into the Detailed Design Stage of the proposed development; and will be installed by experienced and trained specialists and will be subject to inspection and certification, during the Construction Stage. The Contractor, in consultation with the Client and the design team, will be responsible for ensuring that these measures are fully implemented and verified.

It will be the Contractors responsibility to ensure that a project specific Detailed Resource and Waste Management Plan (developed in accordance with relevant 2021 EPA Guidance) is fully implemented onsite for the duration of the project.

Further mitigation measures for the prevention of soil / bedrock contamination during construction are proposed below. The Contractor will be responsible for ensuring these measures are fully implemented. Mitigation measures outlined in Chapter 7 - Water are also applicable to the protection of soils and geology during the construction phase:

- Earthworks / piling plant and vehicles delivering construction materials to Site will be confined to predetermined haul routes around the Site for each phase of the proposed development;
- The need for vehicle wheel wash facilities will be assessed by the Contractor depending on the phasing of works and onsite activity and will be installed as needed, near any Site entrances and road sweeping implemented as necessary to maintain the road network in the immediate vicinity of the Site;
- Dust suppression measures (e.g., dampening down) will be implemented as necessary during dry periods;
- All excavated materials will be stored away from the excavations / immediate works area, in an appropriate manner at a safe and stable location. The maximum height of temporary stockpiles will be 3m;
- A comprehensive monitoring and supervisory regime including monitoring of all excavations and stability assessments as required will be put in place to ensure that the proposed construction works do not constitute a risk to the stability of the Site;
- In the unlikely event that ground contamination is encountered beneath the site during the construction works, all works will cease. Advice will be sought from an experienced contaminated land specialist and a phased environmental risk assessment (specifically to assess any associated potential environmental and/ or human health risks) will be undertaken in accordance with relevant EPA guidance '*Guidance On The Management Of Contaminated Land And Groundwater At EPA Licensed Sites*' (EPA, 2013) and UK Environment Agency Guidance '*Land contamination risk management (LCRM)*' (UK EA, 2023³⁷).

³⁷ <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

- The employment of good construction management practices will serve to minimise the risk of pollution from construction activities at the proposed development in line with the Construction Industry Research and Information Association (CIRIA) publication entitled, Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, CIRIA - C532 (2001) which are also detailed in Chapter 7 – Water;
- Temporary onsite groundwater and gas monitoring wells should be either suitably protected for the duration of the works and / or appropriately decommissioned in accordance with best practice guidance (SEPA guidance document “Good Practice for Decommissioning Redundant Boreholes and Wells”).
- All fill material imported to the Site for the Scheme will be clean, uncontaminated, suitable engineering grade fill material.
- Specifically, regarding pollution control measures, the following will be adhered to;
 - Fuels, lubricants and hydraulic fluids for equipment used on the construction Site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice;
 - Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling;
 - Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of;
 - All Site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area;
 - All machinery will be serviced before being mobilised to Site;
 - Refuelling will be completed in a controlled manner using drip trays at all times;
 - Mobile bowzers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
 - Ancillary equipment such as hoses and pipes will be contained within the bund;
 - Taps, nozzles or valves will be fitted with a lock system;
 - Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
 - Drip-trays will be used for fixed or mobile plant such as pumps and generators to retain oil leaks and spills;
 - Only designated trained operators will be authorised to refuel plant on Site;
 - Procedures and contingency plans will be set up to deal with emergency accidents or spills;
 - An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment;
 - Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-Site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the Site. This will minimise the risk of soils and bedrock becoming contaminated through Site activity; and,
 - The highest standards of Site management will be maintained and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the Site and surrounding environment during construction. A named person will be given the task of overseeing the pollution prevention measures agreed for the Site to ensure that they are operating safely and effectively.

The above mitigation measures will be incorporated (as required) during Detailed Design Stage and will form part of a site-specific Construction Environmental Management Plan (CEMP) which will be implemented during the Construction Stage (including initial Site preparatory / enabling works).

6.5.2 Operational Phase

Taking account of the relevant mitigation measures to be implemented during the Detailed Design Stage and Demolition and Construction Stage (including the installation of an appropriate ground gas membrane beneath Block H), no further mitigation measures will be required during the operational phase.

6.6 Monitoring Requirements

6.6.1 Construction Phase

A comprehensive monitoring and supervisory regime including monitoring of all excavations and stability assessments as required will be put in place to ensure that the proposed construction works do not constitute a risk to the stability of the Site.

6.6.2 Operational Phase

No monitoring will be required during the operational phase.

6.7 Residual Impacts

6.7.1 Demolition and Construction Phase

The impact on land take is likely to have a slight negative permanent impact on the environment of the area; however, this change is consistent with existing and emerging trends.

Implementation of the measures outlined above will ensure that potential moderate impacts of the proposed development on soils and the geological environment do not occur during the construction phase, and that any residual impacts (with the exception of offsite soil removal) will be slight negative and short term in duration.

The primary impact is the potential removal of ca. 5,026m³ of C&D waste and ca. 19,366m³ of waste soils for offsite disposal (via. excavation). However all waste soils will be classified in accordance with the EPA Guidance Document 'Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous' (2019), prior to offsite disposal at an appropriate local authority permitted / EPA licenced waste facility. The relevant local authority registered, permitted and /or EPA licenced waste facilities will be operated and managed according to the relevant conditions of their waste permits or EPA waste licences. The Contractor will ensure that all waste soils are classified correctly (as per relevant EPA (2015) Guidance) and managed, transported and disposed of offsite in accordance with the requirements of the Waste Management Act 1996, as amended, the Waste Framework Directive 2008/98/EC of the European Parliament and Council on waste and any relevant subsequent waste management legislation. The residual impact with respect to offsite soil removal is therefore likely to be slight negative and permanent.

Therefore no significant effects (with respect to Land, Soils and Geology) to the receiving environment are likely to arise as a result of the proposed Scheme during the Demolition and Construction Phase.

6.7.2 Operational Phase

The impact on land take is likely to have a slight negative permanent impact on the environment of the area; however, this change is consistent with existing and emerging trends.

Implementation of the measures outlined previously during the Detailed Design and Demolition and Construction Stages (specifically the installation of an appropriate ground gas membrane beneath Block H) will ensure that potential moderate negative permanent impacts do not occur during the operational phase. Accordingly, no predicted residual impacts with regards to soils or geology will arise during the operational phase.

Therefore no significant effects (with respect to Land, Soils and Geology) to the receiving environment are likely to arise as a result of the proposed Scheme during the Operational Phase.

6.8 'Do Nothing Scenario'

The do-nothing scenario will have a neutral and imperceptible effect on the Site with regards to land, soils and geology.

6.9 Reinstatement

All temporary construction compounds and Site entrances are to be removed upon completion of the construction phase. Such areas are to be reinstated in accordance with the landscape site layout plan and engineer's drawings. All construction waste and / or scrapped building materials are to be removed from Site on completion of the construction phase. Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from Site and disposed of at an appropriately licenced waste facility.

7. Water

7.1 Introduction

This chapter describes the existing surface water and groundwater regime likely to be encountered beneath and in the general vicinity of the proposed development. It also addresses the potential impact of the proposed development on hydrology (i.e. surface water) and hydrogeology (i.e. groundwater) together with the mitigation measures that will be employed to eliminate or reduce any potential impacts. A detailed description of the proposed development (hereafter referred to as the Site) is presented in Chapter 2 – Project Description of the EIAR.

7.2 Study Assessment and Methodology

The following scope of works was undertaken by AtkinsRéalis in order to complete this assessment: -

- Desk-based study including review of available historical information;
- Site attendance during the 2024 Phase 2 Ground Investigation, undertaken for geotechnical and environmental assessment purposes.

The purpose of the desk-based task was to characterise the current hydrological and hydrogeological setting of the Site. Relevant background information was compiled, specifically from the following data sources;

- Bing Maps Aerial photography (consulted 21/02/2025);
- Wicklow County Council Planning Maps (consulted 21/02/2025);
- Bray Municipal District Local Area Plan 2018 - 2024 (WCC 2018);
- Environmental Protection Agency (EPA) Public Viewer and web-mapping (consulted 21/02/2025).
- Geological Survey of Ireland (GSI) Datasets Public Viewer and Groundwater web-mapping (consulted 21/02/2025);
- GSI 'Wicklow GWB: Summary of Initial Characterisation' (GSI, 2004);
- Google Maps Aerial photography (consulted 21/02/2025).
- Ordnance Survey web-mapping (consulted 21/02/2025).
- National Parks and Wildlife Service (NPWS) Map Viewer (consulted 21/02/2025);
- Relevant soils, bedrock and groundwater monitoring data obtained during the Sea Gardens Phase 1 Ground Investigation and documented in a final factual report entitled '*Harbour Point Bray Ground Investigation Report – Factual*' prepared by IGSL Ltd. (2021).
- Site specific soils, bedrock and groundwater monitoring data obtained during the Sea Gardens Phase 2 Ground Investigation and documented in a final factual report entitled '*Harbour Point Bray Ground Investigation Report – Factual*' prepared by IGSL Ltd. (2024).

A comprehensive ground investigation for the proposed Phase 2 development was carried out by IGSL Ltd. (IGSL) between October 2023 and February 2024 in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007), BS 5930:2015, and BS 1377 (Parts 1 to 9). The full scope of ground investigation works completed is detailed in Chapter 6 – Land, Soils and Geology (exploratory locations are presented in Figure 6-9). Full details of the ground investigation are presented in the 'River Quarter Bray Ground Investigation Report – Factual Report' prepared by IGSL (2024) and presented in Appendix 6.1.

Representative environmental perched water samples were collected by IGSL from 3no. window sample boreholes (converted to shallow perched water monitoring wells, WS06B, WS07B, WS08B) and 1no. rotary borehole (converted to groundwater monitoring wells, ROH03). All 4no. groundwater samples (for the 2no. sampling events completed, at high tide and low tide on 25th March 2024) were subsequently scheduled for laboratory analysis for a

comprehensive suite of parameters. All groundwater samples were stored in chilled cooler boxes, prior to dispatch to a UKAS accredited laboratory. Baseline groundwater and perched water level monitoring was carried out by IGSL at 12no. monitoring locations. 3no. perched water and groundwater level monitoring events were carried out between 7th March and 15th April 2024.

In addition, a previous phase of ground investigation was undertaken for the Phase 1 development which is currently under construction. Full details of the Phase 1 ground investigation are presented in the 'Harbour Point Bray Ground Investigation Report – Factual' prepared by IGSL (2021) and presented in in Appendix 6.2.

This assessment has been completed in accordance with relevant best practice guidance from the Institute of Geologists of Ireland (IGI), '*Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements*' (IGI, 2013). The IGI guidance document is an updated version of the 2002 guidelines, '*Geology in Environmental Impact Statements, A Guide*' (IGI, 2002), which was revised to take account of legislative changes, and the operational experience developed by geoscientists in the production of relevant environmental assessments. This assessment has also been prepared in accordance with the relevant Environmental Protection Agency (EPA) guidance, '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' published in May 2022.

Separately, a Flood Risk Assessment (FRA) has been prepared by ARUP (2025) in accordance with the following guidance document; '*The Planning System and Flood Risk Management – Guidelines for Planning Authorities*' DOEHLG 2009, and comprised the following key phases: -

- **Stage 2: Initial Flood Risk Assessment** - to confirm sources of flooding that may affect the proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding; and,
- **Stage 3 Detailed flood risk assessment** – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

The proposed Phase 2 development layout (and red-line boundary) is presented in Figure 7-1.

No difficulties were encountered during the data collection and assessment stages of this Water assessment.

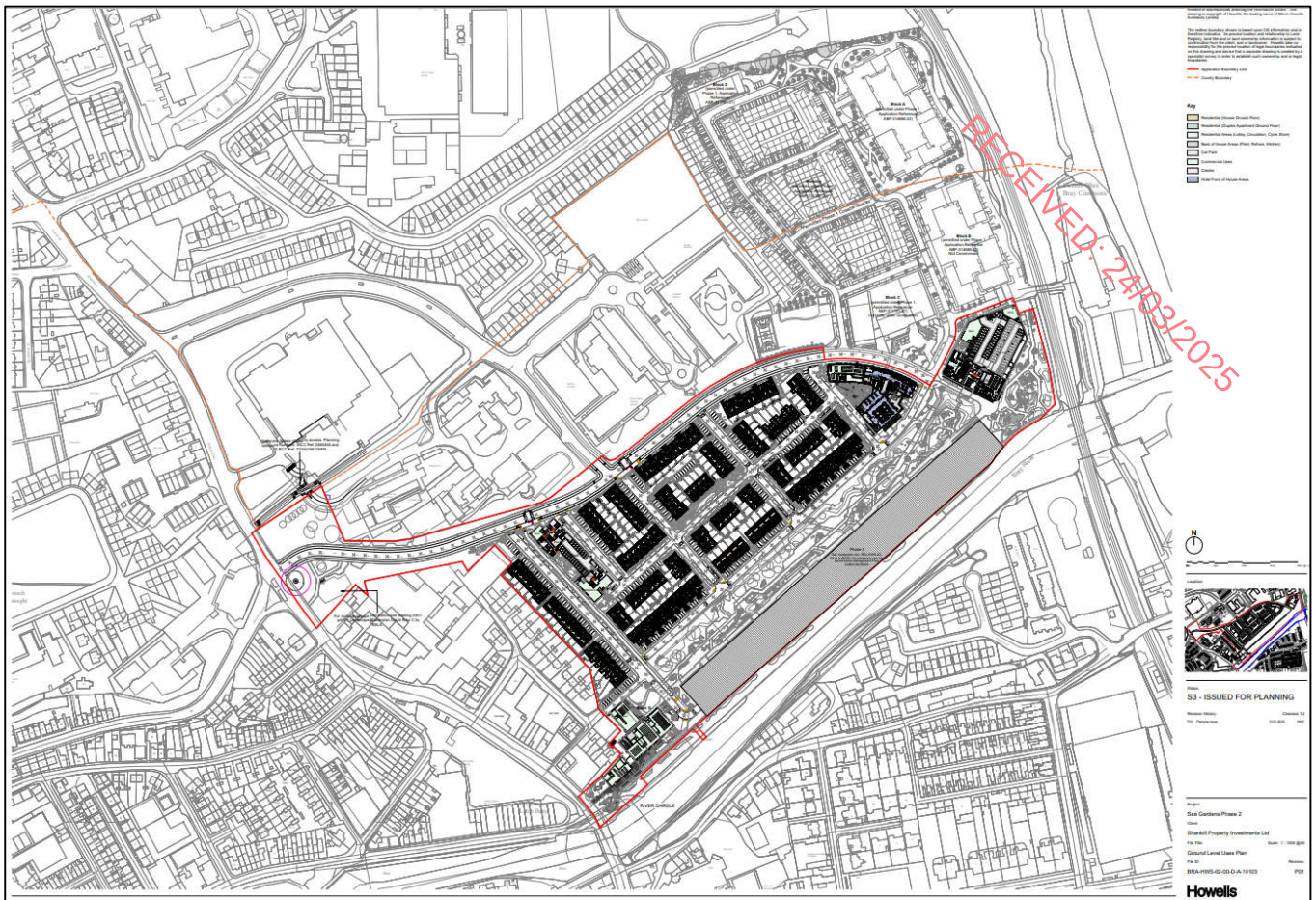


Figure 7-1 - Proposed Phase 2 Sea Gardens Development (Site boundary denoted in red)

7.3 Receiving Environment

7.3.1 Site Development

A review of historic maps (including available 6-inch historic maps, 25-inch historic maps, and aerial photographs (1995 to 2018) from the Ordnance Survey of Ireland) (OSI, 2025) and current aerial photography (Bing Maps, 2025) confirms that land use along the Scheme has generally been transformed over the years from greenfield use. The surrounding lands have developed considerably since the late twentieth century. A detailed summary of land use both in relation to the Site and surrounding lands is presented in Chapter 6 – Land, Soils and Geology.

7.3.2 Current Site Setting (and Topography)

The Site is bound by the permitted Phase 1 Coastal Quarter SHD (Phase 1A: Reference ABP-311181-21 & Phase 1B: ABP-314686-22) part of which is currently under construction in the North, by the Irish Rail Dublin-Rosslare main rail line in the East, by the River Dargle in the South and by existing residential developments to the West.

Most of the proposed development lands are located within a former golf course, Bray Golf Club, first established in the late nineteenth century and characterised by open ground covered by short grass with mature trees and scrub in places. The southern and eastern portions of the Site are located on low-lying level ground, while the ground rises slightly towards the north elsewhere. A temporary construction compound and car park occupy the centre of the Site while the northern portion of the Site contains some stockpiled soil. The western extent of the Site is located within the former garden of Ravenswell House as depicted on the historic OS maps. An existing road orientated north-south divides the eastern and western portion of the development Site. The southeast margin of the Site, adjacent to the River Dargle, is occupied by a car park and access road (now closed). The boundary to the river is defined by a modern concrete flood relief wall and drainage ditch.

There is significant existing foul drainage infrastructure present within Site. A foul rising main and a trunk foul sewer enter the Site at the northern boundary of the Phase 1 lands and turns east then south along the Site boundary where it finally crosses the River Dargle at the south of the Site. There are also two gravity foul sewers to the south of the Site. These sewers run from west to east across the Site where they outfall to the trunk sewers previously discussed.

There is an existing Uisce Éireann underground foul water storage tank close to the western boundary of the proposed development Site. The existing tank was constructed by Dun Laoghaire Rathdown County Council in 2007 – 2008 and is a critical piece of infrastructure associated with the Bray Pumping Station to the south of the River Dargle. As confirmed by Shankill Property Investments Ltd., this tank was installed under a 999-year subterranean lease allowing the surface area above to be incorporated into the future build out of the lands including capacity to accommodate substantial fill and an Uisce Éireann service vehicle driving above it.

The site slopes from the northwest to the River Dargle in the southeast. The levels range from 7.2m AOD on the northern boundary to 1.47m AOD on the southeast boundary.

7.3.2.1 Potential Contamination Sources

On a regional scale there are 9no. EPA licenced facilities within the vicinity of the Scheme:

- Packaging Laundry Limited (site code: W0304), 2.4km from the Site;
- Fassaroe Waste Recovery Facility (site code: W0269), 3.0km from the Site.
- Nypro Limited (site code: P0567), 0.4km from the Site;
- Bray Chemicals Ltd. (site code: P0129), 0.4km from the Site;
- Lithographic Universal Ltd. (site code: P0154), 1.9km from the Site;
- A. O. Smith Electric Motors (Ireland) Limited (site code: P0105), 2.2km from the Site;
- Starrus Eco Holdings Limited (Fassaroe) (site code: W0053), 2.4km from the Site;
- Alert Packaging Limited (site code: P0366), 2.8km from the Site; and,
- International Coatings Limited (site code: P0122), 5.1km from the Site;

There are also five Section 4 Discharges licenced facilities within the vicinity of the Scheme:

- Woodlands Academy (site code: WPL31), located 2.5km southwest;
- Peter Deigan Cars (site code: WPL51), located 2.6km southwest;
- Dargle Valley Nursing Home (site code: WPL/54), located 2.8km southwest;
- E&O Kennedy, Bray (site code: WPL/40), located 3.0km southwest; and,
- Knocksink Conservation Centre (site code: WPL/40), located 4.7km west.

A historic landfill, Bray Municipal Landfill is also located ca. 150m north-west of the Scheme. A Tier 2 Environmental Risk Assessment (Fehily Timoney & Co., 2016) was previously carried out on the historic landfill site to “*confirm the type and depth of the waste and to assess potential groundwater contamination*”. This assessment included ground investigation comprising a geophysical survey, boreholes, and geo-environmental sampling of soil, groundwater, leachate and gas. The former landfill site was categorised as ‘*Class C – Low Risk*’ which is described by the EPA as “*not considered to pose a significant risk to environment or human health*”. Based on the risk characterisation, the location of the former landfill and the fact that there are no surface water or groundwater linkages between the former landfill Site and the proposed Phase 2 development, it is not considered to be a potential offsite source of contamination (via. perched water / groundwater migration). Furthermore, long term coastal protection and remedial measures at the former landfill site were completed in 2024.

The existing underground Irish Water foul storage tank onsite, and underground foul sewer pipes running along the eastern Site boundary which comprise the main pipeline from Bray to Shanganagh Wastewater Treatment Plant (WwTP), as well as the railway line bounding the eastern site boundary, have also been identified as potential sources of contamination.

7.3.3 Flood Risk

A Flood Risk Assessment (FRA) has been prepared by ARUP (2025) on behalf of Shankill Property Investments Ltd. as part of the supporting assessments required for this planning application. During the preparation of the FRA, ARUP engaged in a series of pre-application consultations with the relevant stakeholders including Wicklow County Council (WCC). A copy of the Flood Risk Assessment Report prepared by ARUP (2025) (document ref.: 293308-ARUP-ZZ-XX-RP-C-0001) is presented in Appendix 7.1. Key conclusions presented in the detailed technical report are summarised as follows:

- *'The Sea Gardens Phase 2 development site is protected from fluvial and tidal flooding by the existing River Dargle Flood Defences. Risk of pluvial flooding to the development is low, with some local ponding potentially occurring at the low-lying areas of the site, behind the River Dargle Flood Defences. This is alleviated through an existing drainage ditch and culvert to the river. The risk of groundwater flood risk is low.'*
- *A hydrological analysis and hydraulic modelling were undertaken to analyse the risk of flooding to the site in the absence of defences and during an exceedance event. Three scenarios have been modelled: the fluvial 1% AEP event, tidal 0.5%AEP event and Hurricane Charlie extreme fluvial event. This were modelled for three conditions: undefended condition, defended baseline (no proposals) and defended with proposals.*
- *The dominant flood event at the site location is the tidal 0.5%AEP event. The highest flood level nearest to the site was found to be 3.2m AOD. This level is used to set the flood protection level for the site, with a 300mm allowance for freeboard. As such, the flood protection level is set at 3.5m AOD.*
- *In order to understand residual risks to the development and any impacts it might have to other sites, an overtopping exceedance scenario was run. The modelling demonstrates no rise in flood levels outside of the site and the maintenance of existing flow paths within the site to channel and remove water from Little Bray and Dwyer Park to the river.*
- *The flood risk management strategy of the site comprises of:*
 - *Locating residential (highly vulnerable) properties away from flood risk;*
 - *Raising residential properties and key access routes above the flood protection level of 3.5m AOD. Some localised roads including those to the north and south of Block G have levels below 3.5m AOD to allow for maintenance of the exceedance flow path from Dwyer Park through the linear park as shown in Figure 4-12' (of the 2025 FRA report presented in Appendix 7.1).*
 - *'Where raising of levels is not possible, demountable barriers and a water exclusion strategy is proposed for retail units (less vulnerable development).*
- *The proposed development comprises of 'highly and less vulnerable development', and partially lies within Flood Zone A. Therefore, a Justification Test in accordance with the OPW Guidelines is required. Both the Development Plan and Development Management Justification Tests are passed.*
- *This FRA demonstrates that the risks relating to flooding can be managed and mitigated to acceptable levels and therefore comply with DoEHLG / OPW planning guidance and the Wicklow County Council Development Plan 2022-2028 objective CPO 14.09'. (ARUP, 2025).*

In addition, the potential cumulative impacts with regards to flood risk from the proposed development, particularly in the context of the proposed Harbour Point Masterplan, were assessed within the FRA Report. According to the 2025 FRA report *'Phase 3 of the Bray Sea Gardens Development will include the addition of the area south of the linear park to include 6 apartment blocks built on a podium. The ground floor beneath the podium is proposed to be lowered to 1.5m AOD and will serve as a carpark, raising the higher vulnerability residences off the ground and above the design flood protection level. Flood modelling has been undertaken to include Phase 3 development to ensure the cumulative impact of the potential future development with the Phase 2 development in place. Modelling was done for the exceedance scenario.*

The modelling has demonstrated that:

- *the Phase 3 development will cause no increase in flood extents outside the redline boundary.*
- *All flow paths to the existing culverts are also maintained.*

- Small increases in flood levels (20-40mm) occur locally north of Lower Dargle Road and at the confluence of the Swan River and the Dargle River, as shown in green in Figure 4-14' (of the 2025 FRA report presented in Appendix 7.1). 'These are attributed to water entering a courtyard depression (no buildings impacted) and LiDAR discrepancies, respectively.'

The overall impact of Phase 3 is considered insignificant and would be subject to further detailed modelling undertaken as part of a future planning application for Phase 3, where mitigation measures could be provided if needed. A separate site-specific FRA will be prepared to describe in detail the modelling work. (ARUP, 2025).

7.3.4 Hydrology

There are two rivers located in the general vicinity of the proposed development. The Rathmicheal Stream is located north (ca. 270m from the site boundary) of the proposed development and flows in an easterly direction prior to discharge to the Irish Sea. The River Dargle is located adjacent (ca. 10m from the site boundary) to the proposed development and flows in an easterly direction prior to discharge to the Irish Sea. Bray harbour is located ca. 50m southeast of the Site and is an important amenity for the local population. The proposed development is located ca. 100m from the Irish Sea. Hydrological Features in the general vicinity of the Site are presented in Figure 7-2.

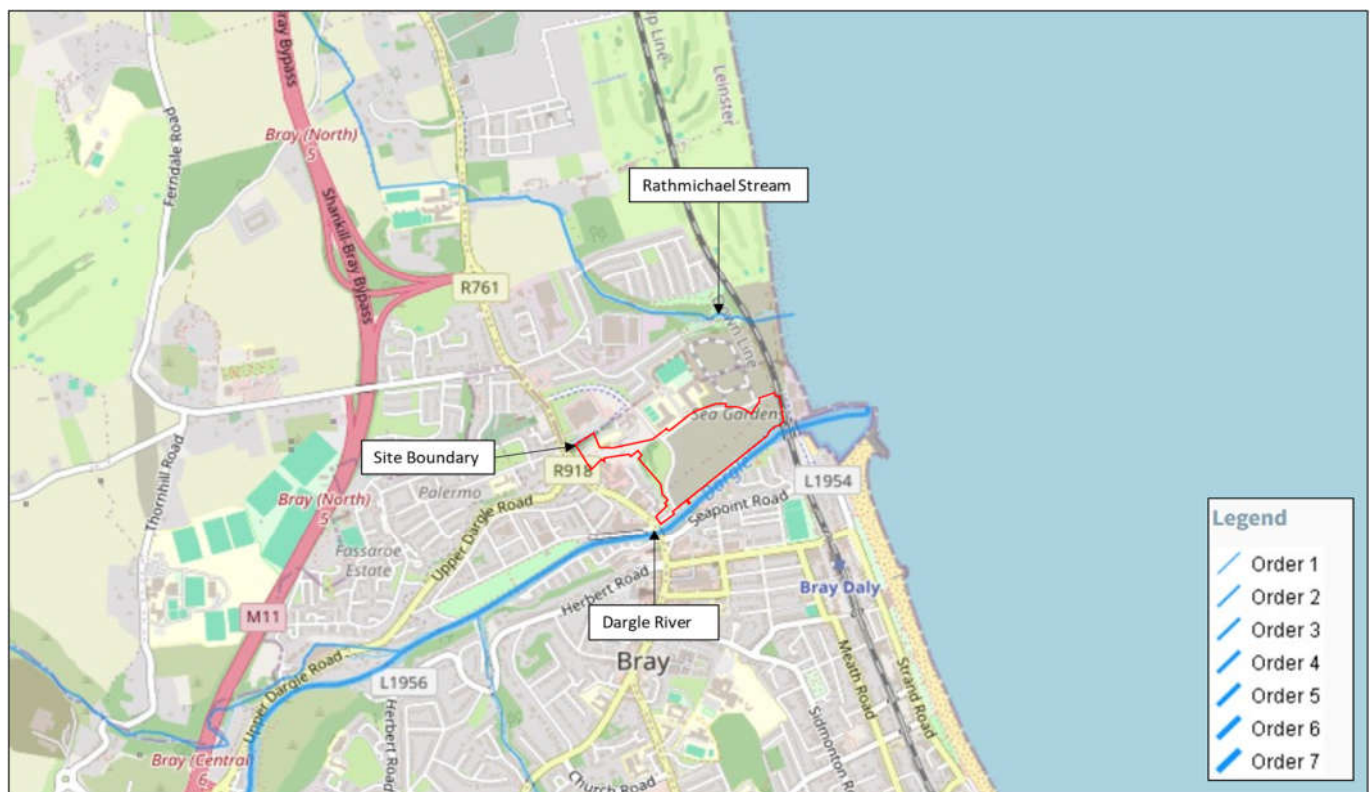


Figure 7-2 - Hydrological Features in the general vicinity of the Site (Source: EPA, 2025)

Killiney Bay geological heritage area (site Ref: DLR007) is located ca. 30m east of the Site. The geological heritage area is described by the GSI (2021) as a '5km long coastal section which exposes a succession of several units of glacial till.' It is considered 'a particularly impressive exposure into deep till with many sedimentological characteristics exposed' (GSI, 2021). The proposed development will not have any impact on Killiney Bay geological heritage area.

As detailed previously in Chapter 5 – Biodiversity, there are 14 no. European sites within the potential ZoI of the development project; 9 no. Special Areas of Conservation (SACs) and 5 no. Special Protection Areas for birds (SPAs). The nearest European site is Bray Head SAC which is located along the coastline ca. 1.7km south of the project site. There is no direct connectivity from the project site to Bray Head SAC or any other European site. There is no viable hydrological connectivity to the qualifying interest (QI) terrestrial heath and cliff habitats of this SAC as they are terrestrial in nature. In addition, there is no direct or viable indirect hydrological connectivity to the QI habitats

of any other European site within the potential Zol of the development site. There is no direct or indirect connectivity from the proposed development site to any NHA or pNHA. Refer to Chapter 5 – Biodiversity for further details.

7.3.4.1 Surface Water Quality

The EPA maintains a database of surface water features including rivers and lakes as well as water quality and risk status in accordance with the Water Framework Directive (WFD). The purpose of the WFD is to protect and enhance all waters including rivers, lakes, estuaries, coastal waters and groundwater as well as water dependent wildlife and habitats. This involves improving or maintaining current water quality status with the aim of achieving ‘Good’ status for all waters; and mitigating against the risk of a decline in the water body quality status. The site is located within the Dargle WFD sub-catchment of the Ovoca-Vartry WFD surface water catchment.

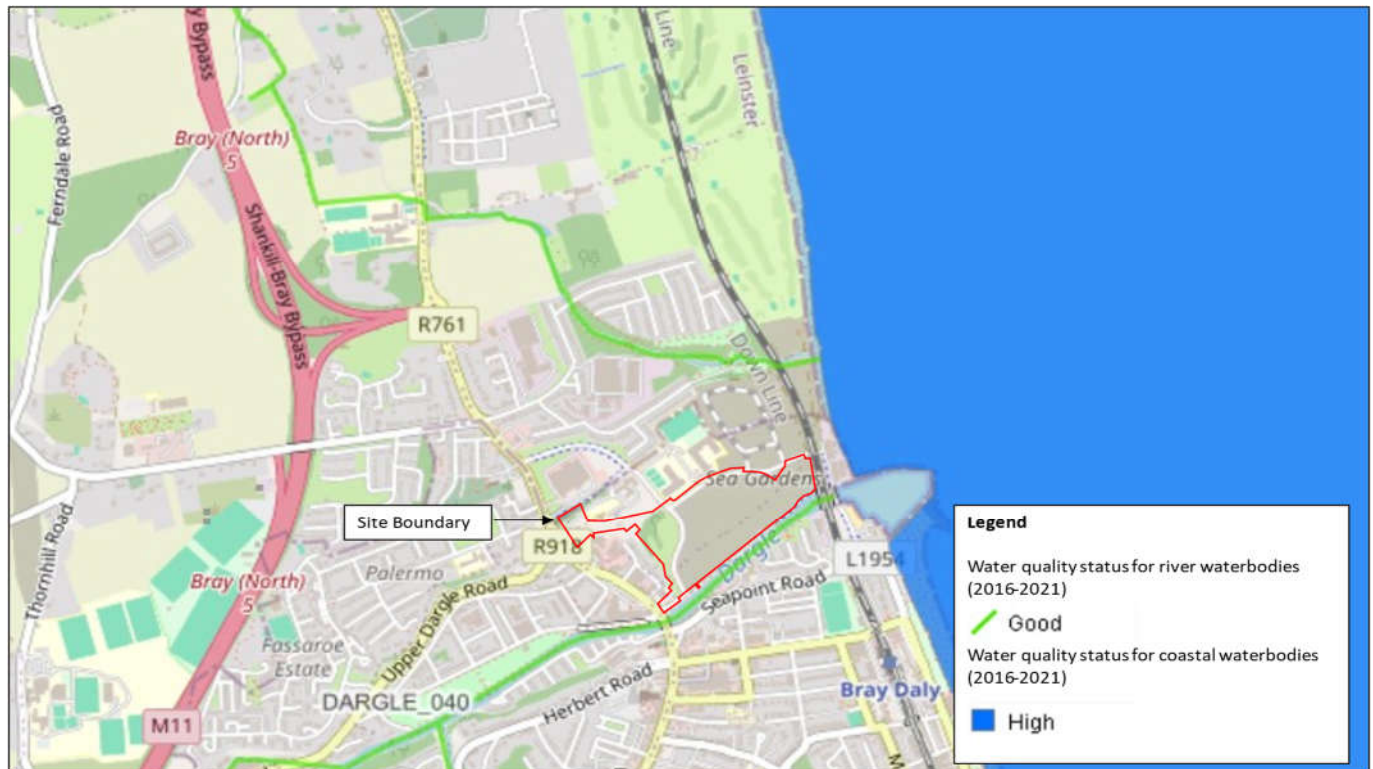


Figure 7-3 - Regional Surface Water Quality in the general vicinity of the Site (Source: EPA, 2025)

Both the Rathmicheal Stream (north of the proposed development) and the River Dargle (south and adjacent to the proposed development) have been assigned ‘Good’ surface water quality status by the EPA, for the 2016 to 2021 monitoring period (EPA, 2025), as presented in Figure 7-3. Both surface water courses are ‘not at risk’ of failing to meet the relevant WFD objectives for these surface waterbodies by 2027 (EPA, 2025). The Irish Sea (east of the proposed development) has been assigned ‘High’ coastal water quality status for the 2016 to 2021 monitoring period (EPA, 2025), and is ‘not at risk’ of failing to meet the relevant WFD objectives for this coastal waterbody by 2027 (EPA, 2025). The EPA produces an annual report which sets out bathing water quality at Ireland’s beaches during the summer bathing water season. Based on the latest available report and supporting data³⁸, the water quality status of Bray South Promenade during the 2024 summer bathing water season was reported to be ‘excellent’ (EPA, 2025).

Surface water sampling data is also available for the River Dargle adjacent to the proposed development. 2no. surface water samples were collected in September 2020. Surface water sample locations are presented in Figure 7-4, and surface water analytical results are presented in Table 7-1.

³⁸ https://www.beaches.ie/find-a-beach/#/beach/IEEABWC100_0000_0300

Surface water quality in the River Dargle, adjacent and downstream of the proposed development, was determined to be generally good. There was no detection of petroleum hydrocarbons, polyaromatic hydrocarbons (PAHs), Hexavalent Chromium, Total Dissolved Chromium III, Ammoniacal Nitrogen as N, Total Ammonia as N, Total Cyanide, Ortho Phosphate as P, Total Phosphorus as P, Nitrite as NO₂, Fluoride, Total Phenols, Benzene, Toluene, Ethylbenzene, m/p/o-Xylene, or Methyl Tertiary Butyl Ether, in either sample analysed. Total Coliforms (including Faecal Coliforms) and E.coli were detected in both samples. Faecal Coliform counts of 870 cfu/100ml and 900 cfu/100ml were detected in SW01 and SW02 respectively, while E.coli was also detected at 727 MPN/100ml and 866 MPN/100ml at these respective locations. However, Bray South Promenade achieved a Good Water Quality rating in 2022 and 2021, and an Excellent Water Quality rating in 2020.



Figure 7-4 - Surface Water Sample Locations along the River Dargle (Source: AtkinsRéalis, 2021)

Table 7-1 - Surface Water Sample Results along River Dargle (Source: AtkinsRéalis, 2021)

Laboratory Reference:			530707	530708
Date Sampled:			03/09/2020	03/09/2020
Parameter	Units	Surface Water Regulations - S.I. No. 272 of 2009 as amended – S.I. No. 327 of 2012, S.I. No. 386 of 2015 and S.I. No. 77 of 2019	SW01 (River Dargle - upstream)	SW02 (River Dargle - downstream)
Conductivity @ 20°C	uS/cm @20°C	-	329	585
pH	pH Unit	6.0<pH<9.0*	8.08	7.90
Ammonia as N	mg/l	0.065	0.061	0.030
BOD	mg/l O2	-	< 2	< 2
Dissolved Inorganic Nitrogen	mg/l	-	0.847	0.862
Orthophosphate as P	mg/l	0.06	< 0.025	< 0.025
Phosphorus, Total as P	mg/l	-	< 0.050	< 0.050
Total Dissolved Solids	mg/l	-	161	287
Total Suspended Solids	mg/l	-	< 2	3
Coliforms	MPN/100ml	-	5540	5830
E.coli	MPN/100ml	-	727	866
Faecal Coliforms	cfu/100ml	-	870	900
Dissolved Arsenic	ug/l	20	3	<2.5
Dissolved Cadmium	ug/l	0.45	<0.5	<0.5
Total Dissolved Chromium	ug/l	-	<1.5	<1.5
Dissolved Copper	ug/l	5	<7	<7
Dissolved Mercury	ug/l	0.07	<1	<1
Dissolved Nickel	ug/l	34	<2	<2
Dissolved Zinc	ug/l	-	4	6
Total Arsenic	ug/l	-	<2.5	<2.5
Total Cadmium	ug/l	-	<0.5	<0.5
Total Chromium	ug/l	-	<1.5	<1.5
Total Copper	ug/l	-	<7	<7
Total Mercury	ug/l	-	<1	<1
Total Nickel	ug/l	-	<2	<2
Total Phosphorus	ug/l	-	38	44
Total Zinc	ug/l	-	6	8
PAH MS				
Naphthalene	ug/l	130	<0.1	<0.1
Acenaphthylene	ug/l	-	<0.013	<0.013
Acenaphthene	ug/l	-	<0.013	<0.013
Fluorene	ug/l	-	<0.014	<0.014
Phenanthrene	ug/l	-	<0.011	<0.011
Anthracene	ug/l	0.1	<0.013	<0.013
Fluoranthene	ug/l	0.12	<0.012	<0.012
Pyrene	ug/l	-	<0.013	<0.013
Benzo(a)anthracene	ug/l	-	<0.015	<0.015
Chrysene	ug/l	-	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	-	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.027	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	-	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	-	<0.01	<0.01
Benzo(ghi)perylene	ug/l	8.2 x 10 ⁻⁴	<0.011	<0.011
PAH 16 Total	ug/l	-	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	0.017	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	0.017	<0.01	<0.01
Methyl Tertiary Butyl Ether	ug/l	-	<0.1	<0.1
Benzene	ug/l	50	<0.5	<0.5
Toluene	ug/l	10	<5	<5
Ethylbenzene	ug/l	-	<1	<1
m/p-Xylene	ug/l	10	<2	<2
o-Xylene	ug/l	10	<1	<1

Laboratory Reference:			530707	530708
Date Sampled:			03/09/2020	03/09/2020
Parameter	Units	Surface Water Regulations - S.I. No. 272 of 2009 as amended – S.I. No. 327 of 2012, S.I. No. 386 of 2015 and S.I. No. 77 of 2019	SW01 (River Dargle - upstream)	SW02 (River Dargle - downstream)
Nitrate as NO3	mg/l	-	2.8	3
Nitrite as NO2	mg/l	-	<0.02	<0.02
MRP Ortho Phosphate as P	mg/l	0.06	<0.03	<0.03
Inorganic Nitrogen	mg/l	-	0.64	0.68
Total Cyanide	mg/l	0.01	<0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	<0.03	<0.03
Hexavalent Chromium	mg/l	0.032	<0.006	<0.006
Total Ammonia as N	mg/l	0.065	<0.03	<0.03
Total Dissolved Chromium III	ug/l	-	<6	<6
TPH CWG				
Aliphatics				
>C5-C6	ug/l	-	<10	<10
>C6-C8	ug/l	-	<10	<10
>C8-C10	ug/l	-	<10	<10
>C10-C12	ug/l	-	<5	<5
>C12-C16	ug/l	-	<10	<10
>C16-C21	ug/l	-	<10	<10
>C21-C35	ug/l	-	<10	<10
Total aliphatics C5-35	ug/l	-	<10	<10
Aromatics				
>C5-EC7	ug/l	-	<10	<10
>EC7-EC8	ug/l	-	<10	<10
>EC8-EC10	ug/l	-	<10	<10
>EC10-EC12	ug/l	-	<5	<5
>EC12-EC16	ug/l	-	<10	<10
>EC16-EC21	ug/l	-	<10	<10
>EC21-EC35	ug/l	-	<10	<10
Total aromatics C5-35	ug/l	-	<10	<10
Total aliphatics and aromatics(C5-35)	ug/l	-	<10	<10
Total Phenols HPLC	mg/l	-	<0.15	<0.15
Fluoride	mg/l	1.5	<0.3	<0.3

Notes:

* in the absence of CaCO3 / water hardness value, the most conservative pH limit has been used.

Relevant Surface Water Regulation Value (for MAC - EQS - Other Surface Waters) applied as generic assessment criteria.

7.3.5 Hydrogeology

7.3.5.1 Aquifer Characteristics

The GSI provides a methodology for aquifer classification based on resource value (regionally important, locally important and poor) and vulnerability (extreme, high, moderate or low). Resource value refers to the scale and production potential of the aquifer whilst vulnerability refers to the ease with which groundwater may be contaminated by human activities (vulnerability classification is primarily based on the permeability and thickness of subsoils), as presented in Table 7-2.

Table 7-2 - Groundwater Vulnerability Rating Table (Source: GSI, 1999)

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	> 3.0m	3.0 - 10.0m	3.0 - 5.0m	> 3.0m	N/A
Moderate (M)	N/A	> 10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	> 10.0m	N/A	N/A

Notes: (1) N/A = not applicable.

(2) Precise permeability values cannot be given at present.

(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Groundwater vulnerability is an indication of how easily the aquifer can become contaminated by human activity. It is dependent on the thickness and permeability of the overlying soils and depth to the water table. For example, a bedrock aquifer with minimal thickness of overburden or with a thin layer of permeable overburden will be more vulnerable to contamination than a bedrock aquifer which has a thick layer of low permeability overburden. Extreme groundwater vulnerability is also associated with karst landforms as these are a direct pathway for water and contaminants to enter the aquifer from the surface. Groundwater vulnerability (in the bedrock aquifer) is Low (L) in the southern portion of the site and Moderate (M) in the northern portion of the Site, as presented in Figure 7-5 (GSI, 2025). Areas of Extreme (E) and Rock at or Near Surface or Karst (X) vulnerability are noted to be present offsite, to the southwest of the Site.

The GSI has devised a system for classifying bedrock aquifers and gravel aquifers in Ireland based on the size and hydrogeological characteristics of these aquifers. The three main classifications for bedrock aquifers are Regionally Important Aquifers (R), Locally Important Aquifers (L) and Poor Aquifers (P) (which are further subdivided based on the productivity of the aquifer). Gravel aquifers are classified as either Regionally Important (Rg) or Locally Important (Lg). Based on the GSI public data viewer (GSI, 2025) the bedrock aquifer (Maulin Formation) beneath the general vicinity of the Site is classified as a locally important aquifer (LI) – bedrock which is moderately productive only in local zones, as presented in Figure 7-6 (GSI, 2025). The Enniskerry Gravels are a locally important gravel aquifer located ca. 1.8km west of the Site.

The general vicinity of the Site is within the Wicklow Groundwater Body (GWB). The Groundwater Body (GWB) is the relevant management unit under the WFD. Groundwater bodies are subdivisions of large geographical areas of aquifers so that they can be effectively managed in order to protect the groundwater and linked surface waters (GSI, 2025). According to the 'Wicklow GWB: Summary of Initial Characterisation' document (GSI, 2004), the majority of groundwater flow in this GWB will occur in the top few metres of the bedrock aquifer, along a weathered zone in a lateral direction towards rivers and springs. The dominant recharge process will be diffuse recharge from water percolating through the overlying tills and into the aquifer. Groundwater will discharge directly to the sea along the coast. The GWB will also discharge to the over lying streams and rivers as baseflow (GSI, 2004). There are no karst features within a 10km radius of the proposed development (GSI 2025). Based on the geological setting of the receiving environment, there is no potential for karst features (such as fractures or epikarst) to be present beneath the Site. Accordingly, the potential for karst connectivity, and groundwater flow via. conduit pathways does not warrant consideration as part of this assessment.

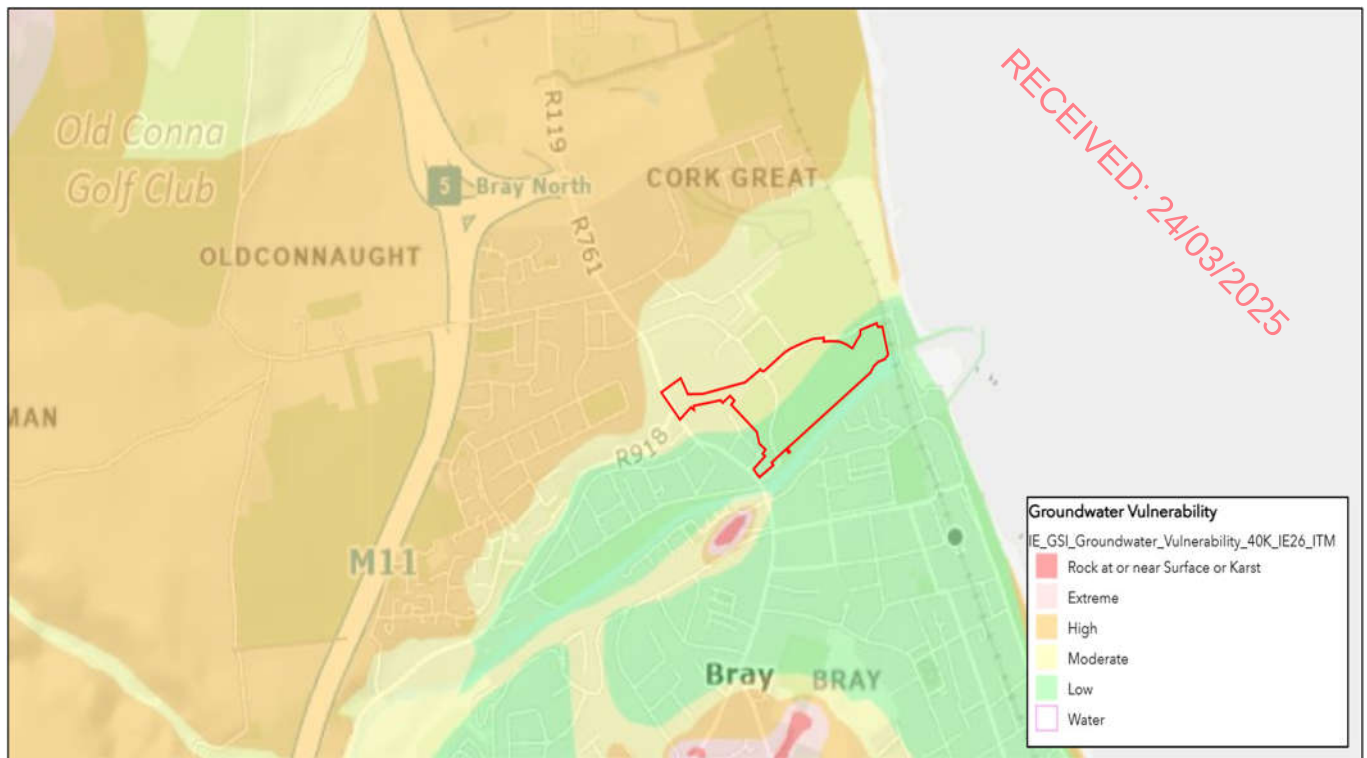


Figure 7-5 - Regional Groundwater Vulnerability Rating (Source: GSI, 2025)

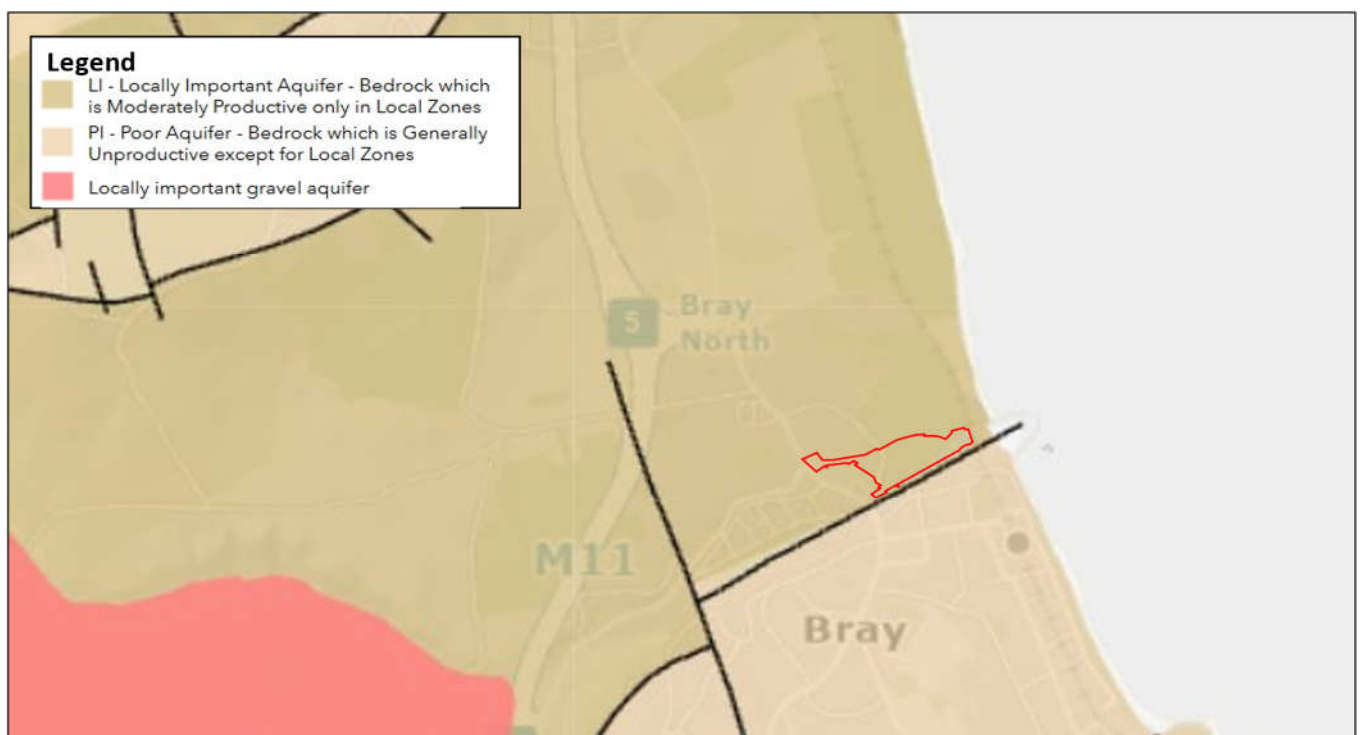


Figure 7-6 - Regional Aquifer Classification (Bedrock Aquifer) (Source: GSI, 2025)

7.3.5.2 Groundwater Recharge

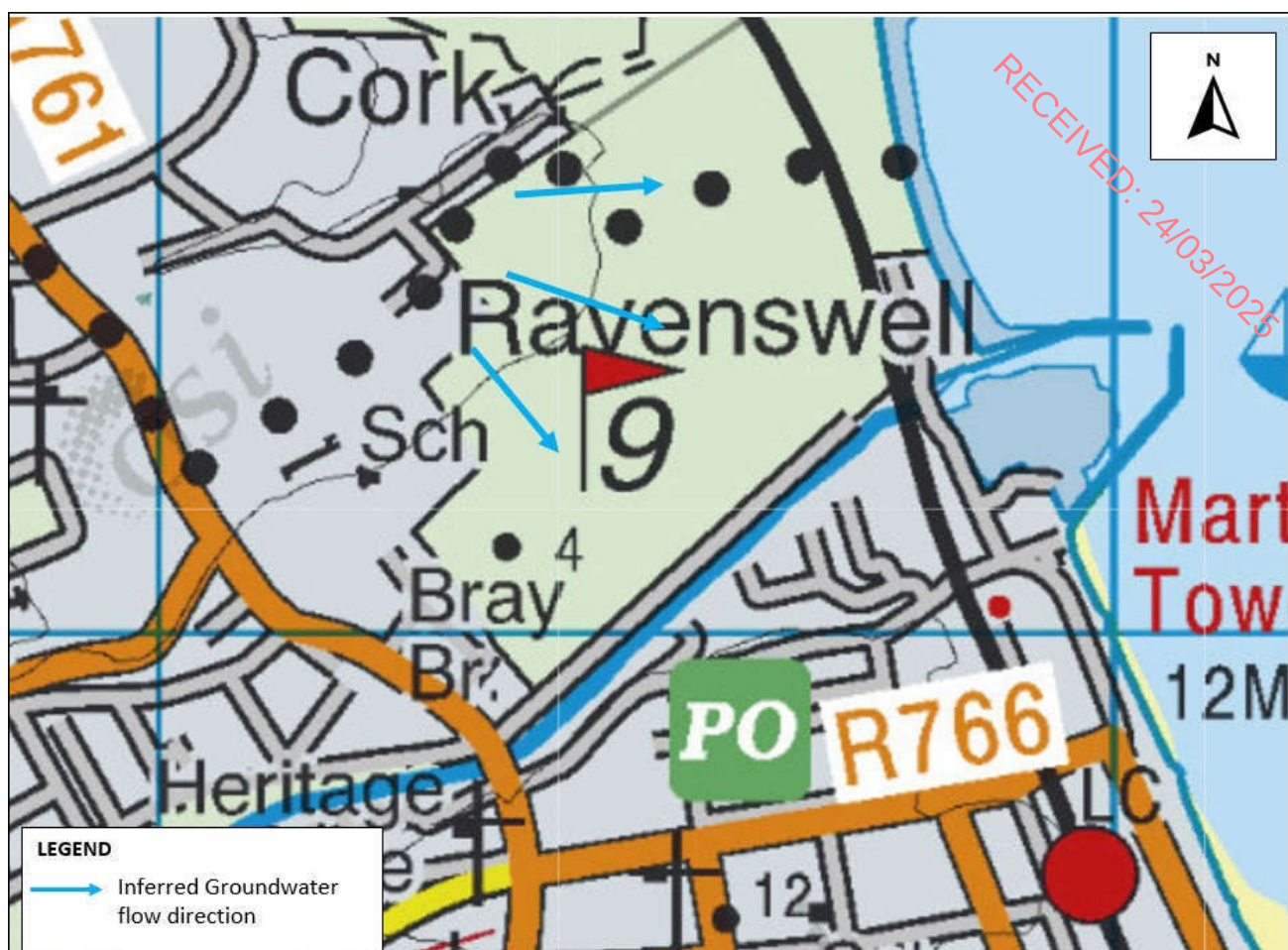
Recharge is the amount of rainfall which infiltrates to ground and replenishes groundwater levels in the bedrock and gravel aquifers. It is dependent on the following key factors: effective rainfall (i.e. total rainfall less evaporation and surface water run-off), transpiration (i.e. uptake by vegetation) and aquifer characteristics (i.e. how easily the aquifer can accept water and store it). Additionally, not all effective rainfall will contribute to recharge due to impermeable materials in urbanised areas and associated drainage and water management infrastructure. The average recharge rate to the locally important bedrock aquifer beneath the general vicinity of the Site is reported to be ca. 81.56mm/yr (GSI, 2025).

7.3.5.3 Groundwater Levels and Flow Direction

During the Phase 2 Ground Investigation, 3no. perched water monitoring wells (WS06B, WS07B, and WS08B) were installed to a maximum depth of 5m across the Site within shallow subsoils (refer to Appendix 6.1 for borehole logs and installation details). 3no. perched water monitoring events were undertaken between March and April 2024. Perched water level monitoring details are presented in Appendix 6.1. Perched water levels at the monitoring wells ranged from 1.10 mbgl (0.67mOD) to 2.10 mbgl (1.81mOD).

During the Phase 1 Ground Investigation, 3no. groundwater monitoring wells (ROH01, ROH02 and ROH04) were installed to a maximum depth of 13m within saturated estuarine deposits (gravelly silt / silt) across the proposed Phase 1 and Phase 2 development lands (refer to Appendix 6.2 for borehole logs and installation details).. 6no. monitoring events were undertaken between October and December 2020. Groundwater level monitoring results are presented Appendix 6.2. Measured groundwater levels during the monitoring period ranged from 4.49 mbgl (6.32mOD) to 4.98 mbgl (5.83mOD) at ROH01; 3.15 mbgl (1.32mOD) to 3.33 mbgl (1.14mOD) at ROH02; and 0.2 mbgl (1.23mOD) to 0.87 mbgl (0.56mOD) at ROH04.

Inferred groundwater flow is expected to follow topography in general southerly, and south easterly directions, primarily towards the River Dargle (in the south) and to the Irish Sea (in the east / south east), as presented in Figure 7-7. It is likely that effective rainfall percolates vertically and flows within the saturated estuarine silts, sands and gravels beneath the general vicinity of the Site. Shallow groundwater flowing beneath the proposed development is subsequently likely to discharge to the River Dargle in the south, and to the Irish Sea, in the east / south east.



During the Phase 1 Ground Investigation, continuous groundwater level monitoring was carried out between 6th October and 12th December 2020 (IGSL, 2021), across the proposed Phase 1 and Phase 2 development lands. Groundwater levels at ROH02 and ROH04 show the greatest tidal influence, as expected, with tidal cycle ranges of ca. 0.55m and ca. 0.60m respectively recorded during the monitoring period. A minimal tidal influence (of ca. 0.02m) was recorded at ROH01. Hydrographs are presented in Appendix 6.2.

7.3.5.4 Groundwater Use & Available Resource

The GSI maintains a record of groundwater abstractions consisting of wells and springs, in addition to designated drinking water protection zones (referred to as Source Protection Areas). According to the GSI database, there are no group water scheme or public water supply abstraction points, or designated group water scheme or public water supply Source Protection Areas within the vicinity of the Site (GSI, 2025).

Based on the GSI database, there are 7no. wells and springs located within the general vicinity of the Site. The details of the 7no. abstraction wells are summarised in Table 7-3 and presented in Figure 7-8. Surface springs are also reported to be present within the general vicinity of the Site (albeit a location accuracy of 5km is noted) (GSI, 2025). Taking account of the reported location accuracy of these wells and springs, no groundwater abstraction wells or springs are known to be present within the Site boundary.

Table 7-3 - GSI Groundwater Abstractions Within Study Area (GSI, 2025)

Abstraction ID	Abstraction Type	Location Accuracy (m)	Approximate Location (relative to the Site)	Depth (m)	Yield (m ³ /d)	Use
3221SWW029	Borehole	1000	Potential location overlaps with Site	60.9	30 - poor	Unknown
3221SWW070	Borehole	200	Potential location overlaps with Site	30.5	300 - good	Domestic use
3221SWW036	Spring	5000	Potential location overlaps with Site	N/A	N/A	Unknown
3221SWW069	Borehole	100	ca. 100m north west of the Site	15.2	300 – good (estimate)	Domestic use only
3221SWW027	Borehole	2000	South of Site	7.6	Unknown	Unknown
3221SWW026	Borehole	2000		5.6	Unknown	Unknown
3221SWW028	Borehole	2000		4.4	Unknown	Unknown

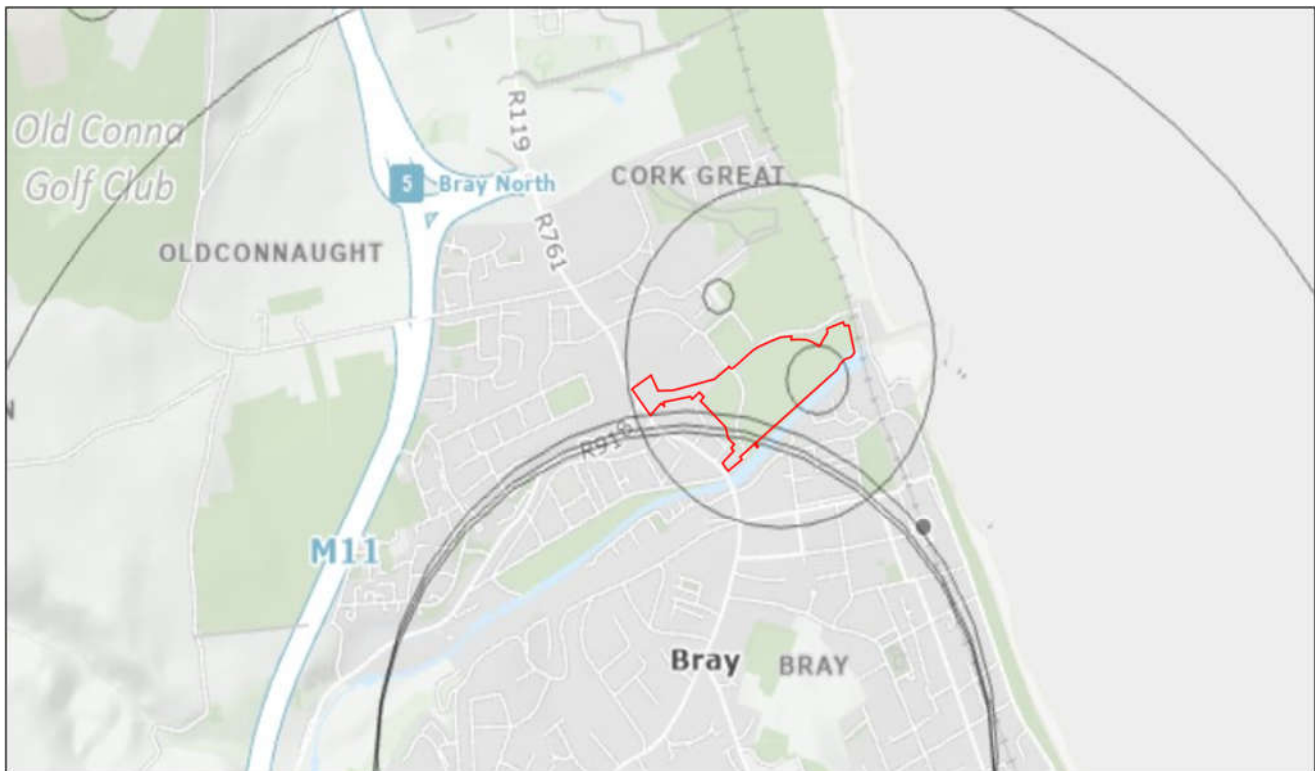


Figure 7-8 - Registered Groundwater Wells in The Vicinity of the Site (Source: GSI, 2025)

7.3.5.5 Groundwater Quality

The European Communities Environmental Objectives (Groundwater) Regulations, (S.I. 9 of 2010) came into effect on 27th January 2010. The aim of the Regulations is to achieve the environmental objectives established for groundwater by Article 4 (1) (b) of the Water Framework Directive (2000/60/EC). The 2010 Regulations set down groundwater quality standards for nitrate (50mg/L) and active substances in pesticides in Schedule 4 and also established threshold values for pollutants or indicators of pollutants in Schedule 5. Under these regulations the EPA shall also assign a status of 'Good' or 'Poor' to those bodies of groundwater where available data and knowledge allows.

The WFD water quality status for the Wicklow GWB is classified as 'Good' for the 2016 to 2021 monitoring period (EPA, 2025), as presented in Figure 7-9. The GWB is reported to be 'At risk' of failing to meet the relevant WFD objectives by 2027 (EPA, 2025). According to the GSI (2004), groundwater within the Maulin bedrock formation (which underlies the general vicinity of the Site) is generally of calcium bicarbonate type, and soft to moderately soft (20–80 mg/l CaCO₃).

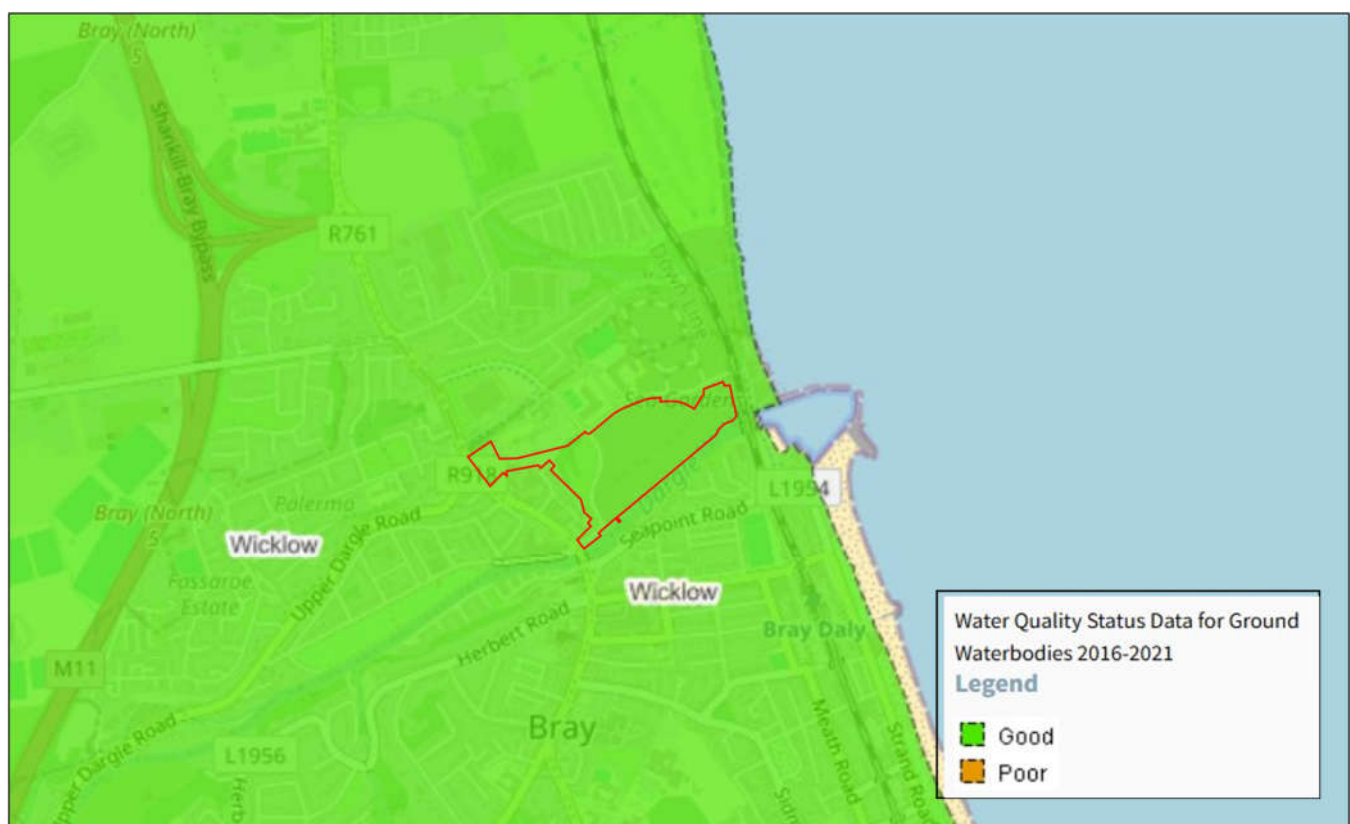


Figure 7-9 - Regional Groundwater Quality in the general vicinity of the Site (Source: EPA, 2025)

7.3.5.5.1 Site Specific Groundwater Quality

During the Phase 1 Ground Investigation, groundwater samples were collected on 8th November and on 13th of November 2020 (across proposed Phase 1 and Phase 2 development lands) at monitoring well locations: ROH01, ROH02 and ROH04 (monitoring locations are presented in Appendix 6.2). Results were summarised as follows:

- No detection of Total petroleum hydrocarbon (TPH), PAH, VOCs (including TICs) or SVOCs (including TICs) concentrations were identified in any of the groundwater samples analysed.

- Chloride exceeded the relevant Lower Groundwater Regulation Value Threshold value (24 mg/l) in all groundwater samples; however this would be expected due to salinity effects associated with the Site setting.
- Ammoniacal Nitrogen exceeded the relevant Lower Groundwater Regulation Threshold value (0.065 mg/l) in 4no. of the 6no. samples analysed, and exceeded the Upper Groundwater Regulation Value Threshold value (0.175mg/l) in 2no. of the 6no. samples analysed (at monitoring locations ROH04). The source of these elevated concentrations are likely due to anthropogenic effects (i.e. sewage, or fertiliser application during the former use of the Site as a golf course). However, based on the surface water monitoring results downstream of the site (SW02), no impacts (in respect of ammoniacal nitrogen) are identified in the River Dargle (identified as the discharge point of groundwater from the Site).
- Nitrite exceeded the relevant Groundwater Regulation value (0.375mg/l) during both monitoring events at groundwater water monitoring location ROH01; however sample results for all other downgradient monitoring locations were below the relevant Groundwater Regulation value, and therefore this localised exceedance was likely due to offsite sources, upgradient of the Phase 1 and Phase 2 development lands. Similarly nitrate exceeded the relevant Groundwater Regulation value (37.5mg/l) during both monitoring events at groundwater water monitoring location ROH01; this localised exceedance is likely due to offsite sources.
- Orthophosphate (as PO₄) exceeded the relevant Groundwater Regulation value (0.107mg/l) in 3no. of the 6no. samples analysed; however concentrations (0.11 to 0.13 mg/l) only marginally exceeded the relevant Groundwater Regulation value.

Laboratory analytical reports are presented in Appendix 6.2.

During the Phase 2 Ground Investigation, groundwater samples were collected at the proposed Phase 2 development lands, at high and low tide on 25th March 2024 at monitoring well location: ROH03 (monitoring locations are presented in Appendix 6.1). Results are summarised as follows:

- No detection of TPH, PAH, VOCs or Total Phenol concentrations were identified in the 2no. samples obtained;
- Concentrations of dissolved arsenic exceeded the relevant Groundwater Regulation Value (7.5ug/l) during both monitoring events at ROH03. The source of these elevated concentrations is likely due to anthropogenic effects (i.e. onsite fertiliser application during the former use of the Site as a golf course) and/or made ground/ soils. However, based on historical surface water monitoring results downstream of the site, no impacts (with respect to arsenic) have been identified in the River Dargle (which is the likely groundwater discharge point in this portion of the Site). All other metals analysed were below the relevant Groundwater Regulation Values.

Laboratory analytical reports are presented in Appendix 6.1.

7.3.5.5.2 Site Specific Perched Water Quality

During the Phase 2 Ground Investigation, perched water samples were collected at high and low tide on 25th March 2024 at monitoring well locations: WS06B, WS07B and WS08B (monitoring locations are presented in Appendix 6.1). Results are summarised as follows:

- No detection of TPH, PAH, VOCs or Total Phenol concentrations were identified in any of the perched water samples analysed.
- Concentrations of all indicator parameters and dissolved metals analysed were below the relevant Groundwater Regulation Values.

Laboratory analytical reports are presented in Appendix 6.1.

7.3.6 Geological Heritage

Figure 7-10 and Table 7-4 show there are a number of Geological Heritage Areas (GHA) in close proximity to the Scheme. However based on the nature of the Scheme, the designation criteria and locations of each of the relevant

GHAs, and specifically for the Killiney Bay GHA, the Scheme will not result in any likely environmental effects to designated GHAs.

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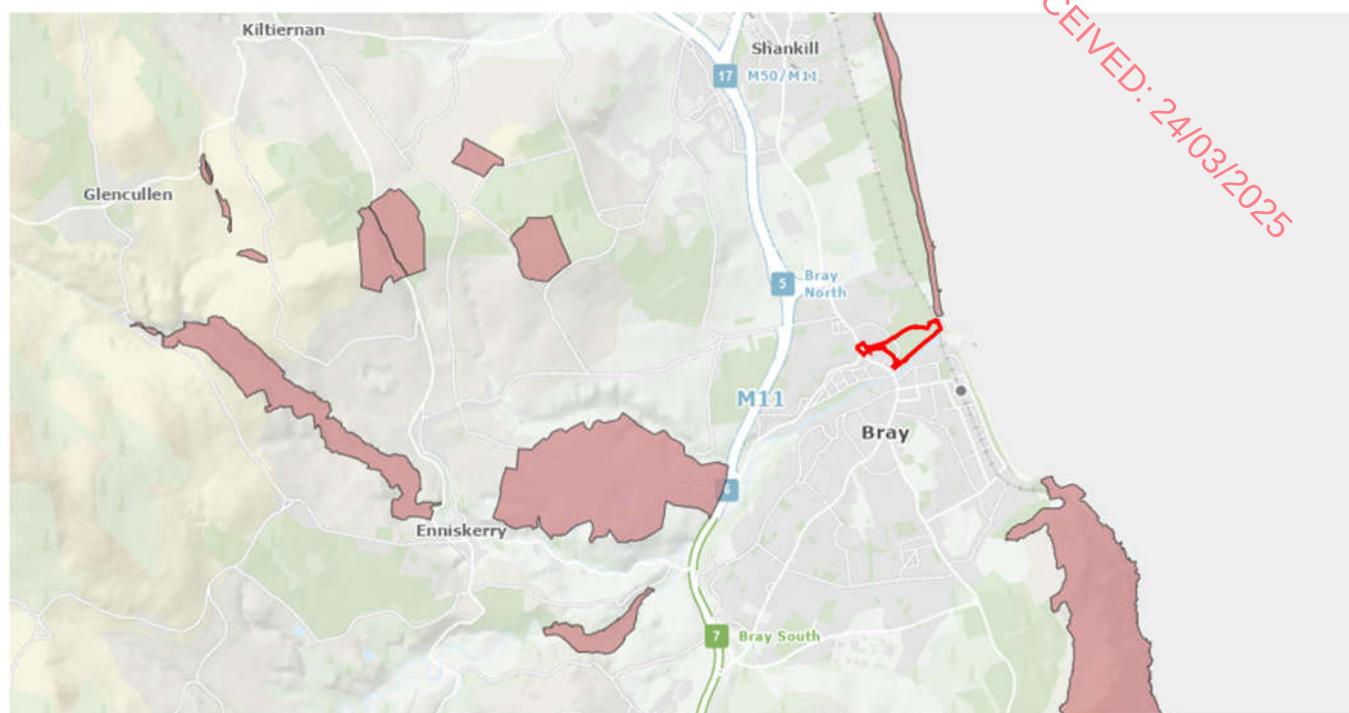


Figure 7-10 - Geological Heritage Areas (GSI 2024)

Table 7-4 - Heritage Sites showing distance from the Scheme

Heritage sites	Distance from the site scheme (km) (from google earth 2024)
Killiney Bay	0.1
Bray Head	2.24
Enniskerry Delta	2.9
Carrickgollogan	3.56
River Dargle Valley	3.68
Ballycorus	4.43
The Scalp	4.86

7.4 Potential Effects of the Proposed Development

7.4.1 Conceptual Site Model

In addition to flood risk, the following criteria are typically applied when evaluating potential impacts to the water environment: -

- Impacts to surface water / groundwater quality; and,
- Impacts to surface water flows / groundwater resources.

In terms of surface water flows / groundwater resources, no significant impact is anticipated arising from the proposed development based on the following considerations: -

- There are no reported public supply wells within the vicinity of the Site. There are no known onsite abstraction wells. According to the GSI (2025) database, there are 7no. groundwater wells located within the general vicinity of the Site. However, due to the nature, scale and location of the proposed development, any offsite groundwater abstraction wells are unlikely to be impacted by the proposed development.
- There will be no significant change to rainfall recharge rates at the proposed development. Storm water generated from the proposed development will be conveyed through new storm water drainage networks which have been designed in accordance with SuDS design principles. The proposed stormwater drainage design has been developed in consultation with the relevant authority, Wicklow County Council (WCC), Municipal services department.
- Storm water generated from the proposed residential development will be conveyed through a proposed storm water network including SuDS and attenuated / managed on site prior to final discharge at greenfield run-off rates. The restricted discharge from the proposed site will be conveyed via. a storm water sewer within the site before discharge to either the receiving River Dargle; or separately to the storm water network installed in the northern and eastern portions of the site during Phase 1. The proposed storm water discharge system has been designed to broadly follow the existing topographic levels and characteristics of the current natural drainage catchment regime. This will minimise any impacts to existing rainfall recharge rates at the Site (and accordingly groundwater levels beneath the Site, and surface water flows in the River Dargle) as a result of the proposed development.
- The maximum anticipated depth of excavation across the Site is anticipated to be 5mbgl. All excavations are anticipated to encounter sandy silt / clay and/or gravel, with localised areas of made ground. No rock breaking will be required. Based on encountered site-specific geological records, measured groundwater levels, and continuous groundwater level monitoring data, some dewatering may be required during the construction phase (albeit in localised areas). However, given the fact that the Site is underlain by a locally important aquifer (LI) – bedrock which is moderately productive only in local zones, and taking account of the localised nature of potential dewatering, no groundwater level impacts to regional groundwater resources are anticipated. Similarly surface water level/ flow impacts are not anticipated.
- Piling will be required at the Site, due to poor ground conditions. Piling may be carried out via. Bored Piles, Continuous Flight Auger (CFA) Piles or Driven Piles, as discussed in detail in Chapter 6 – Land, Soils and Geology. However given the temporary and localised nature of the piling works, no groundwater level impacts are anticipated to regional groundwater resources. Similarly surface water level/ flow impacts are not anticipated.
- No onsite groundwater abstraction is proposed during the operational phase. Based on the proposed design, typical excavation depths and encountered ground conditions beneath the Site, permanent dewatering will not likely be required during the operational phase.

Therefore, given the nature of the proposed development there will be no impact to regional or local groundwater resources or surface water levels / flows in the receiving River Dargle. Accordingly, potential impacts on groundwater resources, groundwater levels or surface water levels/ flows do not warrant further consideration.

In assessing potential water quality impacts, the EPA advocates a 'risk-based approach', and states that *'the principal aim in dealing with contaminated land and groundwater related issues is to secure the protection of human health, water bodies (including groundwater) and the wider environment'* (EPA, 2013). In accordance with this risk-based approach a preliminary Source-Pathway-Receptor (SPR) model has been derived for the Site.

The risk of any potential impacts to the closest European sites with connectivity via the Irish Sea (i.e. Bray Head SAC) have been screened out, as detailed previously within this chapter (and also Chapter 5 – Biodiversity). Similarly the risk of any impacts to Killiney Bay geological heritage area (located ca. 30m east of the Site) have been screened out, as detailed previously within this chapter.

Perched water present within permeable (sand and sandy clay/silt) layers beneath the Site is likely to be localised. Based on topography, and inferred groundwater flow direction beneath the Site, the Rathmichael Stream, located north of the Site will not be impacted by the proposed development, during the construction or operational phases.

Four key receptors (in terms of surface water /groundwater quality) have therefore been identified as follows;

- Shallow groundwater within estuarine deposits (sand, gravel, silt) beneath the Site;
- Bedrock aquifer beneath the Site (a locally important aquifer (LI) – bedrock which is moderately productive only in local zones);
- River Dargle located immediately downgradient of the Site (via. groundwater pathway); and,
- Coastal Waters (Irish Sea) located downgradient / east of the Site (via. groundwater pathway and surface water pathway (i.e. River Dargle).

The focus of this assessment will therefore be on potential groundwater quality and surface water quality impacts associated with the proposed development. A preliminary Hydrogeological Conceptual Site Model (CSM) has been derived for the Site. This model, presented in Figure 7-11, represents the current conceptual understanding of surface water / groundwater processes and interactions in the vicinity of the Site. It should be noted that the cross section in Figure 7-11 is presented for schematic, conceptual purposes only and is not to scale.

Based on relevant IGI guidance (2013) the generic type of geological/hydrogeological environment into which the proposed development will be placed has been determined as *'Type A – Passive geological / hydrogeological environment'*, defined by the IGI as *'areas of thick low permeability subsoil, areas underlain by poor aquifers, recharge areas, historically stable geological environments'*.

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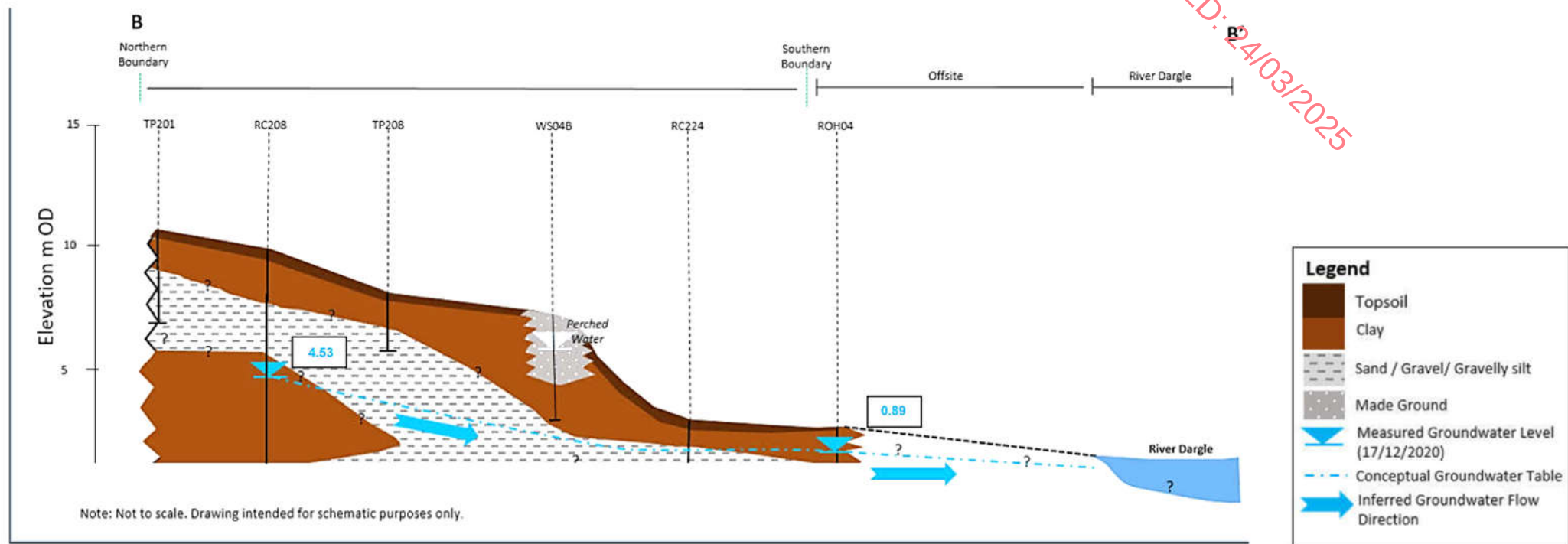


Figure 7-11 - Hydrogeological Conceptual Site Model (Section from North to South) (AtkinsRéalis, 2021)

7.4.2 Characteristics of the Proposed Development

Sea Gardens Phase 2 proposes a mixed-use development comprising 341 residential units (94 houses, 106 duplex units, and 141 apartments located in Blocks E and H). In addition, a 3-5 star hotel is proposed in Block I, a public house in Block E, a childcare facility and a medical centre in Block H, and commercial /retail units distributed in Blocks E, G, H and I. The proposed development will also provide private, communal, and public open spaces, along with car and bicycle parking and all associated development infrastructure.

7.4.2.1 Storm Water Drainage Design

Surface water generated from the proposed residential development will be conveyed through a proposed surface water network including SuDS. The surface water from a portion of the proposed development in the northeast, adjacent to Phase 1 of the development (permitted and currently under construction under ABP-314686-21) will be connected to the surface water drainage network of Phase 1 and the remaining will be attenuated on site prior to final discharge at Qbar greenfield run-off rates. The restricted discharge from the proposed site will be conveyed via a new surface water sewer within the site before discharge to the receiving River Dargle with a pump.

The proposed storm drainage network for the development is indicated on the planning drawings submitted as part of this planning application.

SuDS have been incorporated into the drainage design to reduce run-off rates and to improve run-off quality. The SuDS design will include for permeable paving in light traffic areas (parking bays), swales (within Open Space / Park areas adjacent to roads), filter drains (in rear gardens), green roofs (to suitable apartment block), green courtyards (to suitable apartment blocks), green corridors / park areas and tree pits as well as onsite attenuation tank.

The proposed drainage system (maximum sewer size for main drainage: 225mm) has been designed based on 2no. separate catchment areas, summarised as follows: -

- **Southern / Western Catchment:** Storm water from the southern and western portions of the Site will be attenuated via. an onsite attenuation tank system with the flow controlled. An allowable outflow rate of 15l/s has been calculated for this portion of the Site and agreed with WCC drainage department. Based on a maximum discharge rate of 15 l/s, a minimum tank volume of 936.3m³ is required for 1 in 100-year 6-hour storm event including 20% for climate change. Stormwater drainage will flow to the River Dargle.
- **Northern / Eastern Catchment:** Storm water from the northern and eastern portions of the Site will be attenuated via. an underground attenuation system with the flow controlled. Based on a maximum discharge rate of 15l/s, a minimum tank volume of 1,100m³ is required for 1 in 100-year 6-hour storm event including 20% for climate change. Stormwater drainage will flow to the Phase 1 network. Refer to drawing ref: BRA-ATK-02-ZZ-DR-C-90001-90004, submitted as part of the planning application, for details of the proposed attenuation tank.

The concrete underground attenuation tank and pump to manage flows will be located within the central park area in the main Southern / Western catchment. The tank will allow for storm water attenuation underground for storm events up to 1 in 100-year events. Due to the location of the tank within an existing flood zone, the tank and access chambers / manholes will be sealed to ensure the attenuation volume is available during storm events if flooding of the area was to occur, this approach has been agreed in discussions with WCC. The concrete tank will not allow for infiltration to ground. A pump will be used on the proposed site allow for storm water control and reduce peak runoff.

Storm water runoff from the site will be treated through the use of a Bypass Interceptor prior to discharge to the receiving watercourse.

7.4.2.2 SuDs Measures

The SuDS techniques proposed within the development are outlined below (refer also to the Stormwater Impact Assessment Report (AtkinsRéalis, 2025) submitted with this planning application):

- Swales are to be used within the site as conveyance systems for surface water runoff from sections of road, footpaths or shared surfaces. Discharge into the swale will be via drop kerbs / side inlet gully's or over edge flows.

- Permeable paving will be used in light traffic areas to the front of residential units. The permeable paving will allow for attenuation, infiltration to ground, reduction of peak flow rates and improved water quality. Roof run-off from the front roof area of residential housing units will discharge directly into the subbase below each permeable paving area allowing for reduced runoff from these roof areas.
- Extensive green roof will be provided on suitable buildings in accordance with WCC Development Plan, 2022 – 2028 Appendix 1 Section 1.2 Climate action. The green roofs / courtyards will provide reduced peak flow rates, attenuation, evaporation and improved water quality.
- Concrete underground attenuation tank will be used within the central park area in the catchment. The tank will allow for storm water attenuation underground for storm events up to 1 in 100-year events. Due to the location of the tank within an existing flood zone, the tank and access chambers / manholes will be sealed to ensure the attenuation volume is available during storm events if flooding of the area was to occur, this approach has been agreed in discussions with WCC. The concrete tank will not allow for infiltration to ground.
- Filter drains within rear gardens of the housing units will allow for infiltration to ground, reduced peak flow rates and improved water quality. Only roof run-off from the rear roof of the residential unit will discharge into the filter drain. The filter drain will allow for infiltration to ground and reduce the overall site runoff.
- A pump will be used on the proposed site allow for storm water control and reduce peak runoff.

The SuDs drainage design allows for opportunities for using runoff rainfall where it falls which will ultimately allow for greatly reduced surface water outfall to the River Dargle whilst also providing for watering of extensive areas of soft landscaping. The drainage design also includes for underground attenuation systems and flow controls to slow and manage surface water drainage before final outfall to the River Dargle (Southern / Western Catchment) which will ensure there is protection to the natural flow regimes of the watercourse, and to the existing Phase 1 foul network (Northern / Eastern Catchment).

7.4.2.3 Watermain Design

Proposed watermain services including firewater requirements for the development will be provided. The peak daily domestic water demand (including potable use) for the proposed development is calculated to be 3.71 l/s. UÉ has confirmed that the existing water network has sufficient capacity to meet these peak operational water requirements

A full set of all proposed watermain service drawings are submitted as part of this planning application. Refer to the Engineering Planning Report prepared by AtkinsRéalis (2025) (document ref.: 0088726DG0005), also submitted as part of this planning application.

7.4.2.4 Foul Drainage Design

The foul main from the Sea Garden Phase 2 will flow from north to south catered by a proposed 225mm and 300mm pipes discharging into the existing 900mm diameter foul main along the River Dargle which finally discharges towards the Bray pumping station. Apart from the rest of Sea Gardens Phase 2, Block E, located at the eastern end of the site will have a single point connection to the existing foul main south of the block.

An existing foul line running along the eastern end of the site is being diverted through a proposed 225mm diameter pipe which will connect to the existing 525mm pipe at the south. At the southeast end of the site, two of the existing foul mains, 525mm and 900mm diameter, will be diverted through the new path proposed around Block G which will then both connect and discharge to a single outfall at the existing 900mm diameter pipe.

Each property will have a separate wastewater connection in accordance with UÉ requirements

UÉ has confirmed that the existing foul network has sufficient capacity to meet the wastewater discharge volumes of ca. 275,100 l/d from the proposed development, once operational. A full set of all proposed drainage design drawings are submitted as part of this planning application. Refer also to the Engineering Planning Report prepared by AtkinsRéalis (2025) (document ref.: 0088726DG0005), submitted as part of this planning application. All foul

drainage related works will be carried out in consultation with UÉ and in accordance with all relevant Irish Water guidelines and any site-specific additional requirements.

7.5 Potential Impacts on Water

7.5.1 Demolition & Construction Phase

There is a potential for degradation in groundwater and surface water quality resulting from potential pollution caused by demolition and construction activities e.g. plant, fuel/ chemical spillage etc., particularly during excavations for the proposed residential units, foul services, storm water drainage system, watermain services, attenuation tank, and internal roads and during piling (as required). The maximum anticipated depth of onsite excavation will be approximately 5mbgl. The maximum anticipated depth of piling will be ca. 25m. During the construction phase of the proposed development, the following potential impacts on surface water or groundwater quality could occur: -

- Given the existing ground conditions, particularly adjacent to the River Dargle, ground improvement works are required to facilitate the construction stage of the proposed development. The preliminary ground improvement strategy for the proposed development is described in detail in Chapter 6 – Land, Soils and Geology. The proposed ground improvement works include the installation of vertical drains beneath the footprint of proposed building structures (houses and apartments), followed by the placement of reusable surcharge fill. Combined with the surcharged fill, the drains will ensure the settlement associated with the fill dissipates during the construction period and reduces the geotechnical risks under the structural footprint. These works could pose a potential pollution risk as follows;
 - Water generation and management of same during the ground improvement works. However, any water (within the saturated subsoils and peat) displaced by the works will drain to ground slowly, no significant volumes of water will be generated, and water management and disposal is not usually required based on the proposed approach.
- Accidental spillages or leaks onsite in the vicinity of exposed groundwater / surface water pose a potential pollution risk as follows;
 - Groundwater levels beneath the proposed development lands range from approximately 1.35mbgl (BH307) along the southern site boundary, to 2.45mbgl (BH308) in the northern portion of the Site. Perched water levels (WS06B, WS07B, and WS08B) beneath the proposed development lands ranged from 1.10 mbgl (0.67mOD) to 2.10 mbgl (1.81mOD). Therefore, perched water / shallow groundwater is likely to be encountered during any excavation works within the shallow estuarine deposits, specifically in the lower lying central and southern portions of the Site, and also during piling works. The shallow water table beneath the Site, particularly in any areas where it is intercepted, would be highly vulnerable to water quality impacts through accidental spillages or leaks of oils, fuels, paints or chemicals. This could result in likely moderate adverse temporary impacts directly to the quality of groundwater receptors (i.e. shallow groundwater zone, and bedrock aquifer), and likely slight adverse temporary impacts indirectly (via. groundwater migration) to the quality of surface water receptors (i.e. River Dargle), and also to receiving coastal waters (i.e. Irish Sea).
- General Site activities during the construction phase associated with cement handling and pouring, pose a potential pollution risk as follows;
 - Such general site activities could result in likely slight adverse temporary impacts (via. groundwater pathways) directly to groundwater quality beneath the Site (i.e. shallow groundwater zone, and bedrock aquifer) and indirectly to surface water quality in the River Dargle, or coastal water quality in the Irish Sea.
- Inadequate soil / storm water management during the demolition and construction phase, poses a risk of excess loadings of suspended solids to the River Dargle. This could result in likely moderate adverse temporary impacts directly to surface water quality in the River Dargle, or coastal water quality in the Irish Sea.

- Temporary dewatering will likely be required during excavation in the central and southern portions of the Site (where shallow groundwater levels are likely); this may result in excess loadings of suspended solids to a temporary discharge point (presumed to be a temporary onsite soakaway). This could result in likely temporary slight adverse impacts directly to groundwater quality beneath the Site (i.e. shallow groundwater zone, and bedrock aquifer), but would not impact surface water quality in the River Dargle, or coastal water quality in the Irish Sea.
- The installation of the surface water drainage outfall on the River Dangle's flood defence wall / promenade could pose a potential pollution risk with respect to adverse water quality impacts (which could affect the aquatic environment).
- Temporary onsite groundwater and gas monitoring wells could provide a conduit for potential contamination of soils and bedrock through Site construction activity; in particular the risk of spillages and leakage of any fuel oils and paint. This could result in moderate adverse impacts on groundwater quality beneath the Site (i.e. shallow groundwater zone, and bedrock aquifer); however, any impacts are considered to be short-term and localised.
- Existing subsurface contaminants could pose a potential pollution risk. However, based on the results of the ground investigation and site-specific soils, perched water and groundwater analytical data discussed in detail within this chapter and Chapter 6 – Land, Soils and Geology, the potential for groundwater impacts via excavation and piling, and subsequent mobilisation of any existing subsurface contaminants is negligible. The existing underground Irish Water foul storage tank currently located onsite is critical to Irish Water foul / waste water operations in the town of Bray, and as such all required protection measures will be put in place for the full duration of the construction phase to ensure the onsite holding tank is secure during the works. No groundwater or surface water impacts are expected as a result of current or historic land-use either at the Site or within adjacent lands.

Mitigation measures will be implemented during the construction phase to further reduce these potential impacts, and to address any potential water management issues; these are listed below in Section 7.6.

7.5.2 Operational Phase

During the operational phase of the development, the following potential impacts on surface water or groundwater quality could occur:-

- Groundwater and surface water receptors (i.e. shallow groundwater zone, bedrock aquifer, and the River Dargle) could be at risk from occasional fuel / oil leaks along the access roads and paved areas. However given that the volumes arising from any such spills / leaks are likely to be very minor and taking account of the localised nature of such events, along with the fact that the Site is underlain by low permeability clay / estuarine silts, the potential risk to the shallow groundwater zone, and underlying bedrock aquifer is negligible, and does not warrant further consideration. The drainage design includes for underground attenuation to slow and manage surface water drainage before final outfall to the River Dargle which will ensure there is protection to the natural flow regimes of the watercourse. Taking account of likely dilution effects the potential risk to the River Dargle is negligible and does not warrant further consideration.
- Identified groundwater and surface water receptors could be at risk of quality impacts in the unlikely scenario of an unplanned event (traffic collision, emergency onsite fuel / oil spill, fire water arising from a property fire). The risk of such an event occurring is low given that the majority of traffic into and within the proposed development will be local residents / site users, and the proposed development will be designed, constructed and maintained in accordance with all relevant statutory building and fire safety requirements. Given the fact that the Site is underlain by low permeability clay / estuarine silts, and taking account of the proposed surface water drainage design, potential adverse impacts to groundwater or surface water receptors (i.e. shallow groundwater zone, bedrock aquifer, and the River Dargle) are negligible, and unlikely to occur, and do not warrant further consideration.
- Groundwater and surface water receptors are at risk of becoming contaminated through routine Site maintenance activity during the operational phase. Maintenance of the residential units, commercial/ retail units, open space / amenity areas, hotel, car parking areas, access roads and paved areas, utilities, foul, watermain and storm water drainage system, and attenuation tanks may result in small quantities of lubricant oils, fuel and chemicals being

brought to the Site. In the highly unlikely event of a spill this could result in slight adverse impacts directly to the quality of groundwater receptors, and (via. groundwater migration) to the surface water quality of the River Dargle. Mitigation measures will be implemented during the operational phase to avoid these potential impacts.

7.6 Mitigation Measures

The mitigation factors and measures for the control of pollution and protection of surface water and groundwater quality are described below.

7.6.1 Demolition & Construction Phase

With regard to groundwater and surface water quality impacts the following mitigation measures are proposed. The Contractor will be responsible for ensuring these measures are fully implemented:

- In advance of commencement of the Construction Stage, all onsite monitoring wells (as identified in the Ground Investigation Report (IGSL, 2024) presented in Appendix 6.1 will be fully decommissioned by an experienced borehole specialist in accordance with relevant guidelines, 'Good practice for decommissioning redundant boreholes and wells' (UK Environment Agency, 2012; SEPA, 2003);
- An Outline Construction 'Surface Water Management Plan' will be prepared by the Contractor. The plan will set out clear guidelines and mitigation measures to ensure that surface water quality and quantity is managed throughout the construction stage to prevent impacts on the River Dargle. This should include details on project phasing. A meeting with Inland Fisheries Ireland (IFI), the Project Team and the Contractor should be specified in the document. The meeting should take place before commencement on site.
- The construction management of the Site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guidelines C750 (2016) 'Control of Water Pollution from Construction Sites' and 'Groundwater control - design and practice' and C811 (2023) 'Environmental Good Practice on Site' to minimise as far as possible the risk of pollution.
- All of the mitigation measures (for the protection of soils and geology) listed in Chapter 6 will be implemented onsite during the construction phase.
- Any groundwater temporarily dewatered during the excavation works for the proposed attenuation tanks, services and utilities, and roadways, and during piling (as required), will be treated via. the installation of a temporary in-situ water treatment system;
 - This system should be designed and sized to ensure that all pumped groundwater water is treated via. a temporary attenuation pond, prior to discharge to a selected onsite location (via. a temporary soakaway).
 - The Contractor will be required to provide a Site-specific dewatering plan, clearly setting out proposed excavation methodology, estimated dewatering rates, details of proposed treatment system, and discharge location.
- The Contractor will be responsible for ensuring that the existing drainage network, specifically along the existing road, and as required elsewhere across the site, will be suitably protected (via. the use of physical barriers and / or the implementation a Site-specific water run-off management plan as required). As outlined within Chapter 5 – Biodiversity, the specific construction methodology for the installation of the surface water drainage outfall on the River Dangle's flood defence wall / promenade will include the following measures to ensure there are no adverse water quality impacts which could affect the aquatic environment:-
 - The installation of the surface water drainage outfall pipe on the man-made northern bank of the River Dargle will follow the same construction methodology as was utilised during the Phase 1 Coastal Quarter Development for outfall pipe installation.
 - The flood defence / sea defence wall directly alongside the river channel will remain entirely in situ and intact whilst the promenade path and subbase materials on the landside / northside of the flood defence wall are being excavated to create a pipeline route. There will be no excavation or breaking up of the flood defence wall itself.

- A working platform using scaffolding framework (or similar) shall be hung / suspended from flood defence wall on the river channel side to create a works area for core drilling through the flood defence wall. The scaffolding framework shall be covered to prevent rainfall ingress and dust and debris egress from the working platform area. The working platform will be hung / suspended above water level.
 - The flood defence wall will be core drilled (225mm diameter) from the working platform, i.e. drilling direction will be towards landside, so that no drilled materials fall into the river channel.
 - Following completion of the core drilling, the outfall pipe will be installed through the hole and grouted followed by bolting on the non-return valve.
 - No excavations within or above the river channel will be permitted.
 - No mechanical equipment bar the core drill shall be used above the river channel.
 - No cement or viscous substances, bar grouting material, shall be used above the river channel.
- In order to prevent any potential surface water / groundwater impacts via. release of hydrocarbon / chemical contaminants the following standard measures will be implemented:
 - Fuels, lubricants and hydraulic fluids for equipment used on the construction Site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice;
 - Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling;
- A response procedure will be put in place to deal with any accidental pollution events. Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of in accordance with all relevant waste management legislation;
 - All Site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area.
 - Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-Site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the Site. This will minimise the risk of groundwater becoming contaminated through Site activity.
 - All oil stored on Site for construction vehicles will be kept in a locked and bunded area;
 - Generators, pumps and similar plant will be placed on drip-trays to prevent contamination;
 - All Site vehicles used will be refuelled in bunded areas;
 - All temporary construction fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. Relevant Material Safety Data Sheets along with oil absorbent materials will be kept on Site in close proximity to any fuel storage tanks or bowsers during proposed Site development works; and,
 - All fuel / oil deliveries to on-Site oil storage tanks will be supervised, and records will be kept of delivery dates and volumes.
- In order to prevent any potential surface water / groundwater impacts via. release of cementitious materials the following measures will be implemented where poured concrete is being used on Site;
 - The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out on Site and therefore these aspects will not pose a risk to the waterbodies present, namely any temporarily exposed groundwater, the River Dargle or the Irish Sea;
 - Shutters will be designed to prevent failure. Grout loss will be prevented from shuttered pours by ensuring that all joints between panels achieve a close fit or that they are sealed;
 - Any spillages will be cleaned up and disposed of correctly;
 - Where concrete is to be placed by means of a skip, the opening gate of the delivery chute will be securely fastened to prevent accidental opening;
 - Where possible, concrete skips, pumps and machine buckets will be prevented from slewing over water when placing concrete;

- Mixer washings and excess concrete will not be discharged directly into the drainage network, or any drainage ditches, surface water bodies or exposed groundwater; and,
- Surplus concrete will be returned to batch plant after completion of a pour.
- Foul drainage from Site offices and Site compounds will be directed to the existing wastewater network or will be contained and disposed of off-site in an appropriate manner and in accordance with the relevant statutory regulations.
- No fuels, chemicals, oils or hazardous materials shall be stored within any lower lying portions of the site, specifically along the south, due to potential flood risk. Any such hazardous materials must be stored in identified compound areas within the site boundary.

The above mitigation measures will form part of the Outline Construction Environmental Management Plan (CEMP) submitted as part of this planning application, and which will be further developed by the Contractor within the project-specific Detailed CEMP which will be in operation during the construction phase.

7.6.2 Operational Phase

With regard to groundwater and surface water quality impacts the following mitigation measures are proposed;

- All of the mitigation measures (for the protection of soils and geology) listed in Chapter 6 will be implemented onsite during the Detailed Design Stage and Construction Stage (specifically the installation of an appropriate ground gas membrane beneath Block H. The Contractor, in consultation with the Client and the design team, will be responsible for ensuring that these measures are fully implemented.
- All plant and equipment utilised onsite during maintenance works should be checked and in good working condition. Any equipment not meeting the required standard will not be permitted for use within the Site. Relevant maintenance contractors will be responsible for ensuring that these measures are fully implemented;
- Any minor volumes of fuel, oil or chemicals required during routine maintenance works will be brought to and from Site by the maintenance contractor. While temporarily onsite all chemicals will be kept in secure and bunded areas, with relevant Material Safety Data Sheets available onsite. Any fuel / oil tanks temporarily stored on Site will be located in a suitably bunded area and all tanks will be double skinned, with oil / chemical absorbent materials held onsite in close proximity to the tanks. Relevant maintenance contractors will be responsible for ensuring that these measures are fully implemented;
- In the unlikely event of a fuel / oil or chemical spill / leak during routine maintenance works, emergency spill response measures will be implemented with the aim of limiting the volume spilled and recovering as much of the lost product as possible (relevant maintenance contractors will be responsible for ensuring that these measures are fully implemented); and,
- A maintenance programme for the proposed surface water drainage system should be implemented, as recommended in the Stormwater Impact Assessment Report (AtkinsRéalis, 2025) (Doc. Ref: 0088726DG0007) submitted as part of this planning application. The Contractor, in consultation with the Client and the design team, will be responsible for ensuring that these measures are fully implemented.

7.7 Monitoring Requirements

7.7.1 Demolition & Construction Phase

A maintenance programme for the proposed surface water drainage system should be implemented, as recommended in the Stormwater Impact Assessment Report (AtkinsRéalis, 2025) (document. ref.: 0088726DG0007) submitted as part of this planning application, which states '*Regular checks and maintenance of the SuDS systems is required and have been considered as part of the overall drainage design for the proposed development. This will ensure both the design life of the SuDS systems, ongoing improved water quality, reduced water runoff and reduce the risk of onsite flooding and exceedance flows.*'

A comprehensive monitoring and supervisory regime including monitoring of all excavations and stability assessments as required will be put in place to ensure that the proposed construction works do not constitute a risk to the stability of the Site.

7.7.2 Operational Phase

A maintenance programme for the proposed surface water drainage system should be implemented, as recommended in the Stormwater Impact Assessment Report (AtkinsRéalis, 2025) (document ref.: 0088726DG0007) submitted as part of this planning application, which states '*Regular checks and maintenance of the SuDS systems is required and have been considered as part of the overall drainage design for the proposed development. This will ensure both the design life of the SuDS systems, ongoing improved water quality, reduced water runoff and reduce the risk of onsite flooding and exceedance flows.*'.

7.8 Residual Impacts

The development as proposed will not result in an adverse impact to the existing hydrological regime of the area. The proposed development comprises of 'highly and less vulnerable development', and partially lies within Flood Zone A. Both the Development Plan and Development Management Justification Tests are passed. The FRA prepared to support this Phase 2 planning application demonstrates that the risks relating to flooding can be managed and mitigated to acceptable levels and therefore comply with DoEHLG / OPW and Dublin City Council planning guidance and the Wicklow County Council Development Plan 2022-2028 objective CPO 14.09 (ARUP, 2025)

Taking account of the relevant mitigation measures, the residual impact to groundwater quality and surface water quality including receiving coastal waters (Irish Sea), resulting from potential pollution caused by Site activities (plant, fuel/ chemical spillage etc.) or associated with cement handling and pouring during the demolition and construction phase is slight adverse and short-term. The residual impact to surface water quality, including receiving coastal waters (Irish Sea), resulting from excess loadings of suspended solids, via. inadequate onsite soil / storm water management, during the construction phase is slight adverse and short-term, taking account of the relevant mitigation measures. Any dewatering as required in the central and southern portions of the Site during the construction phase, will be temporary and will pass through a temporary onsite attenuation pond prior to discharge to ground; therefore, dewatering will have no residual adverse impact on groundwater quality or surface including receiving coastal waters (Irish Sea). In summary, anticipated residual adverse impacts on surface water or groundwater will be short-term and slight adverse during the Demolition and Construction Phase of the proposed development, given the mitigation measures proposed.

Taking account of the relevant mitigation measures, the residual impact to groundwater quality and surface water quality including receiving coastal waters (Irish Sea), resulting from occasional / routine Site maintenance works during the Operational Phase is slight adverse, temporary and is unlikely to occur. The residual impact to groundwater quality and surface water quality including receiving coastal waters (Irish Sea) resulting from occasional fuel / oil leaks along the access roads and paved areas during the operational phase is also slight adverse and temporary, taking account of the relevant mitigation measures. The residual impact to groundwater and surface water quality including receiving coastal waters (Irish Sea), resulting from unplanned events during the operational phase (traffic collision, emergency onsite fuel / oil spill, or fire water arising from a property fire), taking account of the relevant mitigation measures, is slight adverse, temporary, and unlikely to occur. In summary, anticipated residual adverse impacts on surface water or groundwater will be temporary and slight adverse, given the mitigation measures proposed during the Operational Phase of the proposed development.

On a regional scale, the proposed development will not affect the current 'Good' surface water quality status of both the Rathmicheal Stream and the River Dargle, and will not affect the current 'High' coastal water quality status of the Irish Sea, east of the proposed development, as required under the European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (as amended 2012-2025). Similarly, the proposed development will

not affect the current 'Good' groundwater quality status of the Wicklow Groundwater Body as required under the European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended 2016 - 2022.

Therefore, taking account of proposed mitigation measures, **no significant adverse effects** are anticipated to occur with respect to the receiving water environment arising from the proposed development during the construction or operational phases. **No significant adverse cumulative effects** are anticipated to occur with respect to the receiving water environment.

7.9 'Do Nothing Scenario'

If the proposed residential development is not undertaken the baseline water environment would remain unchanged. The 'do-nothing' scenario would result in neutral impacts with regards to hydrology and hydrogeology.

7.10 Reinstatement

All temporary construction compounds and Site entrances are to be removed upon completion of the construction phase. Such areas are to be reinstated in accordance with the landscape site layout plan and engineer's drawings. All construction waste and / or scrapped building materials are to be removed from Site on completion of the construction phase. Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from Site and disposed of at an appropriately licenced waste facility.

8. Air Quality

8.1 Introduction

This chapter assesses the likely air quality impacts associated with the proposed development located in Bray, Co. Wicklow. A full description of the development is available in Chapter 2 – Project Description.

This chapter was completed by Ciara Nolan. Ciara is a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. She holds a BSc in Energy Systems Engineering from University College Dublin and has also completed an MSc in Applied Environmental Science at UCD. She is a Member of the Institute of Air Quality Management (MIAQM) and the Institution of Environmental Sciences (MIEnvSc). She has 8 years of experience in undertaking air quality and climate assessments. She has prepared air quality and climate impact assessments as part of EIARs for residential developments including Woodbrook, Shankill (Planning Application Ref. ABP30584419), Ballygossan Park, Skerries (Planning Application Ref. LRD0010/S3), SHD Ratoath (Planning Application Ref. SH305196), SHD Rathmullen, Drogheda (Planning Application Ref. SH305552), commercial and industrial developments by Dublin Airport Authority, Abbvie, Mountpark, Pfizer, Takeda, as well as renewable energy developments such as Crockahenny Windfarm, Upperchurch Windfarm, Knocknamona Windfarm and Keerglen Windfarm. She also specialises in conducting air dispersion modelling assessments of emissions from data centres, energy centres and the chemical industry as part of EPA Industrial Emissions Licences for Echelon DC, AWS, Takea, MSD and Regeneron. She has undertaken air quality and climate impact assessments for transportation schemes, primarily regional and national road schemes, from constraints, through to route selection and EIAR stage.

8.2 Methodology

8.2.1 Criteria for Rating of Impacts

8.2.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland are set out in Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe. This Directive sets out new air quality standards for pollutants to be reached by 2030 which are more closely aligned with the World Health Organisation (WHO) air quality guidelines.

Prior to 2030 the air quality standards set out in EU Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe are still applicable.

The Air Quality Standards Regulations 2022 (S.I. 739 of 2022) transposed EU Directive 2008/50/EC. With the adoption of Directive (EU) 2024/2881, Ireland must transpose this Directive into national law (i.e. update the Air Quality Standards Regulations) before October 2026.

The ambient air quality standards applicable for nitrogen dioxide (NO₂) and particulate matter (as PM₁₀ and PM_{2.5}) are outlined in Table 8-1. The limit values set out in Directive (EU) 2024/2881 will need to be achieved by 2030, with the

limit values set out in the Air Quality Standards Regulations 2022 (and future updated regulations) applicable until 2030.

Table 8-1 - Air Quality Limit Values

Pollutant	2008/50/EC Limit Type	2008/50/EC Limit Value (applicable until 2030)	Directive (EU) 2024/2881 Limit Type	Directive (EU) 2024/2881 Limit Value (to be attained by 2030)
Nitrogen Dioxide (NO ₂)	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m ³	Hourly limit for protection of human health - not to be exceeded more than 3 times/year	200 µg/m ³
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	50 µg/m ³
	Annual limit for protection of human health	40 µg/m ³	Annual limit for protection of human health	20 µg/m ³
Particulate Matter (as PM ₁₀)	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m ³	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	45 µg/m ³
	Annual limit for protection of human health	40 µg/m ³	Annual limit for protection of human health	20 µg/m ³
Particulate Matter (as PM _{2.5})	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	25 µg/m ³
	Annual limit for protection of human health	25 µg/m ³	Annual limit for protection of human health	10 µg/m ³

8.2.1.2 WHO Air Quality Guidelines & Clean Air Strategy

In April 2023, the Government of Ireland published the Clean Air Strategy for Ireland (Government of Ireland 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target 3 (IT3) by 2026 (shown in Table 8-2), the IT4 targets by 2030 and the final targets by 2040 (shown in Table 8-2). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final PM_{2.5} target of 5 µg/m³. The strategy also acknowledges that “*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both PM_{2.5} and NO₂*”.

Annex II of Directive (EU) 2024/2881 gives assessment thresholds which align with the clean air strategy final 2040 WHO targets. Directive (EU) 2024/2881 states that “*Member States shall endeavour to achieve and preserve the best ambient air quality and a high level of protection of human health and the environment, with the aim of achieving a zero-pollution objective as referred to in Article 1(1), in line with WHO recommendations, and below the assessment thresholds laid down in Annex II.*”

These assessment thresholds relate to monitoring of ambient air quality by Member States, where “*exceedances of the assessment thresholds specified in Annex II shall be determined on the basis of concentrations during the previous 5 years where sufficient data are available. An assessment threshold shall be deemed to have been exceeded if it has been exceeded during at least 3 separate years out of those previous 5 years.*”

Table 8-2 - WHO Air Quality Guidelines 2021

Pollutant	Limit Type	IT3 (2026)	IT4 (2030)	Final (2040)	Target
NO ₂	24-hour limit for protection of human health	-	-	25 µg/m ³	
	Annual limit for protection of human health	20 µg/m ³	-	10 µg/m ³	
PM (as PM ₁₀)	24-hour limit for protection of human health	75 µg/m ³	50 µg/m ³	45 µg/m ³	
	Annual limit for protection of human health	30 µg/m ³	20 µg/m ³	15 µg/m ³	
PM (as PM _{2.5})	24-hour limit for protection of human health	37.5 µg/m ³	25 µg/m ³	15 µg/m ³	
	Annual limit for protection of human health	15 µg/m ³	10 µg/m ³	5 µg/m ³	

The applicable air quality limit values for the purposes of this assessment are those set out in Table 8-1. The limit values stipulated under Directive 2008/50/EC and the Air Quality Standards Regulations 2022 are applicable for the construction phase and opening year 2029 for the proposed development. The limit values stipulated by Directive (EU) 2024/2881 are applicable for the design year 2044 for the proposed development.

8.2.1.3 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust that are less than 10 microns (PM₁₀) and less than 2.5 microns (PM_{2.5}). The EU ambient air quality standards outlined in Table 8-1 have set ambient air quality limit values for PM₁₀ and PM_{2.5}.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/m²/day averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled ‘Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006). The document recommends that the TA-Luft limit of 350 mg/m²/day be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed development.

8.2.1.4 Air Quality & Traffic Significance Criteria

The Transport Infrastructure Ireland (TII) guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022) details a methodology for determining air quality impact significance criteria for

road schemes which can be applied to any project that causes a change in traffic. The degree of impact is determined based on the percentage change in pollutant concentrations relative to the Do-Nothing scenario. The TII significance criteria are outlined in Table 4.9 of *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022) and reproduced in Table 8-3 below. These criteria have been adopted for the proposed development to predict the impact of NO₂, PM₁₀ and PM_{2.5} emissions as a result of the proposed development.

Table 8-3 - Air Quality & Traffic Significance Criteria

Long term average concentration at receptor assessment year	% Change in concentration relative to Air Quality Limit Value (AQLV)			
	1%	2-5%	6-10%	>10%
75% or less of AQLV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQLV	Neutral	Slight	Moderate	Moderate
95 – 102% of AQLV	Slight	Moderate	Moderate	Substantial
103 – 109% of AQLV	Moderate	Moderate	Substantial	Substantial
110% or more of AQLV	Moderate	Substantial	Substantial	Substantial

Source: TII (2022) *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106*

As per Table 8-3 a neutral effect is one where a change in concentration at a receptor is:

- 5% or less where the opening year, without the proposed development, annual mean concentration is 75% or less of the standard; or
- 1% or less where the opening year, without the proposed development, annual mean concentration is 94% or less of the standard.

Where an effect does not meet the criteria for neutral, as described above, the effect can either be positive or negative. The TII guidance (2022) states that *“the evaluation of significance of effects for the operational phase should be undertaken for the opening year only as the design year is likely to show lower total pollutant concentrations and changes in concentration”* (TII 2022).

Non-significant effects (i.e. of local importance only) are ‘neutral’ or ‘slight’ changes in concentrations while significant effects can be changes in pollutant concentrations that are either ‘moderate’ or ‘substantial’ however, the TII guidance (2022) states that these must be considered in the context of the project and ‘moderate’ or ‘substantial’ increases are not necessarily always significant effects.

The impact descriptors in Table 8-3 are used to describe the impact at each modelled receptor location, and the significance of the impacts is then determined, aligning with the terminology in the EPA guidelines (EPA 2022). Whilst it may be determined that there are ‘slight’, ‘moderate’ or ‘substantial’ impacts at one or more receptors, an overall judgement should be made of whether the proposed development is ‘significant’ or ‘not significant’ in terms of air quality. Factors to consider when determining the overall significance of a proposed development are provided in Table 4.10 of the TII guidance (TII 2022).

8.2.2 Construction Phase

8.2.2.1 Construction Dust Assessment

The Institute of Air Quality Management in the UK (IAQM) guidance document *‘Guidance on the Assessment of Dust from Demolition and Construction’* (2024) outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely

risk of dust impacts in the absence of mitigation measures and to determine the level of site-specific mitigation required. The use of UK guidance is recommended by Transport Infrastructure Ireland in their guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022).

The major dust generating activities are divided into four types within the IAQM guidance (2024) to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (transport of dust and dirt from the construction site onto the public road network).

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. The criteria for determining the category for the works involved are outlined in Table 8-4, these are based on the IAQM guidance (2024). The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site-specific mitigation to be determined.

Table 8-4 - IAQM Criteria to Determine Dust Emissions Magnitude

Dust Emission Magnitude		
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 <6 m above ground demolition during wetter months	total building volume 12,000 - 75,000 m ³ potentially dusty construction material demolition activities 6 – 12 m above ground level	total building volume >75,000 m ³ potentially dusty construction material (e.g. concrete) on-site crushing and screening demolition activities >12 m above ground level
Earthworks		
total site area <18,000 m ² soil type with large grain size (e.g. sand) <5 heavy earth moving vehicles active at any one time formation of bunds <3 m in height earthworks during wetter months	total site area 18,000 m ² - 110,000 m ² moderately dusty soil type (e.g. silt) 5 – 10 heavy earth moving vehicles active at any one time formation of bunds 3 – 6 m in height	total site area >110,000 m ² potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) >10 heavy earth moving vehicles active at any one time formation of bunds >6 m in height
Construction		
total building volume <12,000 m ³ construction material with low potential for dust release (e.g. metal cladding or timber)	total building volume 12,000 - 75,000 m ³ potentially dusty construction material (e.g. concrete) on-site concrete batching	total building volume >75,000 m ³ on-site concrete batching sandblasting
Trackout (truck movements)		

Dust Emission Magnitude		
Small	Medium	Large
<20 HDV (>3.5 t) outward movements in any one day surface material with low potential for dust release unpaved road length <50 m	20 – 50 HDV (>3.5 t) outward movements in any one day moderately dusty surface material (e.g. high clay content) unpaved road length 50 – 100 m	>50 HDV (>3.5 t) outward movements in any one day potentially dusty surface material (e.g. high clay content) unpaved road length >100 m

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling, human health and ecological effects. The level of risk associated with each activity is determined using the criteria in Table 8-5.

Table 8-5 - IAQM Criteria to Determine Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

8.2.2.2 Construction Phase Traffic Assessment

Construction phase traffic also has the potential to impact air quality. The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022), states that road links meeting one or more of the following criteria can be defined as being ‘affected’ by a proposed development and should be included in the local air quality assessment. While the guidance is specific to infrastructure projects, the approach can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5m or greater.

AtkinsRéalis have prepared a Traffic and Transport Impact Assessment for the proposed development enclosed separately and have prepared Chapter 12: Traffic of this EIAR. As per Chapter 12, it has been determined by AtkinsRéalis that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT, or that the development will not result in speed changes or changes in road alignment. Therefore, the traffic does not meet the above scoping criteria. A detailed air quality assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality with respect with human or ecological receptors.

8.2.3 Operational Phase

8.2.3.1 Operational Phase Traffic Assessment

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the proposed development. The TII scoping criteria detailed in Section 8.2.2.2 were used to determine if any road links are affected by the proposed development and require inclusion in a detailed air dispersion modelling assessment. AtkinsRéalis have prepared a Traffic and Transport Impact Assessment for the proposed development enclosed separately and have prepared Chapter 12: Traffic. The traffic assessment has included traffic associated with the wider masterplan development for the site as well as other specific cumulative developments, as required. This ensures the full cumulative impact is assessed. It has been determined by AtkinsRéalis that the proposed development will result in the operational phase traffic increasing by more than 1,000 AADT on a number of road links. Therefore, in accordance with the TII scoping criteria a detailed air dispersion modelling assessment of operational phase traffic emissions was conducted.

The impact of traffic emissions on air quality is assessed for both human and ecological receptors within 200 m of impacted roads as per the TII PE-ENV-01106 guidance (TII, 2022). There are no sensitive ecological sites within 200 m of any of the identified impacted roads and therefore an assessment of air quality impacts to ecology from traffic emissions is not required. The following sections describe the methodology for the assessment.

The impact to air quality as a result of changes in traffic is assessed at sensitive human receptors in the vicinity of affected roads. These are discussed in further detail within Section 8.3.3 and shown graphically in Figure 8-3.

The TII guidance (2022) states that modelling should be conducted for NO₂, PM₁₀ and PM_{2.5} for the Base, Opening and Design Years for both the Do Minimum (Do Nothing) and Do Something scenarios. Modelling of operational NO₂, PM₁₀ and PM_{2.5} concentrations has been conducted for the Do Nothing and Do Something scenarios using the TII Road Emissions Model (REM) online calculator tool (TII, 2024).

The following inputs are required for the REM tool: receptor locations, light duty vehicle (LDV) annual average daily traffic movements (AADT), annual average daily heavy-duty vehicles (HDV AADT), annual average traffic speeds, road link lengths, road type, project county location and pollutant background concentrations. The *Default* fleet mix option was selected along with the *Intermediate Case* fleet data base selection, as per TII Guidance (TII, 2024). The *Intermediate Case* assumes a linear interpolation between the *Business as Usual* case – where current trends in vehicle ownership continue and the *Climate Action Plan (CAP)* case – where adoption of low emission light duty vehicles occurs.

Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the identified sensitive receptors using generic meteorological data. The TII REM uses county-based Irish fleet

composition for different road types, for different European emission standards from pre-Euro to Euro 6/VI with scaling factors to reflect improvements in fuel quality, retrofitting, and technology conversions. The TII REM also includes emission factors for PM₁₀ emissions associated with brake and tyre wear (TII, 2024). The predicted road contributions are then added to the existing background concentrations to give the predicted ambient concentrations. The ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards.

8.2.3.1.1 Traffic Data used in Modelling Assessment

Traffic flow information is detailed in Table 8-6 as obtained from AtkinsRéalis for the purposes of this assessment. Data for the Base Year 2023 and the Do Nothing and Do Something scenarios for the Opening Year 2029 and Design Year 2044 were provided. The traffic data included traffic associated with the additional phases of the development including the permitted Phase 1 (Planning Ref: SH202206) and potential Phase 3 (see Chapter 12 for further details).

The modelling assessment has been undertaken for road links that were within 200 m of receptors. Background concentrations have been included as per Section 8.3.2 of this chapter based on available EPA background monitoring data (EPA, 2024).

Table 8-6 - Traffic Data used in Operational Phase Air Quality Assessment

Road Name	Speed (kph)	Base Year	Opening Year				Design Year			
			Do Nothing		Do Something		Do Nothing		Do Something	
			LDV (HDV AADT)	AADT	LDV (HDV AADT)	AADT	LDV (HDV AADT)	AADT	LDV (HDV AADT)	AADT
Harbour Road	42.2	92 (65)	451	(338)	1563	(1170)	106	(94)	1136	(1008)
Proposed Access	42.2	1200 (0)	1659	(0)	2875	(0)	1537	(0)	2753	(0)
School Access	30	3648 (0)	4251	(0)	5467	(0)	4673	(0)	5889	(0)

8.3 Receiving Environment

8.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2021). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM₁₀, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than PM_{2.5}) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles (PM_{2.5} - PM₁₀) will actually increase at higher wind speeds. Thus, measured levels of PM₁₀ will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport meteorological station, which is located approximately 25 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 8-1). For data collated during

five representative years (2020 - 2024), the predominant wind direction is westerly to south-westerly with a mean wind speed of 5.4 m/s over the 30-year period of 1991 - 2020 (Met Éireann, 2024).

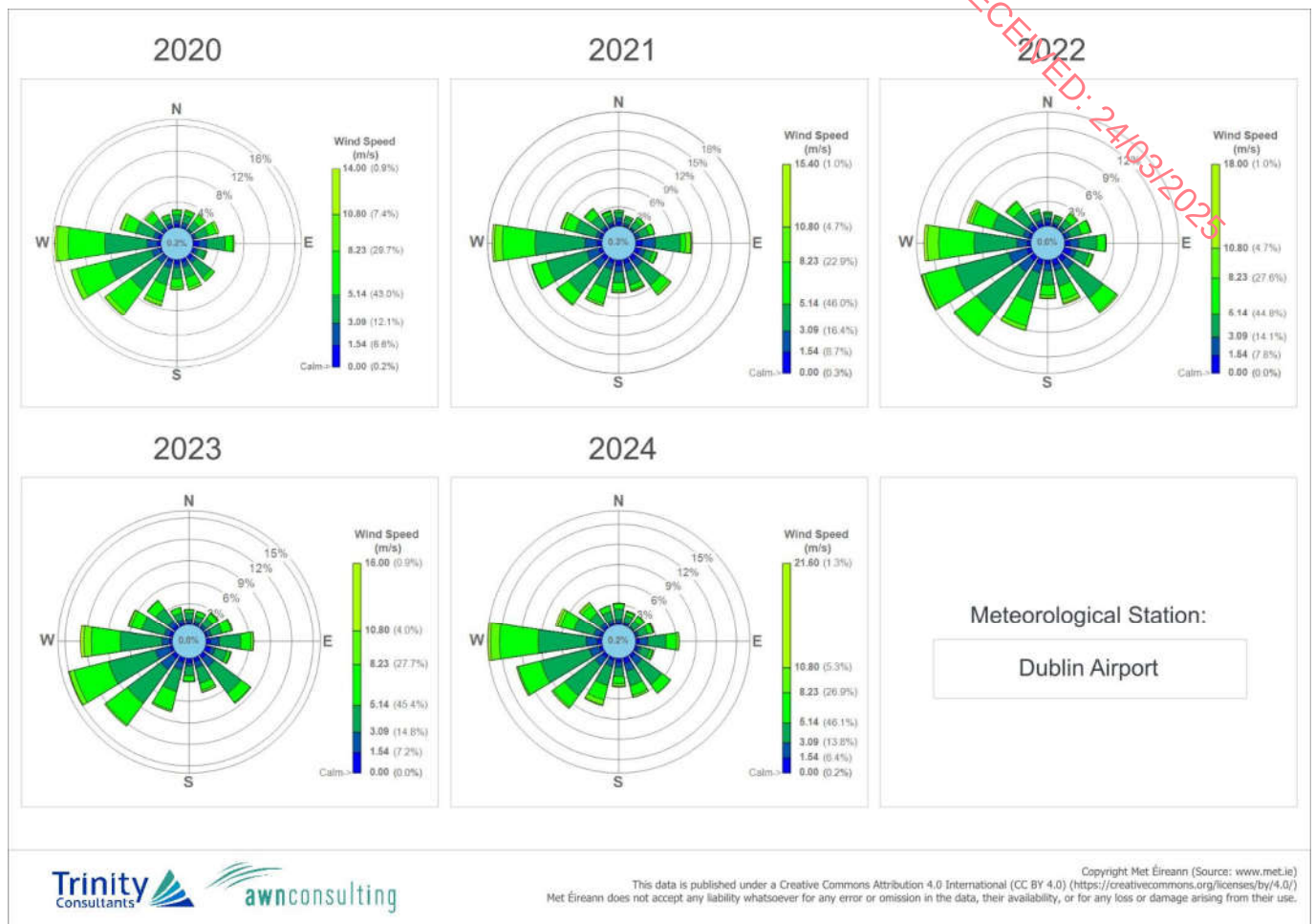


Figure 8-1 - Wind Roses for Dublin Airport Meteorological Station

8.3.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA. The most recent annual report on air quality in Ireland is “Air Quality In Ireland 2023” (EPA, 2024). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments.

As part of the implementation of the Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022) four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2024). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development site is within Zone C, however the site also borders Zone A (EPA, 2024) and this has been taken into account when estimating the background concentrations in the area. The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

8.3.2.1 NO₂

Long-term NO₂ monitoring was carried out at the representative Zone C suburban background locations of Dundalk, Kilkenny and Portlaoise for the period 2019 – 2023 (see Table 8-7) (EPA, 2024). Long term average concentrations are significantly below the annual average limit of 40 µg/m³. Average results range from 4 – 12 µg/m³ for the suburban background locations. Additionally, there were no exceedances of the hourly limit value of 200 µg/m³. As the proposed development is also located in close proximity to Zone A, data from the suburban background monitoring station in Dún Laoghaire, which is located c.8.5 km north of the proposed development, was reviewed. Over the period 2019 – 2023 annual mean NO₂ concentrations in Dún Laoghaire ranged from 13 - 16 µg/m³. The 5-year average annual mean NO₂ concentration for the Zone C locations is 8 µg/m³. Based on the above information an estimate of the current background NO₂ concentration for the region of the proposed development is 8 µg/m³.

Table 8-7 - Trends In Zone C Air Quality - Nitrogen Dioxide (NO₂)

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
Dundalk	Annual Mean NO ₂ (µg/m ³)	12	10	11	10	9
	1-hr Mean NO ₂ values >200 µg/m ³	-	1	0	1	1
Kilkenny Seville Lodge	Annual Mean NO ₂ (µg/m ³)	5	4	4	5	4
	1-hr Mean NO ₂ values >200 µg/m ³	-	0	0	0	0
Portlaoise	Annual Mean NO ₂ (µg/m ³)	11	8	8	9	8
	1-hr Mean NO ₂ values >200 µg/m ³	-	0	0	0	0
Dún Laoghaire (Zone A)	Annual Mean NO ₂ (µg/m ³)	15	13	16	16	13
	1-hr Mean > 200 µg/m ³ (days)	0	0	0	0	0

8.3.2.2 PM₁₀

Continuous PM₁₀ monitoring was carried out at a number of representative Zone C suburban background locations from 2019 – 2023; Athlone, Carlow, Dundalk, Ennis, Galway, Kilkenny, Portlaoise, and Bray. Annual average PM₁₀ concentrations across the sites ranged from 10 – 16 µg/m³ over the 2019 – 2023 period (see Table 8-8). There were at most 21 exceedances (in Ennis in 2022) of the daily limit of 50 µg/m³ (35 exceedances are permitted per year) (EPA, 2024). Additionally, data for the representative monitoring station in Dún Laoghaire over the 2019 – 2023 period indicates that annual mean PM₁₀ concentrations ranged from 11 – 12 µg/m³. The 5-year average annual mean PM₁₀ concentration for the Zone C sites is 14 µg/m³. Based on the EPA data, a conservative estimate of the current background PM₁₀ concentration in the region of the proposed development is 14 µg/m³.

Table 8-8 - Trends In Zone C Air Quality - PM₁₀

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
Athlone	Annual Mean PM ₁₀ (µg/m ³)	17	16	12	12	12
	24-hr Mean > 50 µg/m ³ (days)	-	3	2	3	-
Carlow Town	Annual Mean PM ₁₀ (µg/m ³)	11	11	10	11	10
	24-hr Mean > 50 µg/m ³ (days)	-	1	0	0	-
Dundalk	Annual Mean PM ₁₀ (µg/m ³)	14	13	12	12	13

		24-hr Mean > 50 µg/m ³ (days)	2	2	0	2	-
Ennis		Annual Mean PM ₁₀ (µg/m ³)	18	20	19	20	16
		24-hr Mean > 50 µg/m ³ (days)	12	19	17	21	-
Galway Rahoon		Annual Mean PM ₁₀ (µg/m ³)	13	13	11	13	13
		24-hr Mean > 50 µg/m ³ (days)	0	1	1	0	-
Kilkenny Seville Lodge		Annual Mean PM ₁₀ (µg/m ³)	18	18	17	18	14
		24-hr Mean > 50 µg/m ³ (days)	7	1	2	2	-
Portlaoise		Annual Mean PM ₁₀ (µg/m ³)	15	12	11	12	11
		24-hr Mean > 50 µg/m ³ (days)	0	0	1	0	-
Bray		Annual Mean PM ₁₀ (µg/m ³)	-	-	-	10	11
		24-hr Mean > 50 µg/m ³ (days)	-	-	-	0	-
Dún Laoghaire (Zone A)		Annual Mean PM ₁₀ (µg/m ³)	12	12	11	12	12
		24-hr Mean > 50 µg/m ³ (days)	2	0	0	1	0

8.3.2.3 PM_{2.5}

Monitoring for PM_{2.5} has taken place in Bray over the period 2019 – 2023 and is considered the most representative site for the proposed development. Average PM_{2.5} levels in Bray over the period 2019 - 2023 ranged from 5 - 7 µg/m³ (EPA, 2024). The overall annual average concentration for this 5-year period is 6 µg/m³. Based on this information, an estimate of the background PM_{2.5} concentration in the region of the proposed development is 7 µg/m³.

8.3.2.4 Summary

Based on the above information the air quality in the suburban Zone C locations is generally good, with concentrations of the key pollutants generally well below the relevant limit values set out in Directive 2008/50/EC. The current pollutant concentrations at the majority of monitoring sites are also in compliance with the 2030 limit values set out in Directive (EU) 2024/2881. However, further measures will be needed at a National scale to reduce air pollution in future years. The EPA have indicated that road transport emissions are contributing to increased levels of NO₂ with the potential for breaches in the annual NO₂ limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM₁₀ and PM_{2.5}). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2024).

The current estimated background concentrations have been used in the operational phase air quality assessment for both the Opening and Design Year as a conservative approach to predict future pollutant concentrations. This is in line with the TII methodology (TII, 2022).

8.3.3 Sensitive Receptors

8.3.3.1 Construction Phase

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) prior to assessing the impact of dust from a proposed development, the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places

of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are approximately 23 no. high sensitivity residential properties and a school within 20 m of the proposed development planning boundary (see Figure 8-2). Based on these receptor numbers and using the IAQM criteria in Table 8-9, the sensitivity of the area to dust soiling impacts from the proposed development is high.

Table 8-9 - Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<250
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

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM₁₀ concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works.

A conservative estimate of the current annual mean PM₁₀ concentration in the vicinity of the proposed development is 14 µg/m³. There are 23 no. high sensitivity residential receptor and a school within 20 m of the proposed development planning application boundary (see Figure 8-2). Based on the IAQM criteria outlined in Table 8-10 the worst-case sensitivity of the area to dust-related human health effects is low.

Table 8-10 - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)			
			<20	<50	<100	<250
High	< 24 µg/m ³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	< 24 µg/m ³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 µg/m ³	>1	Low	Low	Low	Low

The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to dust-related ecological impacts. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability of the plant, as well as other effects. The guidance states that dust impacts to vegetation can occur up to 50 m from the site, and 50 m from site access roads, up to 250 m for the site entrance. The sensitivity of the area is determined based on the distance to the source, the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present. There are no sensitive ecological receptors that meet

these criteria within the study area and therefore there is no potential for impacts to sensitive ecology from construction dust emissions and no further assessment is required.

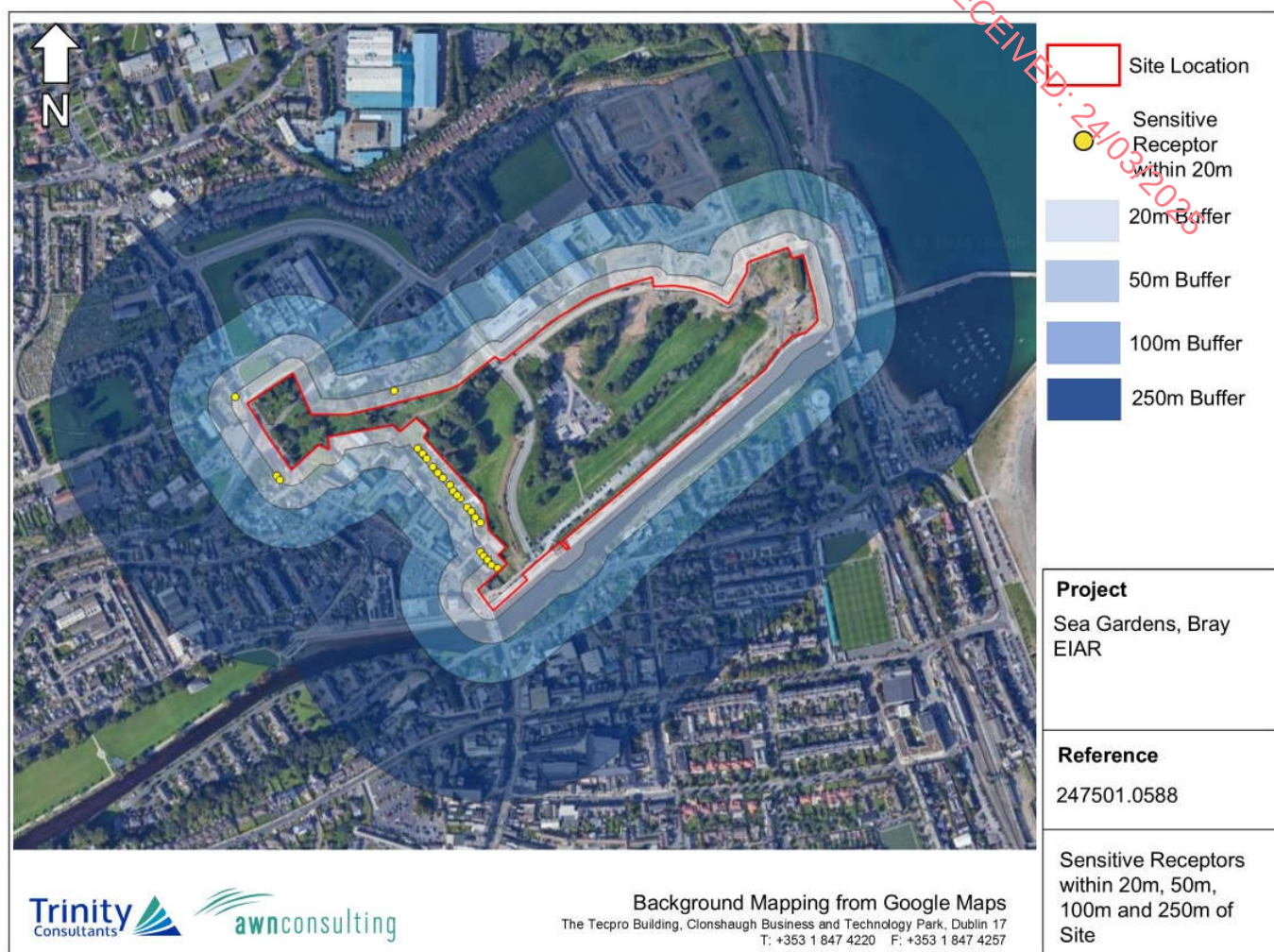


Figure 8-2 - Sensitive Receptors within 20m, 50m, 100m and 250m of Site

8.3.3.2 Operational Phase

The impact to air quality due to changes in traffic is assessed at sensitive receptors in the vicinity of affected roads. The TII guidance (2022) states that a proportionate number of representative receptors, which are located in areas which will experience the highest concentrations or greatest improvements because of the proposed development, are to be included in the modelling. The TII criteria state that receptors within 200 m of impacted road links should be assessed; roads which are greater than 200 m from receptors will not impact pollutant concentrations at that receptor (TII, 2022). The TII guidance (2022) defines sensitive receptor locations for the purposes of modelling annual mean pollutant concentrations as: residential housing, schools, hospitals, care homes and short term-accommodation such as hotels, i.e. locations where members of the public are likely to be regularly present for 24 hours. A total of 1 no. high sensitivity residential receptor (R1) and 3 no. schools (R2 – R4) were included in the modelling assessment (see Figure 8-3).

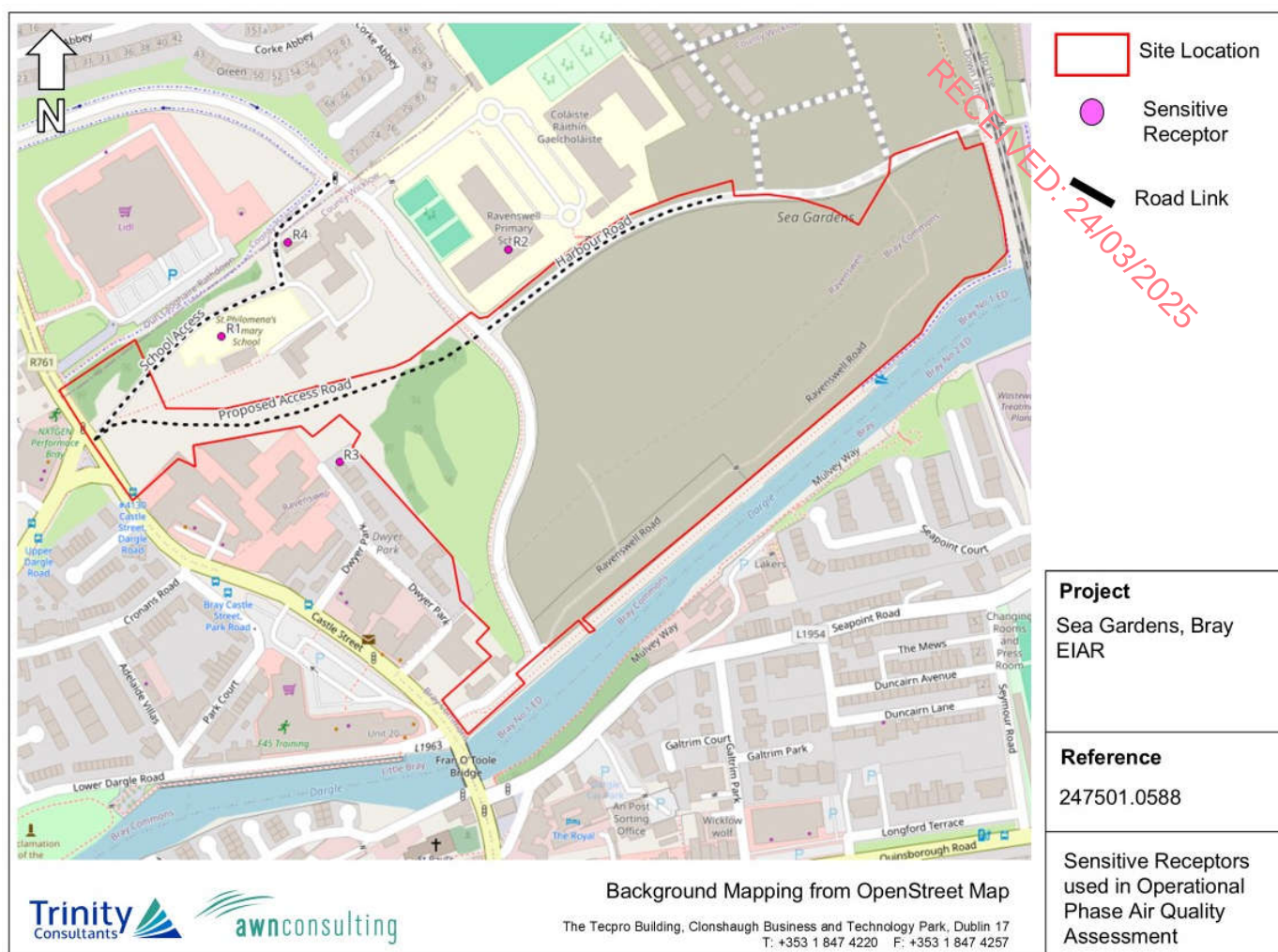


Figure 8-3 - Sensitive Receptors Included in Operational Phase Air Quality Modelling Assessment

8.4 Potential Impacts on Air Quality during Construction Phase

8.4.1 Construction Dust Assessment

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 250m of a construction site, the majority of the deposition occurs within the first 50 m (IAQM, 2024). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Dublin Airport meteorological data indicates that the prevailing wind direction is south-westerly and wind speeds are generally moderate in nature (see Section 8.3.1). In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30 year average data for Dublin Airport meteorological station indicates that on average 200 days per year have rainfall over 0.2 mm (Met Eireann, 2024) and therefore it can be determined that 54% of the time dust generation will be reduced due to natural meteorological conditions.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously

established sensitivity of the area (see Section 8.3.3.1). The major dust generating activities are divided into four types within the IAQM (2024) guidance to reflect their different potential impacts. These are: demolition, earthworks, construction and trackout (movement of heavy vehicles).

8.4.1.1 Determining the Potential Dust Emission Magnitude

The magnitude of the works under each category can be classified as either small, medium or large depending on the scale of the works involved. The magnitude of each activity has been determined below for the proposed development using the criteria in Table 8-4.

- Demolition: There are no significant demolition activities associated with the proposed development. Approximately 600 m3 of buildings will be demolished however, this is considered imperceptible in relation to potential dust generation. However, in order to be conservative the 'small' dust emission magnitude category (Table 8-4) has been assigned to the works to ensure all potential impacts are captured.
- Earthworks: The dust emission magnitude for the proposed earthwork activities can be classified as medium as the total site area is between 18,000 – 110,000 m2.
- Construction: The dust emission magnitude for the proposed construction activities can be classified as large as a worst-case as the total volume of buildings to be constructed will be greater than 75,000 m3.
- Trackout: The dust emission magnitude for the proposed trackout can be classified as small, as there will be at most 20 outward HGV movements per day during the construction phase of the proposed development.

8.4.1.2 Determining the Risk of Dust Impacts

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling and dust-related human health effects (see Section 8.3.3.1). The level of risk associated with each activity is determined using the criteria in Table 8-5.

8.4.1.2.1 Demolition

The sensitivity of the area, as determined in Section 8.3.3.1, is combined with the small dust emission magnitude for the demolition works and the overall risk of impacts is shown in Table 8-11. As the overall sensitivity of the area to dust soiling is high, when combined with a small dust emission magnitude, this produces an overall medium risk of dust impacts (as per the criteria in Table 8-5). As the overall sensitivity of the area to dust-related human health effects is low, this results in a negligible risk of dust-related human health effects (as per the criteria in Table 8-5).

Table 8-11 - Risk of Dust Impacts – Demolition

Receptor	Receptor Sensitivity	Dust Magnitude Construction	Emission – Risk of Dust-Related Impacts
Dust Soiling	High	Small	Medium Risk
Human Health	Low		Negligible Risk

8.4.1.2.2 Earthworks

The sensitivity of the area, as determined in Section 8.3.3.1, is combined with the large dust emission magnitude and the overall risk of impacts is shown in Table 8-12. As the overall sensitivity of the area to dust soiling is high, when combined with a medium dust emission magnitude, this produces an overall medium risk of dust soiling impacts (as per the criteria in Table 8-5). As the overall sensitivity of the area to dust-related human health effects is low, this results in a low risk of dust-related human health effects (as per the criteria in Table 8-5).

Table 8-12 - Risk of Dust Impacts – Earthworks

Receptor	Receptor Sensitivity	Dust Magnitude – Earthworks	Emission	Risk of Dust-Related Impacts
Dust Soiling	High	Medium		Medium Risk
Human Health	Low			Low Risk

8.4.1.2.3 Construction

The overall risk of dust impacts from the construction works is shown in Table 8-13 for each category. Combining the large dust emissions magnitude for the construction activities with the high sensitivity to dust soiling results in a high risk of dust soiling impacts using the criteria in Table 8-5. There is an overall low risk of dust-related human health impacts as a result of the proposed construction activities.

Table 8-13 - Risk of Dust Impacts – Construction

Receptor	Receptor Sensitivity	Dust Magnitude Construction	Emission	Risk of Dust-Related Impacts
Dust Soiling	High	Large		High Risk
Human Health	Low			Low Risk

8.4.1.2.4 Trackout

The overall risk of dust impacts from the trackout works is shown in Table 8-14 for each category. Combining the small dust emissions magnitude for the trackout activities with the high sensitivity to dust soiling results in a low risk of dust impacts using the criteria in Table 8-5. There is an overall negligible risk of dust-related human health impacts as a result of the proposed trackout activities.

Table 8-14 - Risk of Dust Impacts – Trackout

Receptor	Receptor Sensitivity	Dust Magnitude – Trackout	Emission	Risk of Dust-Related Impacts
Dust Soiling	High	Small		Low Risk
Human Health	Low			Negligible Risk

8.4.1.2.5 Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 8-15 for each activity. The magnitude of risk determined is used to prescribe the level of site-specific mitigation required for each activity to prevent significant impacts occurring.

There is at most a high risk of dust soiling impacts and a low risk of dust-related human health impacts associated with the proposed works. As a result, best practice dust mitigation measures associated with high-risk works will be implemented to ensure there are no significant impacts at nearby sensitive receptors. In the absence of mitigation, dust impacts are predicted to be direct, short-term, negative and slight.

Table 8-15 - Summary of construction phase dust impact risk used to define site-specific mitigation

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

8.4.2 Construction Stage Traffic Assessment

There is also the potential for traffic emissions to impact air quality with respect to human health and ecology in the short-term over the construction phase, particularly, due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the TII assessment criteria in Section 8.2.2.2.

It can therefore be determined that the construction stage traffic will have an imperceptible, neutral, short-term and not significant impact on air quality.

8.5 Potential Impacts on Air Quality during Operational Phase

8.5.1 Operational Phase Traffic Assessment

The potential impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. The traffic data includes the Do Nothing and Do Something scenarios. The impact of NO₂, PM₁₀ and PM_{2.5} emissions for the Opening Year 2029 and Design Year 2044 was predicted at the nearest sensitive receptors to the impacted road links. This assessment allows the significance of the development, with respect to both relative and absolute impacts, to be determined.

The TII guidance PE-ENV-01106 (TII, 2022a) details a methodology for determining air quality impact significance criteria for TII road schemes and infrastructure projects. However, this significance criteria can be applied to any development that causes a change in traffic. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, to determine the degree of impact.

Traffic related air emissions have the potential to impact air quality which can affect human health. The following details the results of the air dispersion modelling assessment of traffic emissions to determine the impact to human health. The predicted pollutant concentrations have been compared against the ambient air quality limit values set out in Table 8-1. The limit values set out in Directive 2008/50/EC and the Ambient Air Quality Standards Regulations 2022 are applicable to the Opening Year 2029. The limit values set out under Directive (EU) 2024/2881 are applicable to the Design Year 2044.

8.5.1.1 NO₂

The results of the NO₂ modelling are shown in Table 8-16. In the Opening Year 2029, predicted annual mean concentrations of NO₂ are in compliance with the annual mean limit value of 40 µg/m³ set out under Directive 2008/50/EC, reaching at most 24% of the limit. In addition, the TII guidance (2022a) states that the hourly limit value for NO₂ of 200 µg/m³ is unlikely to be exceeded at roadside locations unless the annual mean is above 60 µg/m³. As predicted NO₂ concentrations are significantly below 60 µg/m³ (Table 8-16), it can be concluded that the short-term NO₂ limit value will be complied with at all receptor locations. Some increases in NO₂ concentrations are predicted at

the worst-case receptors assessed in the Opening Year when compared with the Do Nothing scenario (see Table 8-16). Concentrations are predicted to increase by at most 0.4 µg/m³ at receptor R1. When comparing the change in concentration with the air quality limit value, it results in a maximum change of 1.0% at receptor R1. All other receptors will experience similar or lesser impacts and all increases are considered 'neutral' as per the TII criteria in Table 8-3.

In the Design Year 2044, predicted annual mean NO₂ concentrations are in compliance of the limit value of 20 µg/m³ set out under Directive (EU) 2024/2881, at all receptors assessed, reaching at most 45% of the limit. The proposed development will result in some 'neutral' increases in NO₂ concentrations according to the TII significance criteria in Table 8-3, with concentrations increasing by at most 0.23 µg/m³ as a result of the proposed development (at receptor R1, see Table 8-16), which is an increase of 1.15% when compared with the applicable annual mean limit value for NO₂.

Table 8-16 - Predicted Annual Mean NO2 Concentrations (µg/m3)

Receptor	Impact Opening Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	
R1	9.2	23%	9.6	24%	0.40	1.00%	Neutral
R2	8.1	20%	8.5	21%	0.32	0.80%	Neutral
R3	8.1	20%	8.2	21%	0.09	0.23%	Neutral
R4	9.0	23%	9.3	23%	0.28	0.70%	Neutral
Receptor	Impact Design Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	
R1	8.8	44%	9.0	45%	0.23	1.15%	Neutral
R2	8.0	40%	8.2	41%	0.22	1.10%	Neutral
R3	8.1	40%	8.1	41%	0.06	0.30%	Neutral
R4	8.6	43%	8.8	44%	0.17	0.85%	Neutral

8.5.1.2 PM₁₀

The results of the PM₁₀ modelling can be seen in Table 8-17 for the Opening Year 2029 and Design Year 2044.

In the Opening Year 2029, annual mean PM₁₀ concentrations are in compliance with the annual mean limit value of 40 µg/m³ set out under Directive 2008/50/EC reaching at most 39% of the limit. In the Design Year 2044 annual mean PM₁₀ concentrations are also in compliance with the annual mean limit value of 20 µg/m³ set out under Directive (EU) 2024/2881 reaching at most 78% of the limit. In addition, the proposed development will not result in any days of exceedance of the daily PM₁₀ limit value (Table 8-1) in both the opening and design years.

The changes in PM₁₀ concentrations as a result of the proposed development can be assessed relative to the 'Do Nothing' (DN) levels. In the Opening Year 2029 annual PM₁₀ concentrations will increase by at most 0.52 µg/m³ at receptor R2, this is a 1.33% increase when compared with the annual mean limit value of 40 µg/m³. All other receptors will experience similar or lesser impacts and all increases are considered 'neutral' as per the TII criteria in Table 8-3.

In the Design Year 2044 the proposed development will result in a maximum increase of 0.54 µg/m³ at receptor R2, which is a 2.7% increase when compared with the annual mean limit of 20 µg/m³. The changes in concentrations in the Design Year are considered 'neutral' to 'slight adverse' based on the TII criteria in Table 8-3.

Table 8-17 - Predicted Annual Mean PM10 Concentrations (µg/m3)

Receptor	Impact Opening Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	
R1	15.2	38%	15.6	39%	0.40	1.00%	Neutral
R2	14.2	36%	14.7	37%	0.52	1.30%	Neutral
R3	14.1	35%	14.2	36%	0.10	0.25%	Neutral
R4	15.0	37%	15.3	38%	0.28	0.70%	Neutral
Receptor	Impact Design Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	
R1	15.3	76%	15.6	78%	0.39	1.95%	Slight Adverse
R2	14.1	70%	14.6	73%	0.54	2.70%	Neutral
R3	14.1	71%	14.2	71%	0.10	0.50%	Neutral
R4	15.1	75%	15.3	77%	0.27	1.35%	Neutral

8.5.1.3 PM_{2.5}

In relation to changes in PM_{2.5} concentrations as a result of the proposed development, the results of the assessment can be seen in Table 8-18 for the modelled Opening Year 2029 and Design Year 2044.

In the Opening Year 2029, predicted annual mean concentrations of PM_{2.5} are in compliance with the annual mean limit value of 25 µg/m³ set out under Directive 2008/50/EC reaching at most 31% of the limit. There are predicted to be some increases in PM_{2.5} concentrations at the worst-case receptors assessed in the Opening Year when compared with the Do-Nothing scenario (see Table 8-18). Concentrations are predicted to increase by at most 0.29 µg/m³ at receptor R2. When comparing the change in concentration with the air quality limit value, it results in a maximum change of 1.16% at receptor R2. All other receptors will experience similar or lesser impacts and all increases are considered 'neutral' as per the TII criteria in Table 8-3.

In the Design Year 2044, predicted annual mean PM_{2.5} concentrations are in compliance with the limit value of 10 µg/m³ set out under Directive (EU) 2024/2881 at all receptors assessed. Concentrations reach at most 79% of the annual mean limit value. The proposed development will result in some 'neutral' to 'slight adverse' increases in PM_{2.5} concentrations according to the TII significance criteria in Table 8-3, with concentrations increasing by at most 0.29 µg/m³ as a result of the proposed development (at receptor R2, see Table 8-18), which is an increase of 2.9% when compared with the annual mean limit value of 10 µg/m³ for PM_{2.5}.

Table 8-18 - Predicted Annual Mean PM2.5 Concentrations (µg/m3)

Receptor	Impact Opening Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	
R1	7.7	31%	7.9	31%	0.22	0.88%	Neutral
R2	7.1	28%	7.4	30%	0.29	1.16%	Neutral
R3	7.1	28%	7.1	29%	0.05	0.20%	Neutral
R4	7.5	30%	7.7	31%	0.16	0.64%	Neutral
Receptor	Impact Design Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	

Receptor	Impact Opening Year						Description
	DN	% of AQLV	DS	% of AQLV	DS-DN	% Change of AQLV	
R1	7.7	77%	7.9	79%	0.22	2.20%	Slight Adverse
R2	7.0	70%	7.3	73%	0.29	2.90%	Neutral
R3	7.1	71%	7.1	71%	0.06	0.60%	Neutral
R4	7.6	76%	7.7	77%	0.15	1.50%	Slight Adverse

8.5.1.4 Significance of Predicted Changes in NO₂, PM₁₀ and PM_{2.5} Concentrations

As outlined in Section 8.2.1.4, the TII guidance (2022) states that significance of effects should be assessed based on the opening year only. Non-significant effects are 'neutral' or 'slight' changes in concentrations while significant effects can be changes in pollutant concentrations that are either 'moderate' or 'substantial' however, the TII guidance (2022) states that these must be considered in the context of the project and 'moderate' or 'substantial' increases are not necessarily always significant effects.

In relation to NO₂, PM₁₀ and PM_{2.5} the predicted changes in concentrations range from 'neutral' to 'slight adverse' at the worst-case receptors assessed. Therefore, according to the TII criteria as outlined in Section 8.2.1.4, the impact is not significant.

For the purposes of this assessment it has been assumed that the current estimated background pollutant concentrations are applicable for both the opening and design years, with no decreases in future background concentrations allowed for. There will be some decreases in background concentrations in future years, however at present there is no guidance-based methodology available for estimating future year background concentrations and therefore, as a conservative approach, the current estimated background concentrations have been applied to future years.

Due to the large uncertainty in future improvements in fleet composition and emissions, such as projected changes to vehicle registration and electric vehicle uptake, the future year emission rates utilised by the REM do not account for the full implementation of these measures. Predicted design year concentrations are therefore currently overly conservative as future emissions improvements are not fully taken into account, as well as no improvement in background concentrations being assumed. As a result the opening year predicted concentrations are the most appropriate for determining the significance of effects as per Section 8.2.1.4.

It can be concluded that the impact of traffic emissions on air quality and human health during the operational phase is **long-term, direct, localised, slight**, and overall **not significant** in EIA terms.

The measures set out in the Clean Air Strategy for Ireland (Government of Ireland 2023) aim to work towards solutions to ensure that air pollution concentrations are reduced in order to comply with the future changes in limit values. Ireland will need to continue to implement and develop measures to ensure continuing improvements in air quality in future years in order to meet the objectives of the Clean Air Strategy for Ireland (Government of Ireland, 2023) and to ensure the ambient air quality limit values set out in Directive (EU) 2024/2881 are achieved. The estimated background concentrations used in the assessment are the largest contribution to predicted pollutant concentrations, rather than pollutant contributions associated with the proposed development. Strategies to improve air quality at a national level in future years will contribute to reducing background concentrations and therefore it is envisioned that air quality will improve in the future.

8.6 Do Nothing Scenario

In the Do Nothing Scenario no construction works will take place and the identified impacts of fugitive dust and particulate matter emissions will not occur at the subject site. The air quality baseline will continue to develop in line with current trends.

The Do Nothing scenario associated with the operational phase of the development is assessed within Section 8.6 and it was found to be **direct, long-term, negative** and **slight** which is overall **not significant**.

8.7 Mitigation Measures

8.7.1 Construction Phase

The proposed development has been assessed as having a high risk of dust soiling impacts and a low risk of dust related human health impacts during the construction phase as a result of earthworks, construction and trackout activities (see Section 8.4.1). Therefore, the following dust mitigation measures shall be implemented during the construction phase of the proposed development. These measures are appropriate for sites with a high risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The mitigation measures draw on best practice guidance from Ireland (DLRCC, 2022; DCC, 2018), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

8.7.1.1 Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses.
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details.

8.7.1.2 Site Management

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension therefore mitigations must be implemented if undertaking dust generating activities during these weather conditions.
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out

8.7.1.3 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.
- 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.

- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.

8.7.1.4 Operating Vehicles / 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 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)

8.7.1.5 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.

8.7.1.6 Waste Management

- Avoid bonfires and burning of waste materials.

8.7.1.7 Measures Specific to Demolition

- Prior to demolition blocks should be soft striped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- During the demolition process, water suppression should be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.

8.7.1.8 Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers 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.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

8.7.1.9 Measures Specific to Construction

- 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.

8.7.1.10 Measures Specific to Trackout

- A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles.
- 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 log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

8.7.1.11 Monitoring

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

8.7.2 Operational Phase

No site-specific mitigation measures are proposed for the operational phase as impacts are predicted to be not significant.

8.8 Residual Impacts

8.8.1 Construction Phase

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared as outlined in Section 8.7.1. Provided the dust minimisation measures are adhered to, the predicted residual air quality impacts during the construction phase are **short-term, direct, negative, localised** and **not significant**.

Best practice mitigation measures are proposed for the construction phase of the proposed development, which will focus on the proactive control of dust and other air pollutants, to minimise generation of emissions at source. The

mitigation measures that will be put in place during construction will ensure that the impact complies with all EU ambient air quality legislative limit values (set out in Directive 2008/50/EC), which are based on the protection of human health (see Table 8-1). Therefore, the predicted residual, dust-related, human health impact of the construction phase of the proposed development is **short-term, direct, negative, localised** and **not significant**.

8.8.2 Operational Phase

Dispersion modelling of traffic emissions at sensitive receptors in proximity to impacted road links during the operational phase indicate pollutant emissions will be in compliance with the TII assessment criteria which is based on the impacts in the opening year. Section 8.5.1 determined that the impact to air quality as a result of increased traffic volumes during the operational phase of the proposed development will be **localised, direct, long-term, negative** and **slight** for the opening year, which is overall **not significant** in EIA terms. However, Ireland will need to develop measures to ensure continuing improvements in air quality in future years in order to meet the objectives of the Clean Air Strategy for Ireland (Government of Ireland, 2023) and to ensure the ambient air quality limit values set out in Directive (EU) 2024/2881 are achieved.

8.9 Monitoring Requirements

8.9.1 Construction Phase

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m²/day during the monitoring period of 30 days (+/- 2 days).

8.9.2 Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality are predicted to be not significant.

8.10 Difficulties encountered during the preparation of this chapter

There were no difficulties encountered when compiling this assessment.

9. Climate Change

9.1 Introduction

This chapter assesses the likely climate impacts associated with the proposed development located in Bray, Co. Wicklow. A full description of the development is available in Chapter 2 – Project Description.

The climate assessment is divided into two distinct sections – a greenhouse gas assessment (GHGA) and a climate change risk assessment (CCRA).

- Greenhouse Gas Emissions Assessment (GHGA) – Quantifies the GHG emissions from a project over its lifetime. The assessment compares these emissions to relevant carbon budgets, targets and policy to contextualise magnitude.
- Climate Change Risk Assessment (CCRA) – Identifies the impact of a changing climate on a project and receiving environment. The assessment considers a projects vulnerability to climate change and identifies adaptation measures to increase project resilience.

This chapter was completed by Ciara Nolan. Ciara is a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting, a Trinity Consultants Company. She holds a BSc in Energy Systems Engineering from University College Dublin and has also completed an MSc in Applied Environmental Science at UCD. She is a Member of the Institute of Air Quality Management (MIAQM) and the Institution of Environmental Sciences (MIEnvSc). She has over 8 years of experience in undertaking air quality and climate assessments. She has prepared air quality and climate impact assessments as part of EIARs for residential developments including Woodbrook, Shankill (Planning Application Ref. ABP30584419), Ballygossan Park, Skerries (Planning Application Ref. LRD0010/S3), SHD Ratoath (Planning Application Ref. SH305196), SHD Rathmullen, Drogheda (Planning Application Ref. SH305552), commercial and industrial developments by Dublin Airport Authority, Abbvie, Mountpark, Pfizer, Takeda, as well as renewable energy developments such as Crockahenny Windfarm, Upperchurch Windfarm, Knocknamona Windfarm and Keerglen Windfarm. She also specialises in conducting air dispersion modelling assessments of emissions from data centres, energy centres and the chemical industry as part of EPA Industrial Emissions Licences for Echelon DC, AWS, Takea, MSD and Regeneron. She has undertaken air quality and climate impact assessments for transportation schemes, primarily regional and national road schemes, from constraints, through to route selection and EIAR stage.

9.2 Methodology

9.2.1 Relevant Guidance, Legislation and Policy

9.2.1.1 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on climate are summarised below. In addition to specific climate guidance documents, the following guidelines were considered and consulted in the preparation of this chapter:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the Environmental Protection Agency (EPA) Guidelines) (EPA, 2022); and
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission, 2017).

The assessment has made reference to national guidelines where available, in addition to international standards and guidelines relating to the assessment of climate impacts. These are summarised below:

- Transport Infrastructure Ireland (TII) PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII, 2022a);
- Transport Infrastructure Ireland (TII) GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII, 2024a);
- Institute of Environmental Management & Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing GHG Emissions and Evaluating their Significance (hereafter referred to as the IEMA 2022 GHG Guidance) (IEMA, 2022);
- IEMA Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (hereafter referred to as the IEMA 2020 EIA Guide) (IEMA, 2020a);
- IEMA GHG Management Hierarchy (hereafter referred to as the IEMA 2020 GHG Management Hierarchy) (IEMA, 2020b);
- IEMA Principles Series: Climate Change Mitigation & EIA (IEMA, 2010);
- Publicly Available Specification (PAS) 2080:2016 on Carbon Management in Infrastructure (BSI, 2016); and
- Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021a).

9.2.1.2 Legislation

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the 2015 Act). The purpose of the 2015 Act was to enable Ireland *‘to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050’* (3.(1) of No. 46 of 2015). This is referred to in the 2015 Act as the ‘national transition objective’. The 2015 Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the 2015 Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a) and a third update in December 2022 (Government of Ireland, 2022) with an Annex of Action published in March 2023. The current Climate Action Plan is CAP24, published in December 2022 (DECC, 2023a).

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (hereafter referred to as the 2021 Climate Act) in March 2021. The Climate Act was signed into Law on the 23rd July 2021, giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act (Government of Ireland, 2021) is to provide for the approval of plans *“for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050”*. The 2021 Climate Act also provides for *“carbon budgets and a decarbonisation target range for certain sectors of the economy”*. The 2021 Climate Act defines the carbon budget as *“the total amount of greenhouse gas emissions that are permitted during the budget period”*.

In relation to carbon budgets, the 2015 Act (as amended) states *‘A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and*

ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')'. The carbon budget is to be produced for 3 sequential budget periods, as shown in Table 9-1. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of GHG emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectoral emission ceilings for 2030 were published in the Climate Action Plan 2024 (CAP24) (DECC, 2023a) and are shown in Table 9-2.

Table 9-1 - 5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2035

Budget Period	Carbon Budget	Reduction Required
2021-2025	295 Mt CO ₂ e	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO ₂ e	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO ₂ e	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 9-2 - Sectoral Emissions Ceilings 2030

Sector	Baseline (MtCO ₂ e)	Carbon (MtCO ₂ e)	Budgets	2030 Emissions (MtCO ₂ e)	Indicative Emissions % Reduction in Final Year of 2025 – 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Electricity	10	40	20	3	75
Transport	12	54	37	6	50
Built Environment – Residential	7	29	23	4	40
Built Environment – Commercial	2	7	5	1	45
Industry	7	30	24	4	35
Agriculture	23	106	96	17.25	25
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Land Use, Land-use Change and Forestry (LULUCF)	5	Reflecting the continued volatility for LULUCF baseline emissions to 2030 and beyond, CAP24 puts in place ambitious activity targets for the sector reflecting an EU-type approach.			
Total	68				
Unallocated Savings	-	-	26	-5.25	-
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	-	295	200	-	51

9.2.1.3 Policy

9.2.1.3.1 Greenhouse Gas Policy

In December 2023 the current Climate Action Plan, CAP24, was published (DECC, 2023a). CAP25 is due to be published in 2025 which will update CAP24. CAP24 builds on the progress of CAP23, which first published carbon budgets and sectoral emissions ceilings, and it aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030 and 2050 net zero goal. The CAP has six vital high impact sectors where the biggest savings can be made. These sectors are renewable energy, energy efficiency of buildings, transport, sustainable farming, sustainable business and change of land-use. CAP24 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP24 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report *Modern Methods of Construction* (Construction Industry Federation, 2021). The IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies to ensure economic growth can continue alongside a reduction in emissions.

In April 2023, the Government published its *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (DECC, 2023b). This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050, achieving the interim targets set out in the Climate Action Plan.

The Wicklow County Council (WCC) Climate Action Plan 2024 – 2029 (WCC, 2024) outlines WCC's goals to mitigate GHG emissions and plans to prepare for and adapt to climate change. The plan includes eight strategic goals which are based on the objectives of the *Delivering Effective Climate Action 2030*. These are:

1. Adopt climate focused governance, provide leadership and build partnerships for climate action.
2. Achieve carbon emissions reduction of 51% and energy efficiency improvement of 50% in our operations by 2030, creating a pathway to net zero by 2050.
3. Deliver on climate adaptation, biodiversity resilience and enhanced capacity for our environment to adapt to changing conditions.
4. Mobilise and empower climate action in local communities.
5. Mobilise climate action in enterprise and agriculture, supporting the transition to an inclusive, net zero and circular economy.
6. Achieve a 'just transition' particularly for communities that may be economically disadvantaged by decarbonising projects or impacted by climate change.
7. Support decarbonisation of transport and modal shift from cars to active travel and public transport.
8. Test the scope and scale of decarbonisation in Arklow with the aim of creating a vibrant town which has low carbon living at its core.

There are five key action areas within the plan: Governance & Leadership, Built Environment & Transport, Natural Environment & Green Infrastructure, Communities: Resilience & Transition, and Sustainability & Resource Management. The plan includes measures for climate action and climate adaptation. The implementation of these measures will enable the WCC area to adapt to climate change and will assist in bringing Ireland closer to achieving its climate related targets in future years. New developments need to be aware of the measures within the Action Plan and incorporate climate friendly designs and measures where possible.

9.2.1.3.2 Climate Change Vulnerability Policy

The second National Adaptation Framework (NAF) (DECC, 2024) was published in June 2024 in line with the five-year requirement of the 2015 Climate and Low Carbon Development Act, as amended. The plan provides a whole of government and society approach to climate adaptation in Ireland to reduce Ireland's vulnerability to climate change

risks including extreme weather events, flooding, drought, loss of biodiversity, sea level rise and increased temperatures. Similar to the “*Just Transition*” when considering carbon emissions, the NAF aims for “*Just Resilience*” stating that:

“A climate resilient Ireland will have a reduced reliance on fossil fuel, it will have widely accessible electrified public transport and will have transitioned towards sustainable agricultural practices such as agroforestry and organic farming.”

In relation to the built environment the NAF states in Chapter 3 “*deepening of adaptation considerations in the planning and building standards processes is considered the most appropriate way of increasing the resilience of the built environment*”. Within the NAF it mentions that there is a risk of damage to buildings and structures from severe weather events such as high winds and intense rainfall. New development should accommodate predicted future climate change impacts without requiring major redesign or redevelopment in the future which may be costly and inefficient. This will require facilitating innovative building design, new materials and standards (to accommodate hotter summers while withstanding changes in precipitation patterns and more intense storms for example) according to the NAF (DECC, 2024).

The National Climate Change Risk Assessment (NCCRA) was published in May 2024 (EPA, 2024a). The NCCRA was required to be developed under Action 457 from the 2021 CAP (Government of Ireland 2021). Action 457 seeks to “*Further develop Ireland’s national climate change risk assessment capacity to identify the priority physical risks of climate change to Ireland*”. The NCCRA uses definitions of the risk determinants from the Intergovernmental Panel on Climate Change (IPCC) Risk Framework (IPCC 2023):

- **Hazard** - the potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources
- **Exposure** - the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected
- **Vulnerability** - the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity
- **Risk** - the potential for adverse consequences for human or ecological systems.

When considering risk, the NCCRA assess exposure and vulnerability for two future climate change scenarios or Representative Concentration Pathways (RCPs):

- RCP4.5 was selected as it represents a scenario aligned with the global temperature trajectory
- RCP8.5 was selected as it represents a high-emissions scenario and achieves the highest level of modelled temperature increases by the end of the century. Consequently, this scenario will result in the highest level of physical risk for Ireland, and therefore the greatest requirement for adaptation.

These scenarios align with a conservative approach to assess risks to Ireland and assumes global emission reduction targets are not met. This aligns with the principle of precaution as stated in the NAF (DECC 2024). In addition to the future climate scenarios, the NCCRA assesses the risk from the future climate during the following timeframes:

- Present (~2030)
- Medium term (~2050)
- Long term (~2100).

9.2.2 Greenhouse Gas Assessment

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions (see Section 9.3.1).

9.2.2.1 Construction Phase

The GHG assessment accounts for various components relating to the project during different life stages to determine the total impact of the development on climate. The reference study period (i.e. the assumed building life expectancy) for the purposes of the assessment is 50 years. Embodied carbon emissions are attributed to four main categories, taken from BS EN 15978. The categories are:

- **Product Stages (Category A1 to A3)** The carbon emissions generated at this stage arise from extracting the raw materials from the ground, their transport to a point of manufacture and then the primary energy used (and the associated carbon impacts that arise) from transforming the raw materials into construction products.
- **Construction (Category A4 to A5)** These carbon impacts arise from transporting the construction products to site, and their subsequent processing and assembly into the building.
- **Use Stage (Category B1 to B7)** This covers a wide range of sources from the GHG emissions associated with the operation of the building (B1), maintenance (B2), repair (B3), refurbishment (B4) and replacement (B5) of materials, and operational energy use (B6) and water use (B7).
- **End of Life Stages (Category C1 to C4)** The eventual deconstruction and disposal of the existing building at the end of its life takes account of the on-site activities of the demolition contractors. No 'credit' is taken for any future carbon benefit associated with the reuse or recycling of a material into new products.

PE-ENV-01104 (TII, 2022a) recommends the calculation of the construction stage embodied carbon using the TII Online Carbon Tool (TII, 2024a). Embodied carbon refers to the sum of the carbon needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site. The purpose of the embodied carbon assessment is to engage the design team in the consideration of embodied carbon at an early stage in the development and mitigate embodied carbon. This engagement aims to ensure carbon savings are made and to assist in aligning the project to Ireland's CAP goal of Net Carbon Zero by 2050.

The TII Online Carbon Tool (TII, 2024a) has been commissioned by TII to assess GHG emissions associated with road or rail projects in Ireland. The TII Carbon Tool (TII, 2024a) uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013), which can be applied to a variety of developments, not just road or rail. The tool aligns with PAS 2080.

The use of the TII Carbon Tool was not considered suitable for the building elements of the proposed development. As the TII Carbon Tool was developed for road and infrastructure projects, the material types within the tool are specific to these types of developments. These material types are not fully appropriate for assessing the embodied carbon associated with the construction of buildings. Therefore, the carbon impact of the buildings was carried out using an alternative tool; the Carbon Designer for Ireland tool.

The Irish Green Building Council in partnership with One Click LCA Ltd. have developed the Carbon Designer for Ireland tool (One Click LCA Ltd., 2023) for use on Irish specific building projects. The Carbon Designer tool is promoted by the EPA and the Land Development Agency. OneClickLCA is certified to EN 15978, ISO 21931 – 1 & ISO 21929, and data requirements of ISO 14040 & EN 15804, and is LEED, BREEAM and PAS 2080 aligned. It allows users to assess the carbon impact of buildings at an early stage using typical default materials and values. Inputs to the tool include the gross floor area and number of stories above ground level along with the building frame type. Once the baseline is established using generic data, the tool allows for optioneering and optimization of the carbon impact. It highlights the key areas within the building with the highest carbon impact and provides options

for lower carbon intensive materials. The Carbon Designer for Ireland tool was completed by AWN Consulting with input from the project architects to assess the GHG impact of the building elements of the proposed development. The TII Carbon Tool was utilised to estimate the GHG emissions associated with the non-building elements of the proposed development including construction activities, construction site electricity use, landscaping and infrastructure elements and construction worker travel to site.

Reasonable conservative estimates have been used in this assessment where necessary to provide an estimate of the GHGs associated with the proposed development.

9.2.2.2 Operational Phase

9.2.2.2.1 Traffic Emissions

Emissions from road traffic associated with the proposed development have the potential to emit carbon dioxide (CO₂) which will impact climate.

The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022b), states that road links meeting one or more of the following criteria can be defined as being ‘affected’ by a proposed development and should be included in the local air quality assessment, and also the climate assessment. While the guidance is specific to infrastructure projects the approach can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5 m or greater.

As per Chapter 8 – Air Quality, there are a number of road links that will experience a change of over 1,000 AADT during the operational phase as a result of the proposed development. As a result a detailed assessment of traffic related carbon dioxide (CO₂) emissions was conducted.

PE-ENV-01104 (TII, 2022a) states that road traffic related emissions information should be obtained from an Air Quality Practitioner (i.e. the air quality EIAR chapter author) to show future user emissions during operation without the development in place. The Air Quality Practitioner calculated the traffic related emissions through the use of the TII REM tool (TII, 2024b) which includes detailed fleet predictions for age, fuel technology, engine size and weight based on available national forecasts. The output is provided in terms of CO₂e for the base year 2023, Opening Year 2029 and Design Year 2044. Both the Do Nothing (i.e. assuming the proposed development is not in place in future years) and Do Something (i.e. assuming the proposed development is constructed) scenarios are quantified in order to determine the degree of change in emissions as a result of the proposed development. Traffic data was obtained from AtkinsRéalis for the purpose of this assessment. Inputs include light duty vehicle (LDV) annual average daily traffic movements (AADT), annual average daily heavy-duty vehicles (HDV AADT), annual average traffic speeds, road link lengths, road type and project county location. The traffic data used in the operational phase modelling assessment is detailed in Table 9-3 and in Chapter 8 – Air Quality.

Table 9-3 - Traffic Data used in Operational Phase GHG Assessment

Road Name	Speed (kph)	Base Year		Opening Year				Design Year			
				Do Nothing		Do Something		Do Nothing		Do Something	
		LDV	AADT	LDV	AADT	LDV	AADT	LDV	AADT	LDV	AADT
		(HDV AADT)		(HDV AADT)		(HDV AADT)		(HDV AADT)		(HDV AADT)	
Harbour Road	42.2	92 (65)		451 (338)		1563 (1170)		106 (94)		1136 (1008)	

Road Name	Speed (kph)	Base Year	Opening Year		Design Year			
			Do Nothing		Do Something		Do Nothing	
			LDV (HDV AADT)	AADT	LDV (HDV AADT)	AADT	LDV (HDV AADT)	AADT
Proposed Access	42.2	1200 (0)	1659 (0)		2875 (0)		1537 (0)	2753 (0)
School Access	30	3648 (0)	4251 (0)		5467 (0)		4673 (0)	5889 (0)

9.2.2.2.2 Operational Phase Energy Use

The EU guidance (European Commission, 2013) also states indirect GHG emissions as a result of a development must be considered, which includes emissions associated with energy usage. A Climate Action and Energy Statement was prepared by Metec Consulting Engineers in relation to the proposed development and is submitted separately with this planning application. The report outlines a number of measures which have been incorporated into the overall design of the development which will have the benefit of reducing the impact to climate where possible during operation.

9.2.2.3 Significance Criteria for GHGA

The Transport Infrastructure Ireland (TII) guidance document entitled *PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document* (TII, 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development.

The significance of GHG effects set out in PE-ENV-01104 (TII, 2022a) is based on IEMA guidance (IEMA, 2022) which is consistent with the terminology contained within Figure 3.4 of the EPA's (2022) 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'.

The 2022 IEMA Guidance (IEMA, 2022) sets out the following principles for significance:

- When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible;
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages; and
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

The criteria for determining the significance of effects are a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors (i.e. Ireland's National GHG targets). In relation to climate, there is no project specific assessment criteria, but the project will be assessed against the recommended TII significance determination. This takes account of any embedded or committed mitigation measures that form part of the design which should be considered.

TII (TII, 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. TII (TII 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. In line with IEMA Guidance (IEMA, 2022), TII state that the crux of assessing significance is "not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050".

Significance is determined using the criteria outlined in Table 9-4 (derived from Table 6.7 of PE-ENV-01104 (TII 2022a)) along with consideration of the following two factors:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

Table 9-4 - Significance Criteria for GHGA

Effects	Significance Level	Description
Significant adverse	Major adverse	The project's GHG impacts are not mitigated. The project has not complied with do-minimum standards set through regulation, nor provided reductions required by local or national policies; and No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	The project's GHG impacts are partially mitigated. The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and Falls short of full contribution to Ireland's trajectory towards net zero.
Not significant	Minor adverse	The project's GHG impacts are mitigated through 'good practice' measures. The project has complied with existing and emerging policy requirements; and Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	The project's GHG impacts are mitigated beyond design standards. The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration. The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

Ireland's carbon budgets can also be used to contextualise the magnitude of GHG emissions from the proposed development (TII, 2022a). The approach is based on comparing the net proposed development GHG emissions to the relevant carbon budgets (DECC, 2023a). With the publication of the Climate Action Act in 2021 and the Climate Action Plan 2024, sectoral carbon budgets have been published for comparison with the net GHG emissions from the proposed development over its lifespan.

9.2.3 Climate Change Risk Assessment

The assessment involves determining the vulnerability of the proposed development to climate change. This involves an analysis of the sensitivity and exposure of the development to climate hazards which together provide a measure of vulnerability.

PE-ENV-01104 (TII, 2022a) states that the CCRA is guided by the principles set out in the overarching best practice guidance documents:

- Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021a); and
- The Institute of Environmental Management and Assessment, Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2nd Edition) (IEMA, 2020).

The baseline environment information provided in Section 9.3, future climate change modelling and input from other experts working on the proposed development (i.e. hydrologists) should be used to assess the likelihood of a climate risk.

First an initial screening CCRA based on the operational phase is carried out, according to the TII guidance PE-ENV-01104. This is carried out by determining the sensitivity of proposed development assets (i.e. receptors) and their exposure to climate change hazards.

The proposed development asset categories must be assigned a level of sensitivity to climate hazards. PE-ENV-01104 (TII, 2022a) provides the list of asset categories and climate hazards to be considered. The asset categories will vary for development type and need to be determined on a development by development basis.

- **Asset Categories** Pavements; drainage; structures; utilities; landscaping; signs, light posts, buildings, and fences.
- **Climate Hazards** Flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning and hail; landslides; fog.

The sensitivity is based on a High, Medium or Low rating with a score of 1 to 3 assigned as per the criteria below.

- **High Sensitivity** The climate hazard will or is likely to have a major impact on the asset category. This is a sensitivity score of 3.
- **Medium Sensitivity** It is possible or likely the climate hazard will have a moderate impact on the asset category. This is a sensitivity score of 2.
- **Low Sensitivity** It is possible the climate hazard will have a low or negligible impact on the asset category. This is a sensitivity score of 1.

Once the sensitivities have been identified the exposure analysis is undertaken. The exposure analysis involves determining the level of exposure of each climate hazard at the project location irrespective of the project type. For example, flooding could be a risk if the project location is next to a river in a floodplain. Exposure is assigned a level of High, Medium or Low as per the below criteria.

- **High Exposure** It is almost certain or likely this climate hazard will occur at the project location, i.e. might arise once to several times per year. This is an exposure score of 3.
- **Medium Exposure** It is possible this climate hazard will occur at the project location, i.e. might arise a number of times in a decade. This is an exposure score of 2.
- **Low Exposure** It is unlikely or rare this climate hazard will occur at the project location, i.e. might arise a number of times in a generation or in a lifetime. This is an exposure score of 1.

Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability.

9.2.3.1 Significance Criteria for CCRA

The CCRA involves an initial screening assessment to determine the vulnerability of the proposed development to various climate hazards. The vulnerability is determined by combining the sensitivity and the exposure of the proposed development to various climate hazards.

$$\text{Vulnerability} = \text{Sensitivity} \times \text{Exposure}$$

The vulnerability assessment takes any proposed mitigation into account. Table 9-5 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale.

TII guidance (TII, 2022a) and the EU technical guidance (European Commission, 2021a) note that if all vulnerabilities are ranked as low in a justified manner, no detailed climate risk assessment may be needed. Therefore, the impact from climate change on the proposed development can be considered to be not significant.

However, where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks. An assessment of construction phase CCRA impacts is only required according to the TII guidance (TII, 2022a) if a detailed CCRA is required.

Table 9-5 - Vulnerability Matrix

		Exposure		
		High (3)	Medium (2)	Low (1)
Sensitivity	High (3)	9 - High	6 – High	3 - Medium
	Medium (2)	6 - High	4 - Medium	2 - Low
	Low (1)	3 - Medium	2 – Low	1 - Low

The screening CCRA, detailed in Section 9.5.2, did not identify any residual medium or high risks to the proposed development as a result of climate change. Therefore, a detailed CCRA for the construction and operational phase were scoped out.

While a CCRA for the construction phase was not required, best practice mitigation against climate hazards is still recommended in Section 9.7.1.

9.3 Receiving Environment

PE-ENV-01104 (TII, 2022a) states that a baseline climate scenario should identify, consistent with the study area for the project, GHG emissions without the project for both the current and future baseline.

Ireland declared a climate and biodiversity emergency in May 2019 and in November 2019 there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. This, in addition to Ireland's current failure to meet its EU binding targets under Regulation 2018/842 (European Union, 2018) results in changes in GHG emissions either beneficial or adverse being of more significance than previously considered prior to these declarations.

9.3.1 Current GHG Baseline

Data published in July 2024 (EPA, 2024), indicates that Ireland exceeded, without the use of flexibilities, its 2023 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 2.27 Mt CO₂e. However, the 2023

emissions were the first time that Ireland's emission were below (-1.2%) 1990 levels. ETS (Emissions Trading Scheme) emissions decreased (-17.0%) and ESR (Effort Sharing Regulation) emissions decreased (-3.4%). Ireland's target is an emission reduction of 626 kt of CO₂e by 2030 on an average baseline of 2016 to 2018. The EPA estimate that 2023 total national GHG emissions, excluding LULUCF, have decreased by 6.8% on 2022 levels to 55.01 Mt CO₂e, with a 2.2 Mt CO₂e (-21.6%) reduction in electricity industries alone. This was driven by a 40.7% share of energy from renewables in 2023 and by increasing our imported electricity. Manufacturing combustion and industrial processes decreased by 5.1% to 6.3 Mt CO₂e in 2023 due to declines in fossil fuel usage. The sector with the highest emissions in 2023 was agriculture at 37.6% of the total, followed by transport at 21.4%. For 2023, total national emissions (including LULUCF) were 60.62 Mt CO₂e (EPA, 2024), as shown in Table 9-6.

The provisional 2023 figures indicate that Ireland has used 63.9% of the 295 Mt CO₂e Carbon Budget for the five-year period 2021-2025.

Table 9-6 - Trends in Total National GHG Emissions 2021 – 2023

Sector ^{Note 1}	2021	2022	2023	Total Budget (Mt CO ₂ e) (2021-2025)	% Budget 2021-2025 Used	Annual Change 2022 to 2023
Electricity	9.893	9.694	7.558	40.0	67.9%	-22.0%
Transport	11.089	11.760	11.791	54.0	64.1%	0.3%
Buildings (Residential)	6.868	5.753	5.346	29.0	62.0%	-7.1%
Buildings (Commercial and Public)	1.444	1.447	1.409	7.0	61.4%	-2.6%
Industry	7.093	6.622	6.288	30.0	66.7%	-5.0%
Agriculture	21.940	21.795	20.782	106.0	60.9%	-4.6%
Other ^{Note 2}	1.864	1.931	1.832	9.0	62.5%	-5.1%
LULUCF	4.628	3.983	5.614	–	–	40.9%
Total including LULUCF	64.819	62.986	60.620	295.0	63.9%	-3.8%

Note 1 Reproduced from latest emissions data on the EPA website July 2024 (EPA, 2024).

Note 2 Other includes Petroleum refining, F-Gases and Waste (emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste).

9.3.2 Future GHG Baseline

The future baseline with respect to the GHGA can be considered in relation to the future climate targets which the assessment results will be compared against. In line with TII (TII, 2022a) and IEMA Guidance (IEMA, 2022) the future baseline is a trajectory towards net zero by 2050, “*whether it [the project] contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*”.

The future baseline will be determined by Ireland meeting its targets set out in the CAP24, and future CAPs, alongside binding 2030 EU targets. The European Union (EU) enacted ‘*Regulation (EU) 2018/842 on binding annual GHG emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013*’ (hereafter referred to as the Regulation) (European Union, 2018) to meet the commitments under the Paris Agreement. The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005.

The Regulation was amended in April 2023 and Ireland must now limit its greenhouse gas emissions by at least 42% by 2030. The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and includes GHG emissions from transport, residential and commercial buildings and agriculture.

In June 2024, the EPA released the report Ireland's *Greenhouse Gas Emissions Projections 2023-2050* (EPA, 2024d), which includes total projected emissions and a breakdown of projected emissions per sector under the 'With Existing Measures' and 'With Additional Measures' scenarios. The EPA projections indicate that under the 'With Existing Measures' scenario, Ireland will achieve a reduction of 11% on 2018 levels by 2030. A reduction of 29% by 2030 can be achieved under the 'With Additional Measures' scenario, which is still short of the 42% reduction target, set out in the carbon budgets.

9.3.3 Current CCRA Baseline

The region of the proposed development has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Dublin Airport is the nearest, representative, weather and climate monitoring station to the proposed development with meteorological data recorded for the 30-year period from 1991 to 2020. The historical regional weather data for Dublin Airport meteorological station is representative of the current climate in the region of the proposed development. The data for the 30-year period from 1991 to 2020 indicates that the wettest months at Dublin Airport meteorological station were November and December, and the driest month on average was June (Met Éireann, 2023a). July was the warmest month with a mean temperature of 15.4 Celsius. January was the coldest month with a mean temperature of 5.2 Celsius.

Met Éireann's 2023 Climate Statement (Met Éireann, 2024b) states 2023's average shaded air temperature in Ireland is provisionally 11.20°C, which is 1.65°C above the 1961-1990 long-term average. Previous to this 2022 was the warmest year on record; however, 2023 was 0.38°C warmer (see Figure 9-1).

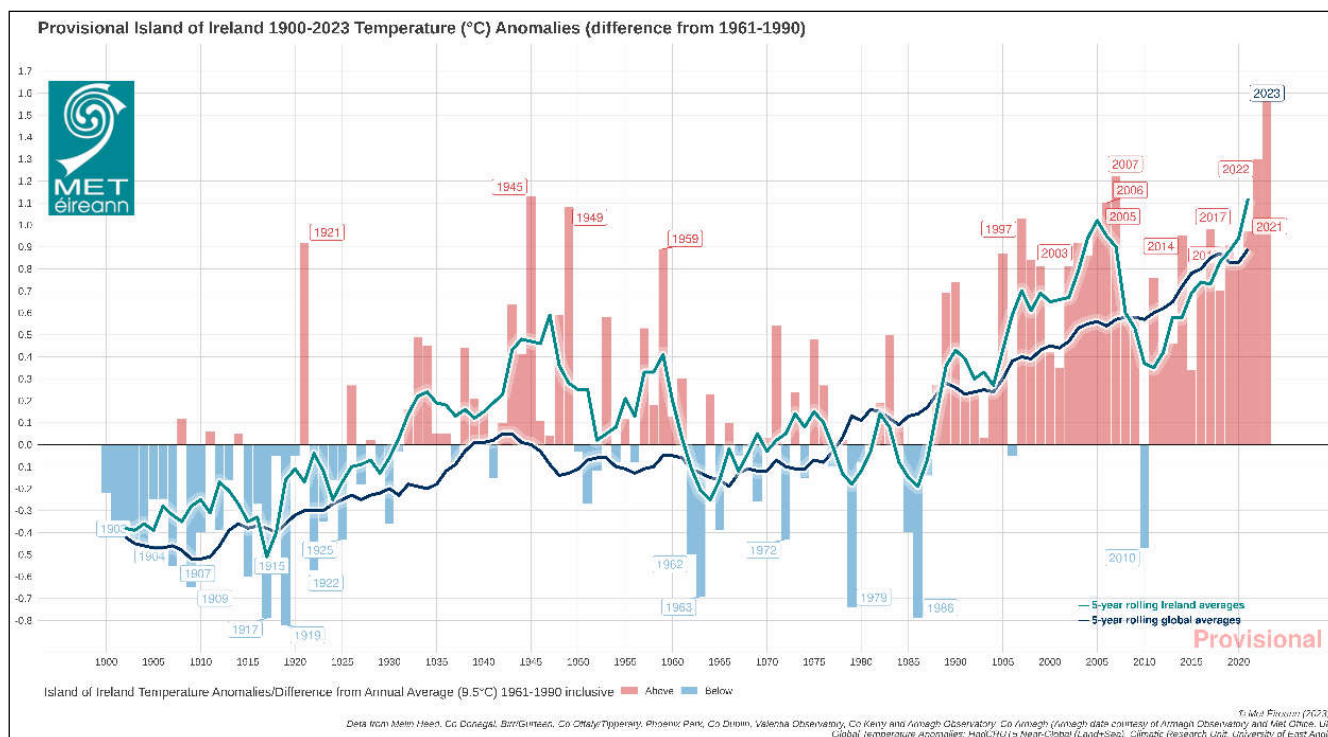


Figure 9-1 - 1900-2023 Temperature (°C) Temperature Anomalies (differences from 1961-1990)

2023 also had above average rainfall, this included the warmest June on record and the wettest March and July on record. Record high sea surface temperatures (SST) were recorded since April 2023 which included a severe marine heatwave to the west of Ireland during the June 2023. This marine heatwave contributed to the record rainfall in July.

Recent weather patterns and records of extreme weather events recorded by Met Éireann have been reviewed. Considering the extraordinary 2023 data, Met Éireann states that the latest Irish climate change projections indicate further warming in the future, including warmer winters. The record temperatures means the likelihood of extreme weather events occurring has increased. This will result in longer dry periods and heavy rainfall events. Storm surges and coastal flooding due to sea level rise. Compound events, where coastal surges and extreme rainfall events occur simultaneously will also increase. Met Éireann has high confidence in maximum rainfall rates increasing but not in how the frequency or intensity of storms will change with climate change.

9.3.4 Future CCRA Baseline

Impacts as a result of climate change will evolve with a changing future baseline, changes have the potential to include increases in global temperatures and increases in the number of rainfall days per year. Therefore, it is expected that the baseline climate will evolve over time and consideration is needed with respect to this within the design of the proposed development.

Ireland has seen increases in the annual rainfall in the north and west of the country, with small increases or decreases in the south and east including in the region where the proposed development will be located (EPA, 2021b). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the proposed development (EPA, 2021b):

- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding;
- Water shortages in summer in the east;
- Adverse impacts on water quality; and
- Changes in distribution of plant and animal species.

TII's Guidance document PE-ENV-01104 (TII 2022a) states that for future climate change a moderate to high Representative Concentration Pathways (RCP) should be adopted. RCP4.5 is considered moderate, while RCP8.5 is considered high. Representative Concentration Pathways (RCPs) describe different 21st century pathways of GHG emissions depending on the level of climate mitigation action undertaken.

National Framework for Climate Services (NFCS) was founded in June 2022 to streamline the provision of climate services in Ireland and will be led by Met Éireann. The aim of the NFCS is to enable the co-production, delivery and use of accurate, actionable and accessible climate information and tools to support climate resilience planning and decision making. In addition to the NFCS, further work has been ongoing into climate projects in Ireland through research under the TRANSLATE project. TRANSLATE (Met Éireann, 2023b) has been led by climate researchers from University of Galway – Irish Centre for High End Computing (ICHEC), and University College Cork – SFI Research Centre for Energy, Climate and Marine (MaREI), supported by Met Éireann climatologists. TRANSLATE's outputs are produced using a selection of internationally reviewed and accepted models from both CORDEX and CMIP5. Representative Concentration Pathways (RCPs) provide a broad range of possible futures based on assumptions of human activity. The modelled scenarios include for "least" (RCP2.6), "more" (RCP4.5) or "most" (RCP8.5) climate change, see Figure 9-2.

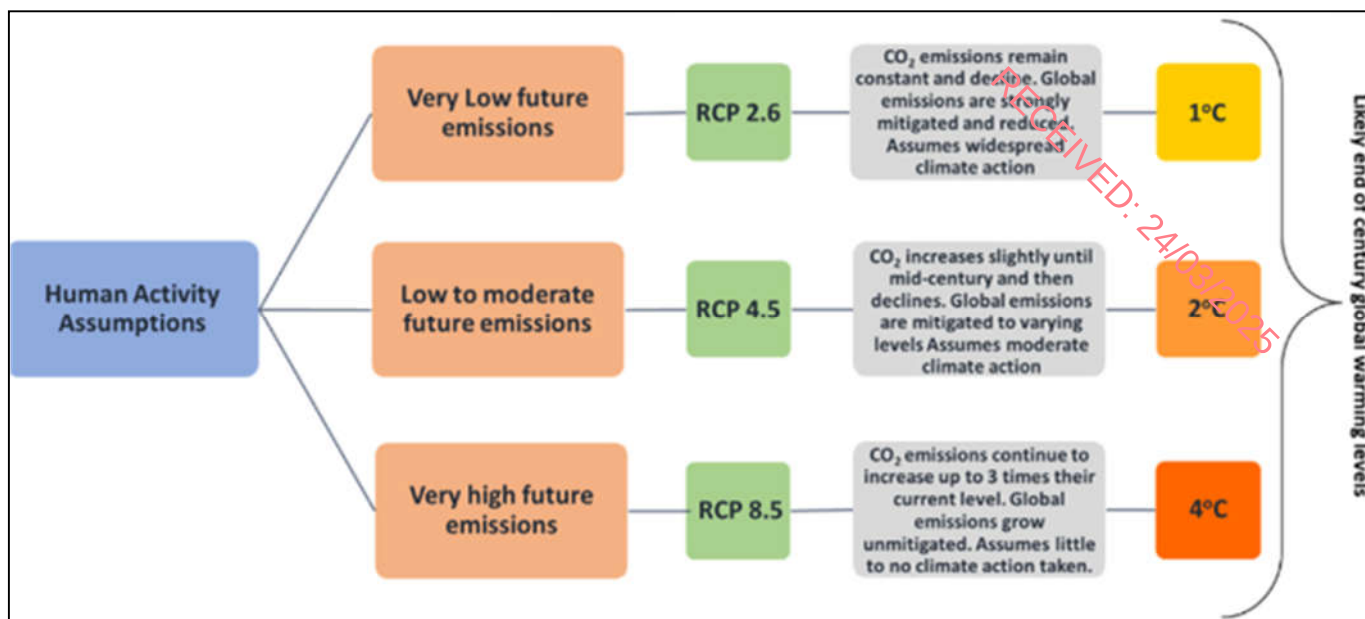


Figure 9-2 - Representative Concentration Pathways associated emission levels. Source: TRANSLATE project storymap (Met Éireann 2023)

TRANSLATE (Met Éireann, 2023b) provides the first standardised and bias-corrected national climate projections for Ireland to aid climate risk decision making across multiple sectors (for example, transport, energy, water), by providing information on how Ireland's climate could change as global temperatures increase to 1.5°C, 2°C, 2.5°C, 3°C or 4°C. Projections broadly agree with previous projections for Ireland. Ireland's climate is dominated by the Atlantic Meridional Overturning Circulation (AMOC), a large system of ocean currents – including the Gulf Stream – characterised by a northward flow of warm water and a southward flow of cold water. Due to the AMOC, Ireland does not suffer from the extremes of temperature experienced by other countries at a similar latitude. Recent studies have projected that the AMOC could decline by 30 – 40 % by 2100, resulting in cooler North Atlantic Sea surface temperatures (SSTs) (Met Éireann, 2023b). Met Éireann projects that Ireland will nevertheless continue to warm, although the AMOC cooling influence may lead to reduced warming compared with continental Europe. AMOC weakening is also expected to lead to additional sea level rise around Ireland. With climate change Ireland's temperature and rainfall will undergo more and more significant changes e.g. on average summer temperature could increase by more than 2°C, summer rainfall could decrease by 9% while winter rainfall could increase by 24% (See Figure 9-3). Future projects also include a 10-fold increase in the frequency of summer nights (values > 15°C) by the end of the century, a decrease in the frequency of cold winter nights and an increase in the number of heatwaves. A heatwave in Ireland is defined as a period of 5 consecutive days where the daily maximum temperature is greater than 25°C.

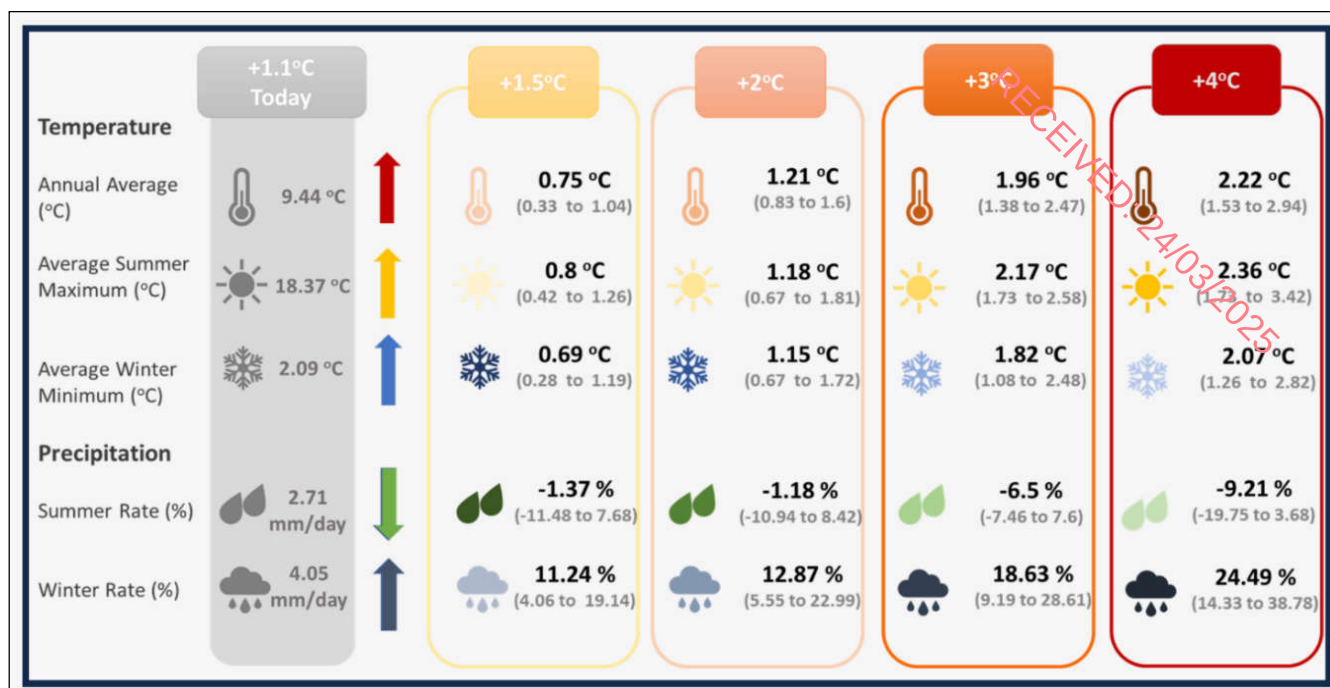


Figure 9-3 - Change of climate variables for Ireland for different global warming thresholds. Source: TRANSLATE project storymap (Met Éireann, 2023b)

The TRANSLATE research report (Met Éireann 2024d) finds that night-time temperatures will warm more than day-time temperatures, with temperatures increases across all seasons but the highest in the summer (with an increase of 0.5°C to 3.5°C). Autumn is projected to have the highest increase in average minimum temperatures (with an increase of 1.1°C to 4.4°C). The variance is dependent on the scenario that is being reviewed. While these temperatures are projected across all of Ireland, they increase most in the east of the country compared to the west. With respect to rainfall, increases of 4% to 38% are projected, however this will not be spread across the year as during summer months there are projected decreases in rainfall beyond the 2°C warming scenario.

In January 2024 the EPA published *Ireland's Climate Change Assessment Synthesis Report* (EPA, 2024e) which contained four volumes:

- Volume 1: Climate Science: Ireland in a Changing World
- Volume 2: Achieving Climate Neutrality by 2050
- Volume 3: Being Prepared for Ireland's Future Climate
- Volume 4: Realising the Benefits of Transition and Transformation

This report reinforces the existing and future risks arising from climate change. Volume 1 (EPA, 2024e) states that under Early action, the temperature increase averaged across the island of Ireland relative to the recent past (1976 to 2005) would reach 0.91°C (0.44 to 1.10°C) by mid-century before falling back to 0.80°C (0.34 to 1.07°C) at the end of the century. Whereas under Late action, by the end of the century it is projected that the temperature increases could be 2.77°C (2.02 to 3.49°C). Heat extremes will become more frequent and more severe and cold extremes will become less frequent and less severe with further warming.

Precipitation was 7% higher over the period 1991 to 2020 than over the 1961 to 1990 period. The average future predicted increase in precipitation is <10% in annual mean accumulated. By 2100 projected additional rises in sea level range from 0.32 to 0.6m under early action to 0.63 to 1.01m under late action scenarios, with greater storm surges potentially effecting critical infrastructure along the coastline. Projections of changes in storminess are highly uncertain and translate into large uncertainties in future frequency and intensity of extreme waves.

Volume 3 (EPA, 2024e) discusses how water supplies will face growing pressures resulting in increased water demand and how options need to be developed, including potential new sources. The report states the key role of critical infrastructure for delivering public services, economic development and a sustainable environment. These are exposed to a range of climate extremes. Failures in critical infrastructure can cascade across other sectors and present a multi-sector risk due to climate change.

The report references the EPA's *Critical Infrastructure Vulnerability to Climate Change* report (EPA, 2021a) as the most substantial research project in Ireland to date on climate change and critical infrastructure which assesses the future performance of Ireland's critical infrastructure when climate is considered. The Critical Infrastructure Vulnerability to Climate Change report states with respect to water availability and quality, that flood risk and heatwaves have a medium vulnerability index and the underground supply network has a high vulnerability to snowstorms and cold spells. However, while the vulnerability is high, the exposure is likely to reduce due to future climate change resulting in less cold weather events. The risk assessment highlights the co-dependence of the water sector to the energy sector, and how vulnerability in the energy sector may have cascading impacts.

Volume 4 (EPA, 2024e) calls for system change, including a transformation of urban settings. Stating that meaningful urban transformation can create a better living environment while simultaneously reducing emissions.

9.4 Greenhouse Gas Assessment

9.4.1 Potential Impacts on Climate during Construction Phase

The most significant proportion of GHG emissions tend to occur during the construction phase as a result of embodied carbon in construction materials and emissions from construction activities. Therefore, the assessment has been included in the construction phase assessment for the purposes of the EIAR. The assessment is broken down into the following stages as per Section 9.2.2.1:

- Product stage (A1 – A3);
- Transportation to site (A4);
- Site operations (construction activities) (A5); and
- Material replacement & refurbishment (B4 – B5).

The construction phase GHG emissions comprise stages A1 – A5 which includes the construction materials, the transport of the materials to site and the construction activities or site operations. Ongoing material refurbishment and replacement throughout the lifetime of the development is included within category B4 – B5, these are default values based on the typical maintenance requirements for the chosen material types over the assumed 50 year lifetime. Figure 9-4 shows the GHG emissions for the proposed development per life-cycle stage based on the output from the Carbon Designer for Ireland tool and the TII Carbon Tool combined.

Construction materials make up the majority of GHG emissions for the proposed development making up approximately 78% of the total construction phase GHG emissions across the various apartment blocks, duplex units and houses. Material replacement makes up the second highest contribution at 12% of the total and material transport and construction activities make up the remainder of the construction GHG emissions. The A5 and B4-B5 categories include carbon savings associated with waste material recycling or re-use.

The carbon assessment has highlighted the areas where the highest embodied carbon emissions occur, specifically as a result of building materials. Where material types were not known, as these will not be selected until detailed design stage, the standard default material type was used within the Carbon Designer for Ireland tool. Additionally, where the specific material type was not available within the tool, as the tool does not currently contain all possible material types, a conservative alternative material type was chosen which allowed for a best representation of the embodied carbon associated with the material.

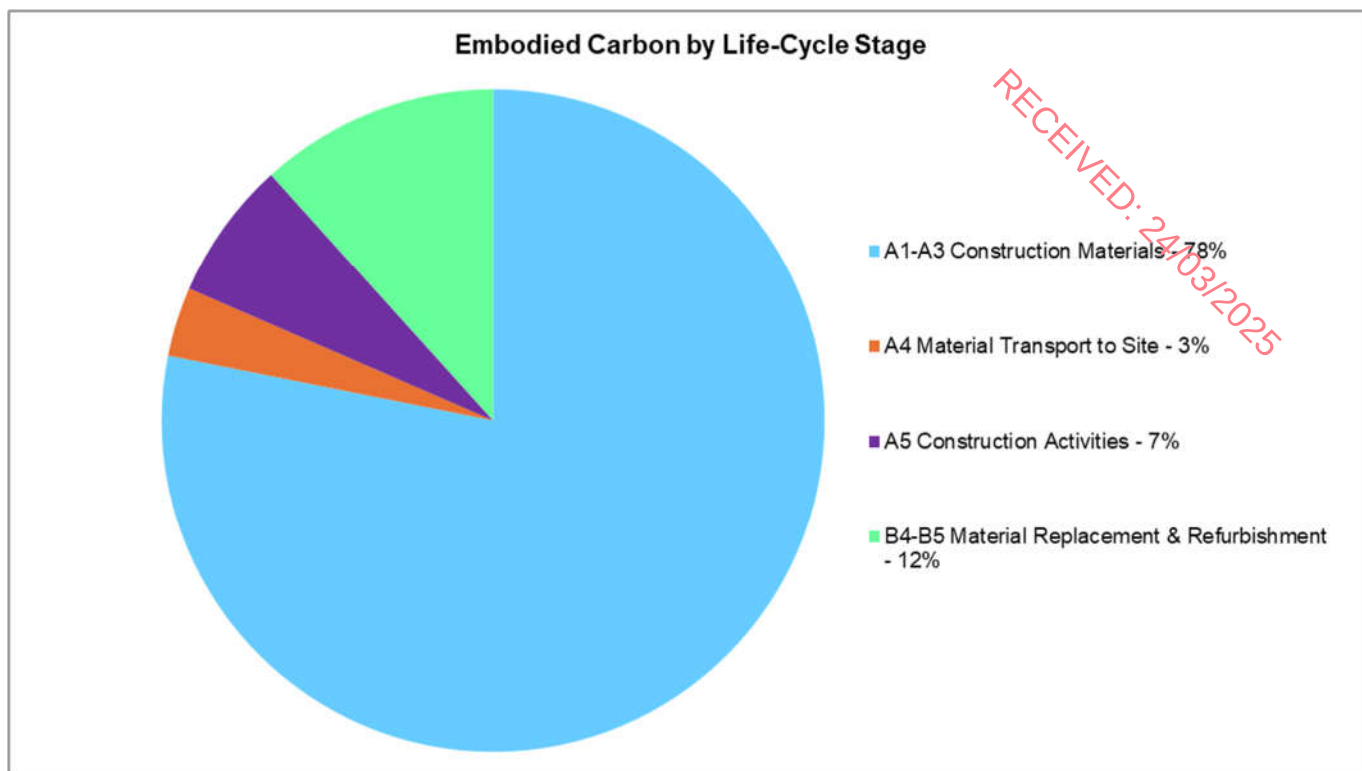


Figure 9-4 - Embodied Carbon by Life-Cycle Stage

It has been calculated that the total construction phase embodied carbon (including maintenance and replacement of materials over the development lifetime) will be 41,849 tonnes CO₂e (see Table 9-7). The GHG emissions from the development as a total cannot be compared against one specific sector 2030 carbon budget. The emissions are broken down into different assessment categories and these must be compared separately to the relevant sectoral emissions budget which are detailed in Table 9-7 and Table 9-8. The relevant sectoral emissions for the proposed development comparison include the Industry sector, Transport sector, electricity sector and Waste sector. The predicted emissions for the proposed development are annualised over the assumed 50 year lifespan and then compared to the relevant sector 2030 carbon budgets. Annualising the full carbon emissions over the lifetime of the development allows for appropriate comparison with annual GHG targets.

Table 9-7 - GHG Assessment Results

Stage	GHG Assessment Category	Predicted GHG Emissions (tCO ₂ e)	Predicted GHG Emissions as % of Project Total	Relevant Sector for Carbon Budget Comparison
A1-A3	Materials	32,777	78%	Industry
A4	Material Transport	1,420	3%	Transport
A5	Site Clearance and Demolition	6	0.02%	Industry
	Land Use Change and Vegetation Loss	389	1%	LULUCF
	Construction/Installation Process	671	2%	Electricity
	Construction site material waste	1,433	3%	Waste
	Construction site material waste transport	21	0.05%	Transport
	Construction site waste	81	0.19%	Waste
	Construction Worker Travel to Site	151	0.36%	Transport

Stage	GHG Assessment Category	Predicted GHG Emissions (tCO ₂ e)	Predicted GHG Emissions as % of Project Total	GHG as % Total	Relevant Sector for Carbon Budget Comparison
B4	Maintenance Material	3,699	9%		Industry
B5	Maintenance Material Transport	7	0.02%		Transport
	Maintenance Material Waste	1,193	3%		Waste
Project Total		41,849			

The predicted GHG emissions (as shown in Table 9-7) can be averaged over the full lifespan of the proposed development to give the predicted annual emissions to allow for direct comparison with national annual emissions and targets.

In Table 9-8, GHG emissions have been compared against the carbon budget for the industry, transport and waste sectors in 2030 (DECC, 2024), against Ireland's total GHG emissions in 2023 and against Ireland's EU 2030 target of a 42% reduction in non-ETS sector emissions based on 2005 levels (27.7 Mt CO₂e) (set out in Regulation EU 2018/842 of the European Parliament and of the Council).

The estimated total GHG emissions, when annualised over the 50-year proposed development lifespan, are equivalent to 0.0014% of Ireland's total GHG emissions in 2023 and 0.003% of Ireland's non-ETS 2030 emissions target. The estimated GHG emissions associated with transport-related activities are 0.0005% of the 2030 Transport budget, construction waste GHG emissions are 0.005% of the Waste budget, industry-related activities are 0.02% of the 2030 Industry budget and electricity use emissions are 0.0004% of the Electricity sector budget.

Table 9-8 - Estimated GHG Emissions Relative to Sectoral Budgets and GHG Baseline

Target/Sectoral Budget (tCO ₂ e)		Annualised Development GHG Emissions (tCO ₂ e)		% of Relevant Target/Budget
Ireland's 2023 Total GHG Emissions (existing baseline)	60,620,000	837	Total GHG Emissions	0.0014%
Non-ETS 2030 Target	27,722,000	837	Total GHG Emissions	0.003%
2030 Sectoral Budget (Industry Sector)	4,000,000	730	Total Industry Emissions	0.02%
2030 Sectoral Budget (Transport Sector)	6,000,000	32	Total Transport Emissions	0.0005%
2030 Sectoral Budget (Waste Sector)	1,000,000	54	Total Waste Emissions	0.005%
2030 Sectoral Budget (Electricity Sector)	3,000,000	13	Total Electricity Emissions	0.0004%

9.4.2 Potential Impacts on Climate during Operational Phase

9.4.2.1 Operational Energy Usage

The proposed development has been designed to reduce the impact to climate where possible. A number of measures have been incorporated into the design to ensure the operational phase emissions are minimised. The primary elements with respect to reducing climate impacts and optimising energy usage are summarised in Section 9.7.2 and are based on information provided within the Climate Action and Energy Statement prepared by Metec Consulting Engineers in relation to the proposed development.

9.4.2.2 Operational Traffic Emissions

There is the potential for increased traffic volumes to impact climate during the operational phase. To provide for a worst-case assessment and to assess potential cumulative impacts, the traffic data has included specific cumulative developments within the area (see Chapter 12 –Traffic and Traffic & Transportation Assessment for further details).

The predicted concentrations of CO₂e for the future years of 2029 and 2044 are detailed in Table 9-9. These are significantly less than Ireland's national 2029 and 2030 targets set out under EU legislation (targets beyond 2030 are not available) and the 2030 sectoral emissions ceilings. It is predicted that in 2029 the proposed development will increase CO₂ emissions by 85 tonnes CO₂e. This equates to 0.0002% of the 2029 national emission ceiling or 0.001% of the 2030 Transport sector emissions ceiling (see Table 9-9). Similarly low increases in CO₂ emissions are predicted to occur in 2044 with emissions increasing by 84 tonnes CO₂e. This equates to 0.0002% of the 2030 national emission ceiling or 0.001% of the 2030 Transport sector emissions ceiling (see Table 9-9).

In addition, bicycle parking as well as cycling paths will be provided as part of the proposed development. The development is also located in close proximity to a number of public transport links including rail and bus. This will promote the use of more sustainable methods of transport and reduce the need for private vehicle trips.

Table 9-9 - Traffic Emissions GHG Impact Assessment

Year	Scenario	CO ₂ e (tonnes/annum)
2029	Do Nothing	95
	Do Something	180
2044	Do Nothing	70
	Do Something	154
Increment Change in 2029		85
National Emission Ceiling 2029 (Tonnes) ^{Note 1}		34,503,322
Impact in 2029 (as % of national emissions ceiling)		0.0002%
Transport Sector 2030 Emission Ceiling		6,000,000
Impact in 2029 (as % of transport sector emissions ceiling)		0.001%
Increment Change in 2044		84
National Emission Ceiling 2030 (Tonnes) ^{Note 1}		27,722,000
Impact in 2044 (as % of national emissions ceiling)		0.0003%
Impact in 2044 (as % of transport sector emissions ceiling)		0.001%

^{Note 1} Target under Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council.

9.4.3 GHGA Significance of Effects

The TII guidance states that the following two factors should be considered when determining significance:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

The level of mitigation described in Section 9.8 has been taken into account when determining the significance of the proposed development's GHG emissions. According to the TII significance criteria described in Section 9.2.2.3 and Table 9-4, the significance of the GHG emissions during the construction and operational phase is minor adverse. The proposed development has mitigated GHG impacts and is in line with Ireland's trajectory towards net zero.

In accordance with the EPA guidelines (EPA, 2022), the above significance equates to a significance of effect of GHG emissions during the construction and operational phase which is **direct, long-term, negative** and **slight**, which is overall **not significant**.

9.5 Climate Change Risk Assessment

9.5.1 Potential Impacts on Climate during Construction Phase

A detailed CCRA of the construction phase has been scoped out, as discussed in Section 9.2.3, which states that where there are no residual medium or high risk vulnerabilities to climate change hazards. Therefore, a detailed CCRA is not required (TII, 2022a). However, consideration has been given to the proposed development's vulnerability to the following climate change hazards with best practice mitigation measures proposed in Section 9.7.1:

- Flood Risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding;
- Increased temperatures potentially causing drought, wildfires and prolonged periods of hot weather;
- Reduced temperatures resulting in ice or snow; and
- Major Storm Damage including wind damage.

9.5.2 Potential Impacts on Climate during Operational Phase

The sensitivity and exposure of the development to various climate hazards must first be determined to then determine the vulnerability of the proposed development to climate change. Flooding (coastal, pluvial, fluvial), extreme heat, extreme cold, wildfire, drought, extreme wind, lightning, hail, landslides and fog have been considered as climate hazards in the context of the proposed development.

The sensitivity of the proposed development to the climate hazards is assessed irrespective of the project location. Table 9-10 details the sensitivity of the proposed development on a scale of high (3), medium (2) and low (1). Once the sensitivity has been established the exposure of the proposed development to each of the climate hazards is determined, this is the likelihood of the climate hazard occurring at the project location and is also scored on a scale of high (3), medium (2) and low (1). The product of the sensitivity and exposure is then used to determine the overall vulnerability of the proposed development to each of the climate hazards as per Table 9-5. The results of the vulnerability assessment are detailed in Table 9-10.

Table 9-10 - Climate Change Vulnerability Assessment

Climate Hazard	Sensitivity	Exposure	Vulnerability
Flooding (Coastal, Pluvial, Fluvial)	1 (Low)	2 (Medium)	2 (Low)

Climate Hazard	Sensitivity	Exposure	Vulnerability
Extreme Heat	1 (Low)	2 (Medium)	2 (Low)
Extreme Cold	1 (Low)	2 (Medium)	2 (Low)
Wildfire	1 (Low)	1 (Low)	1 (Low)
Drought	1 (Low)	1 (Low)	1 (Low)
Extreme Wind	1 (Low)	1 (Low)	1 (Low)
Lightning & Hail	1 (Low)	1 (Low)	1 (Low)
Landslides	1 (Low)	1 (Low)	1 (Low)
Fog	1 (Low)	1 (Low)	1 (Low)

The sensitivity and exposure of the area was determined with reference to a number of online tools and with input from the various discipline specialists on the project team. It was concluded that the proposed development does not have any significant vulnerabilities to the identified climate hazards as described in the below sections. All vulnerabilities are classified as low.

9.5.2.1 Flooding

Increased rainfall in future years as a result of climate change has the potential to result in flooding. A Flood Risk Assessment (FRA) for the proposed development was undertaken by ARUP. According to the findings of the assessment *'The site is protected by the River Dargle Flood Defence Scheme for the 1% AEP fluvial event, the 0.5% tidal event and Hurricane Charlie with an allowance for freeboard and climate change at the tidal reaches. At the fluvial reaches, the scheme was designed for enhancement and future adaptation. As such, the proposed development and any changes to the levels within the site will have no impact in term of flood risk to River Dargle during the above events. When defences are not taken into account, portions of the site by the River Dargle are impacted by both the 1% AEP fluvial event, the 0.5% tidal event, and the 0.1% tidal event. The development site is therefore considered to be partially in Flood Zones A, B and C. It is prudent to consider the risk of flooding from fluvial and tidal sources in the absence of these defences and to provide mitigation measures and strategies in the event of an exceedance or breach event. Following consultation with WCC, the modelling of the exceedance event was carried out to ensure this scenario was accounted for.'* (ARUP, 2025)

As per the FRA the flood risk management strategy devised for the proposed development comprises of:

- Locating residential (highly vulnerable) properties away from flood risk, as much possible;
- Raising residential properties and key access routes above the flood protection level of 3.5m AOD, as well as setting one retail unit space located in Block G at a level of 4.0m AOD;
- Where raising of levels is not possible, demountable barriers and a water exclusion strategy is proposed for retail units (less vulnerable development).

The proposed development is protected from fluvial and tidal flooding by the existing River Dargle Flood Defences. Additionally the FRA concludes the risk of pluvial flooding to the development is low, with some local ponding potentially occurring at the low-lying areas of the site, behind the River Dargle Flood Defences however, this is alleviated through an existing drainage ditch and culvert to the river. The risk of groundwater flood risk is low.

9.5.2.2 Extreme Wind, Fog, Lightning & Hail

In relation to extreme winds, the buildings shall be designed to the appropriate standards to account for the relevant wind loadings events for RCP4.5 and RCP8.5. If required as part of the building design, lightning protection shall be provided for. Hail and fog are not predicted to significantly affect the buildings due to their design.

9.5.2.3 Wildfires

In relation to wildfires, the *Think Hazard!* tool developed by the Global Facility for Disaster Reduction and Recovery (GFDRR, 2025), indicates that the wildfire hazard is classified as low for the Wicklow area. This means that there is between a 4% to 10% chance of experiencing weather that may cause disruptions and low but tangible risk of life and property loss in any given year. Future climate modelling indicates that there could be an increase in the weather conditions which are favourable to fire conditions, these include increases in temperature and prolonged dry periods. However, due to the project location in a built-up, suburban area the risk of wildfire is significantly lessened and it can be concluded that the proposed development is of low vulnerability to wildfires.

9.5.2.4 Landslides

The Geological Society of Ireland (GSI) landslide susceptibility mapping database (GSI, 2025) was reviewed to determine the risk from landslides at the proposed development. There have not been any historical landslide events in the vicinity of the proposed development and the area is of low susceptibility to future landslides. Therefore, landslides are not a risk for the proposed development site.

9.5.2.5 Extreme Temperatures (Heat & Cold) & Drought

In relation to extreme temperatures, both extreme heat and extreme cold, these have the potential to impact the building materials and some related infrastructure. However, the building materials selected at the detailed design. Therefore, extreme temperatures are not considered a significant risk.

9.5.2.6 Summary

Overall, the proposed development has at most low vulnerabilities to the identified climate hazards. Therefore, no detailed risk assessment is required.

9.5.3 CCRA Significance of Effects

With design mitigation in place, there are no significant risks to the proposed development as a result of climate change. In accordance with the EPA Guidelines (EPA, 2022), the significance of effect of the impacts to the proposed development as a result of climate change are **direct, long-term, negative** and **imperceptible**, which is overall **not significant** in EIA terms.

9.6 Do Nothing Scenario

In the Do-Nothing scenario, the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc). The Do-Nothing scenario is considered neutral in terms of the climate assessment.

9.7 Mitigation Measures

9.7.1 Construction Phase

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. During the construction phase the following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate:

- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and machinery are well maintained and inspected regularly.

- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site. A construction waste management plan will be implemented to minimise construction waste sent to landfills. Recycling of materials will be promoted to and reduce the environmental footprint of the site.
- Sourcing materials locally will be prioritised. This will help to reduce transport related CO2 emissions and helps support local suppliers, further promoting economic sustainability.
- Material choices and quantities will be reviewed during detailed design, to identify and implement any lower embodied carbon options, where feasible.

In terms of impact on the proposed development due to climate change, during construction the Contractor will be required to mitigate against the effects of extreme rainfall/flooding through site risk assessments and method statements. The Contractor will also be required to mitigate against the effects of extreme wind/storms, temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction. During construction, the Contractor will be required to mitigate against the effects of fog, lighting and hail through site risk assessments and method statements.

9.7.2 Operational Phase

A number of mitigation measures have been incorporated into the design of the development to reduce the impact on climate wherever possible. Metec Consulting Engineers have prepared a Climate Action and Energy Statement in relation to the proposed development. As per the Climate Action and Energy Statement, the development will be a Nearly Zero Energy Building (NZEB) in accordance with the 2022 Part L requirements and the relevant sustainability policies within the Wicklow County Development Plan 2022-2028.

The residential units and commercial spaces will aim to achieve a Building Energy Ratio (BER) of A3. The residential units will have an energy performance coefficient (EPC) that complies with NZEB (maximum permitted under NZEB requirements is <0.3). The units will also have a carbon performance coefficient (CPC) and renewable energy ratio (RER) that comply with NZEB requirements (maximum permitted CPC under NZEB requirements is <0.35 and RER is 0.20). Similar to the residential units, the non-domestic spaces will also comply with the NZEB requirements. The EPC will comply with the NZEB requirements (maximum permitted under NZEB requirements is <1.0). The units will also have a CPC and RER that comply with NZEB requirements (maximum permitted CPC under NZEB requirements is <1.15 and RER is 0.20).

The Energy & Sustainability Statement outlines that the design of the development has incorporated the principles of the energy hierarchy which are:

1. Be Lean – this encourages a passive strategy whereby space heating, cooling and lighting energy demand is minimised through a fabric first approach.
2. Be Clean – this stage encourages that energy supplied to the development, such as heating or domestic hot water is delivered efficiently through communal or highly efficient systems.
3. Be Green – this stage ties in with the Renewable Energy Ratio requirement of Part L 2022, whereby any remaining requirements are addressed through on-site renewable energy or low zero carbon technologies.

The following measures will ensure the development minimises the impact to climate during its operation: -

- The fabric specification will ensure compliance with the NZEB and Part L requirements for thermal bridging, air permeability and thermal comfort.
- Centralised Heating with Air Source Heat Pumps (ASHP), ASHP and EAHP options.
- Efficient water fittings to sanitaryware such as flow restrictors will be investigated as to their feasibility to reduce water consumption.

The above measures will assist in optimising the energy consumed by the development and will also have the benefit of reducing the impact to climate during the operational phase of the development.

Some measures have been incorporated into the design of the development to mitigate the impacts of future climate change. For example, adequate attenuation and drainage have been incorporated to avoid potential flooding impacts due to increased rainfall events in future years. These measures have been considered when assessing the vulnerability of the proposed development to climate change (see Section 9.5.2).

9.8 Residual Impacts

The impact to climate as a result of a proposed development must be assessed as a whole for all phases. The proposed development will result in some impacts to climate through the release of GHGs. TII reference the IEMA guidance which states that the crux of assessing significance is “*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*”. The proposed development has proposed some best practice mitigation measures and is committing to reducing climate impacts where feasible. As per the assessment criteria in Table 9-4 the residual impact of the proposed development in relation to GHG emissions is considered **direct, long-term, negative** and **slight**, which is overall **not significant** in EIA terms.

In relation to climate change vulnerability, it has been assessed that there are no significant risks to the proposed development as a result of climate change. The residual effect of climate change on the proposed development is considered **direct, long-term, negative** and **imperceptible**, which is overall **not significant** in EIA terms.

9.9 Monitoring Requirements

There are no monitoring requirements in relation to climate.

9.10 Difficulties encountered during the preparation of this chapter

There were no difficulties encountered when completing the climate assessment.

10. Noise and Vibration

10.1 Introduction

AWN Consulting Ltd. has been commissioned to carry out a noise and vibration impact assessment of the proposed Phase 2 development at Sea Gardens, Bray. This assessment has been prepared by Alistair MacLaurin BSc PgDip MIOA, Senior Consultant at AWN Consulting who has over 12 years' experience as an acoustic consultant.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the subject site, an assessment of the potential noise and vibration impact associated with the proposed development during both the short-term construction phase and the long term operational phase on its surrounding environment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure its minimal impact on the receiving noise climate.

The assessment has been undertaken with reference to appropriate guidance documents relating to environmental noise and vibration which are set out within the relevant sections of this chapter and listed in the references section. In addition to specific noise guidance documents, the following guidelines were considered and consulted for the purposes of this chapter:

- European Commission, Guidance on the preparation of the Environmental Impact Assessment Report (2017)
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022)

10.2 Methodology

The following methodology has been prepared based on the requirements of the relevant guidance documents as outlined above and on our experience of preparing the noise & vibration assessments for similar developments. The following approach has been used for this assessment:

- Baseline noise monitoring has been undertaken at the development site in order to characterise the existing noise environment;
- A review of applicable standards and guidelines has been reviewed in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development;
- Predictive calculations relating to construction phase impacts have been undertaken at the nearest sensitive locations to the development site;
- Potential inward noise impacts to the proposed development during the operational phase have been assessed;
- Potential noise impacts associated with the operational phase of the development at the most sensitive locations surrounding the proposed development have been determined and assessed, and;
- A schedule of mitigation measures has been included to reduce, where necessary, identified potential outward impacts relating to noise and vibration from the proposed development.

10.2.1 Construction Phase – Noise

BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2

There is no published statutory Irish guidance relating to the maximum permissible noise and vibration levels that may be generated during the construction phase of a project. It is common practice to use BS 5228:2009+A1:2014

Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2 with respect to the controlling noise and vibration impacts. In this instance, appropriate criteria relating to permissible construction noise levels are taken from Part One of this standard: Noise.

The approach adopted on this assessment calls for the designation of a noise sensitive location into a specific category (A, B or C) based on exiting ambient noise levels in the absence of construction noise. This then sets a construction noise threshold value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities. Note that, in accordance with the BS5228 guidance, this assessment criterion is only applicable to residential receptors.

The closest neighbouring noise sensitive properties to the proposed development are the residential dwellings on Corke Abbey Road and the Colaiste Raithin School that bounds the west of the site. Figure 10-1 identifies the closest noise sensitive receptors to the proposed development.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 10-1 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors.

Table 10-1 - BS 5228-1:2009+A1:2014 Guidance

Assessment and threshold period (L_{Aeq})	category value	Threshold value, in decibels (dB)		
		Category A	Category B	Category C
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65		70	75
Evenings and weekends ^D		55	60	65
Night-time (23:00 to 07:00hrs)	45		50	55
Note A)	Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.			
Note B)	Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.			
Note C)	Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.			
Note D)	19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.			

Taking the above into account it is considered appropriate to adopt a construction noise limit of 65 dB L_{Aeq} Monday to Friday 07:00 to 19:00hrs and Saturday 07:00 to 14:00hrs. This limit is also considered appropriate for the local school.



Figure 10-1 - Identified NSL's

- **NSL1** – Phase one development to the North of the proposed site.
- **NSL2** – Coláiste Raitihin Secondary School to the North of the proposed site.
- **NSL3** – Saint John of God Community Services, Home Health Care Service to the North West of the proposed site.
- **NSL4** – Residential and commercial properties to the west of the proposed site.

10.2.2 Construction Phase – Vibration

In terms of vibration, *British Standard BS 5228-2:2009+A1:2014 Part 2: Vibration* recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity (PPV) (in frequency range of predominant pulse) of 15 mm/s at 4Hz increasing to 20 mm/s at 15Hz and 50 mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in are recommended.

Table 10-2 - Vibration Thresholds during Construction

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:-		
Less than 15Hz	15 to 40Hz	40Hz and above
12 mm/s	20 mm/s	50 mm/s

10.2.3 Operational Phase – Additional Vehicular Activity on Public Roads

In order to consider the potential noise impact associated with the proposed development in terms of additional traffic onto the existing road networks, and given that vehicle movements on public roads are assessed using a different parameter (the ten percentile noise level; L_{A10}), it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development in terms of the L_{A10} parameter.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, guidance is offered by Design Manual for Roads and Bridges, 2019 where Table 10-3 provides a summary of the likely impact associated with any particular change in traffic noise level.

Table 10-3 - Likely Impact Associated with Change in Traffic Noise Level

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Long-term)	EPA Significance of Effect
0.0 – 2.9	Inaudible	Negligible	Imperceptible
	Barely Perceptible		Not significant ^{Note 1}
3 – 4.9	Perceptible	Minor	Slight to Moderate
5 – 9.9	Up to a doubling of loudness	Moderate	Significant
10+	Doubling of loudness and above	Major	Very significant

Note 1: Change in noise levels at the upper end of this range will approach perceptibility, therefore this range is categorised as Imperceptible to Not significant.

10.2.4 Operational Phase – Mechanical Plant and Services

Once a development of this nature becomes fully operational, a variety of electrical and mechanical plant will be required to service the development. Most of this plant will be capable of generating noise to some degree. Some of this plant may operate 24 hours a day, and hence would be most noticeable during quiet periods (i.e. overnight). Noisy plant with a direct line-of-sight to noise sensitive properties would potentially have the greatest impact. Plant contained within plantrooms has the least potential for impact once consideration is given to appropriate design of the space.

The most appropriate standard used to set operational noise limits relating to fixed item of plant to noise sensitive areas is BS 4142: 2014+A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. This standard describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

For an appropriate BS 4142 assessment it is necessary to compare the measured external background noise level (i.e. the $L_{A90,T}$ level measured in the absence of plant items) to the rating level ($L_{Ar,T}$) of the various plant items, when operational. Where noise emissions are found to be tonal, impulsive in nature or irregular enough to attract attention, BS 4142 also advises that a penalty be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal noise characteristics outlined in BS 4142 recommends the application of a 2 dB penalty for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

The following definitions as discussed in BS 4142 as summarised below:

“ambient noise level, $L_{Aeq,T}$ ”	is the noise level produced by all sources including the sources of concern, i.e. the residual noise level plus the specific noise of mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
“residual noise level, $L_{Aeq,T}$ ”	is the noise level produced by all sources excluding the sources of concern, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
“specific noise level, $L_{Aeq,T}$ ”	is the sound level associated with the sources of concern, i.e. noise emissions solely from the mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
“rating level, $L_{Ar,T}$ ”	is the specific sound level plus any adjustments for the characteristic features of the sound (e.g. tonal, impulsive or irregular components);
“background noise level, $L_{A90,T}$ ”	is the sound pressure level of the residual noise that is exceeded for 90% of the time period T.

If the rated plant noise level is +10 dB or more above the pre-existing background noise level then this is likely to be an indication of a significant adverse impact, depending on context. A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

10.2.5 Operational Phase – Noise Breakout from Hotel Event Room

It is noted that there is an event room associated with the proposed hotel portion of the site. There is no published statutory Irish guidance relating to the break out of noise. Planning authorities typically control noise break out using the following criteria:

“Noise break out from the Music Room shall be so controlled that its level at any adjacent noise sensitive location shall not cause the ambient noise (measured in the absence of said noise break out) to increase, when assessed over 5 minute back to back periods. Similar criteria shall apply to the 63Hz & 125Hz octave band levels.”

10.2.6 Operational Phase – Other Noise Sources

For other non-traffic related sources appropriate guidance on internal noise levels for dwellings is contained within BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings. This British Standard sets out recommended noise limits for indoor ambient noise levels in dwellings as follows:

Table 10-4 - BS8233:2014 Internal Noise Level Guidelines

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living Room	35 dB LAeq, 16hr	-
Dining	Dining Room/Area	40 dB LAeq, 16hr	-
Sleeping (Daytime Resting)	Bedroom	35 dB LAeq, 16hr	30 dB LAeq, 8hr

BS8233 indicates that an open window typically affords up to 15 dB of attenuation, hence, appropriate external noise levels can be calculated for noise sources other plant and mechanical services (e.g. potential noise outbreak from the creche), the thresholds are detailed as follows:

- Day – 50 dB LAeq, 16hr
- Night – 45 dB LAeq, 8hr

10.2.7 Operational Phase – Inward Noise Assessment

Professional Guidance on Planning & Noise (ProPG)

The *Professional Guidance on Planning & Noise* (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption it has been generally considered as best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The ProPG outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

- Stage 1 - Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,
- Stage 2 – Involves a full detailed appraisal of the proposed development covering four “key elements” which include:
 - Element 1 - Good Acoustic Design Process;
 - Element 2 - Noise Level Guidelines;
 - Element 3 - External Amenity Area Noise Assessment; and,
 - Element 4 - Other Relevant Issues.

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as negligible, low, medium or high risk based on the pre-existing noise environment. Figure 10-2 presents the basis of the initial noise risk assessment, it provides appropriate risk categories for a range of continuous noise levels, either measured and/or predicted on site.

It should be noted that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period, and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night.

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 10-5 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

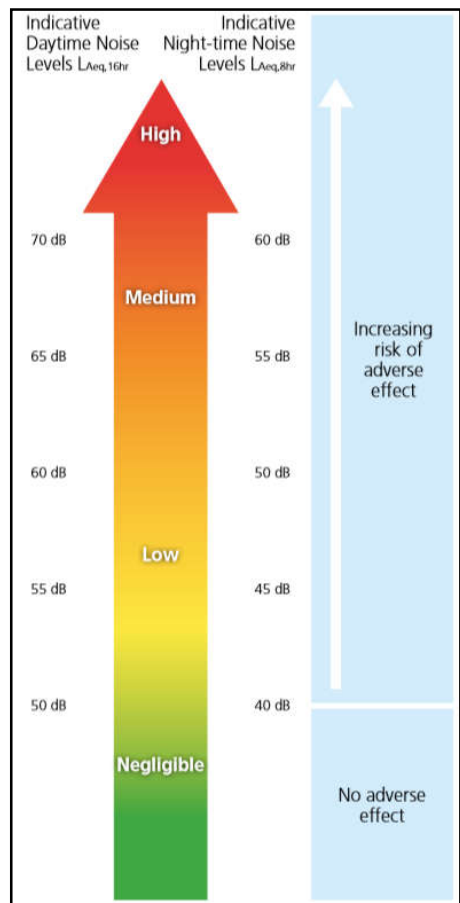


Figure 10-2 - ProPG Stage 1 - Initial Noise Risk Assessment

Table 10-5 - ProPG Internal Noise Level Guidelines

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living Room	35 dB $L_{Aeq, 16hr}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq, 16hr}$	-
Sleeping	Bedroom	35 dB $L_{Aeq, 16hr}$	30 dB $L_{Aeq,8hr}$
(Daytime Resting)			45 dB L_{AFmax}^*

*Note - The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

In addition to these absolute internal noise levels ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal L_{Aeq} values by up to 5 dB can still provide reasonable internal conditions.

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

“The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.”

10.2.8 Operational Phase – Inward Vibration Assessment

Guidance relating to human response to vibration is contained within BS 6472 Guide to evaluation of human exposure to vibration in buildings (2008): Part 1 - Vibration sources other than blasting.

BS 6472 uses the Vibration Dose Value (VDV) which is measured or forecast over the day or night-time periods in terms of $m/s^{-1.75}$. The VDV parameter takes into account how people respond to vibration in terms of frequency content, vibration magnitude and the number of vibration events during an assessment period.

The following Table, as set out in the standard (BS 6472), details the values of VDV where various comments from occupiers are possible. The standard notes that the values are applicable for both vertical and horizontal vibration with the appropriate weighting applied. The values in Table 10-6 have been adopted for this assessment.

Table 10-6 - VDV ($m/s^{-1.75}$) above which various degrees of adverse comment may be expected in residential buildings.

Building Type	Low probability of adverse comment	Adverse possible	Adverse probable
Residential building – Day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential building – Night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

10.3 Receiving Environment

An environmental noise survey was conducted at the development site as part of the assessment. The noise survey was conducted in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Specific details are set out below.

10.3.1 Measurement Locations

The following four attended measurement locations, one unattended location and one vibration location was selected as shown in Figure 10-3;

- **Attended 1** Located on the site of the proposed development 100m from the rail line.
- **Attended 2** Located at the south-west of the site, closest to the neighbouring dwellings;
- **Attended 3** Located to the west of the proposed development.
- **Attended 4** Located to the north-west of the proposed development.
- **Unattended 1** Located to the east, on the site of the proposed development adjacent to the rail line.
- **Vibration 1** Located to the east, on the site of the proposed development adjacent to the rail line.



Figure 10-3 - Noise Monitoring Locations

10.3.2 Survey Periods

Noise measurements were conducted at Locations AT 1 – 4 over the course of the following survey period:

- 10:50hrs to 15:10hrs on 17th October 2024.

Noise measurements were conducted at Location UN 1 over the course of the following survey period:

- 10:00hrs on 17th October 2024 to 10:00hrs on the 20th October 2024.

The weather during the survey periods were dry and calm.

10.3.3 Instrumentation

The attended noise measurements were performed using a RION NL-52 Sound Level Meters. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

10.3.4 Procedure

Attended noise measurements were conducted with the microphone at a height of 1.5m above ground level. Four 15-minute intervals were measured at Locations 1,2, 3 and 4. An unattended noise monitor was set up at UN1 seen in Figure 10-3. The microphone was set at a height of 3.8m above ground level. The location of the unattended meter was chosen to obtain an overall measurement of the rail noise impacting on the site, and also to capture noise data at an adequately granular interval so that sound exposure level (SEL) measurements of the train pass-bys can be

derived from the data. The results were saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up during setup and collection.

10.3.5 Measurement Parameters

The noise survey results are presented in terms of the following parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{Amax} is the instantaneous maximum sound level measured during the sample period.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

L_{AE} Sound Exposure Level is the A weighted equivalent sound level which, when maintained for one second, contains the same quantity of sound energy as the actual time varying level of one noise event.

The “A” suffix denotes the fact that the sound levels have been “A-weighted” in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

10.3.6 Noise Survey Results

10.3.6.1 Attended Measurement Results AT1 to AT4

Table 10-7 - Measured Noise Levels at Locations AT1 to AT4

Location	Time	Measured Noise Levels (dB re. 2×10^{-5} Pa)			
		L _{Aeq}	L _{Amax}	L _{A90}	L _{A95}
AT1	10:53	57	76	57	50
	12:41	53	70	55	51
	14:00	57	78	57	51
AT2	11:27	59	78	62	51
	13:01	62	90	63	49
	14:34	59	75	63	50
AT3	11:54	50	62	53	47
	13:21	47	55	49	45
	14:54	52	61	55	50
AT4	12:16	61	80	64	48
	13:38	57	74	61	45

Location	Time	Measured Noise Levels (dB re. 2x10 ⁻⁵ Pa)			
		L _{Aeq}	L _{AFmax}	L _{AF10}	L _{AF90}
	15:11	59	74	64	48

AT1 – At AT1 it was noted that the local noise environment comprised of sporadic train movements and distant road traffic on Castle Street. It was also noted that some reverse alarms from a forklift truck in operation nearby and impact noises from the construction site were audible.

AT2 – AT2 was setup on Ravenswell Road along the footpath leading to Main Street R761. The dominant noise source at this location was traffic from R761 Main Street and Lower Dargle Road. Other sources included trucks and vans entering the construction site and the gate opening and closing. No construction noise was audible at this location.

AT3 – At AT3 it was noted that the local noise environment comprised of distant road traffic from R761 Main Street, wind rustling the foliage and brief construction activity in a nearby industrial yard. There was no construction noise from the site audible at this location.

AT4 – AT4 was setup at the intersection at Ravenswell Primary School along the footpath. It was noted that the local noise environment comprised of vehicles passing from each direction, school yard noise and an excavator working in the distance briefly during the first measurement at AT4.

10.3.6.2 Unattended Measurement Results

Results of Unattended Noise Survey

Measured noise levels are summarised in Table 10-8 and Table 10-9.

On review of the measured data, it is confirmed that the noise levels were as follows:

- Daytime ambient noise levels of between 54 and 57 dB L_{Aeq,T};
- Daytime background noise levels of between 42 and 47 dB L_{A90,T};
- Night time ambient noise levels of between 48 and 53 dB L_{Aeq,T}; and,
- Night time background noise levels of between 37 and 49 dB L_{A90,T}.

Table 10-8 - Daytime Measured Noise Levels

Date	L _{Aeq,16hr}	L _{A90} (Arithmetic Average)
Thursday 17 October 2024	57	45
Friday 18 October 2024	57	47
Saturday 19 October 2024	54	42
Overall	56	45

Table 10-9 - Night-time Measured Noise Levels

Date	$L_{Aeq,16hr}$	L_{A90} (Arithmetic Average)
Thursday 17 to Friday 18 October 2024	49	39
Friday 18 to Saturday 19 October 2024	48	37
Saturday 19 to Sunday 20 October 2024	53	49
Overall	51	41

Additionally, a review of L_{Amax} events has been undertaken for the night period. The measured data indicates that a noise level of 75 dB L_{Amax} is not typically exceeded at UN1, which corresponds to the location of the closest façade of the proposed development to the rail line.

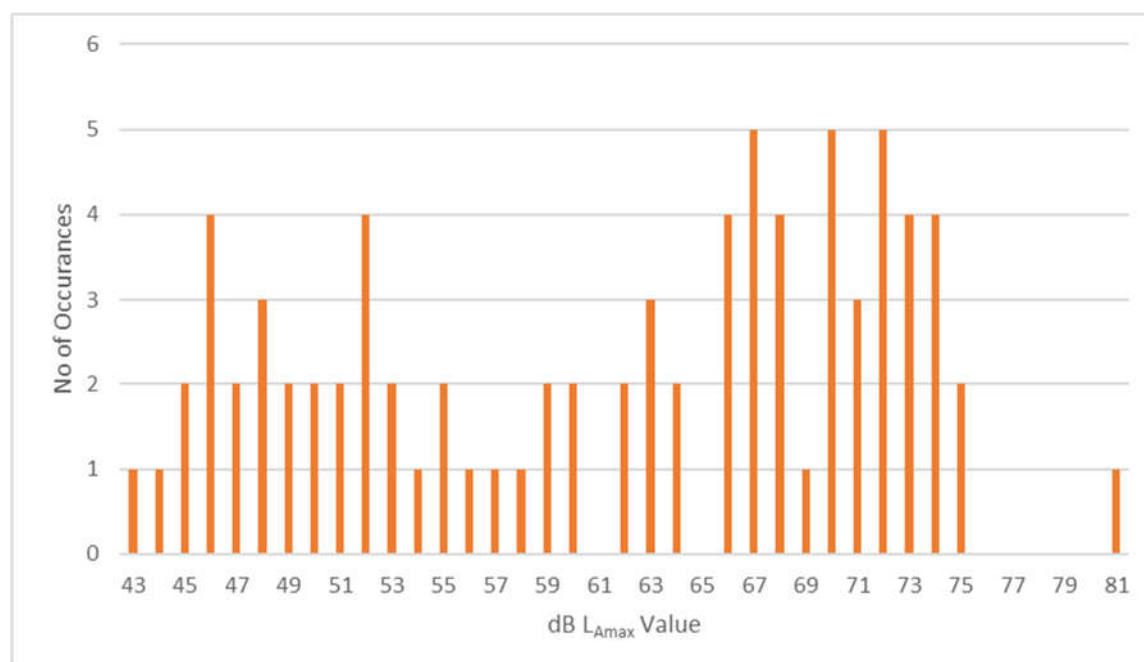


Figure 10-4 - No of dB L_{Amax} events at each noise level during the night period

10.3.7 Vibration Results

Vibration measurements were undertaken at Location VIB 1 seen in Figure 10-3, the location was selected as a representation of vibration from train pass-bys impacting on the façade of the proposed development building. The results are summarised in Table 10-10.

Table 10-10 - Vibration Results

Location	VDV (m/s ^{-1.75})	
	Lowest	Highest
VIB1	0.0001	0.04

10.4 Potential Noise Impacts during Construction Phase

10.4.1 Noise

It is noted that the construction programme will create typical construction activity related noise on site. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators.

The proposed general construction hours are 07:00 to 19:00hrs Monday to Friday and 09:00 to 14:00hrs on Saturdays.

Due to the nature of daytime activities undertaken on a construction site of this nature, there is potential for generation of significant levels of noise.

Typical noise levels are predicted using guidance set out in BS5228-1: 2009+A1: 2014. Table 10-11 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme at a standard reference distance of 10 metres from the various plant items as well as predicted activity noise levels at various distances. The predictions assume a standard 2.4m hoarding surrounding the site.

Table 10-11 - Construction Noise Predictions

Phase	Item of Plant (Ref. BS5228-1:2009+A1:2014)	BS5228 Noise Level at 10m (dB LAeq,1hr)	Predicted Construction Noise Level at 20m Distance (dB LAeq,12 hr)	Predicted Construction Noise Level at 30m Distance (dB LAeq,12 hr)	Predicted Construction Noise Level at 45m Distance (dB LAeq,12 hr)
Site Preparation	Wheeled Loader Lorry (D3 1)	75	61	57	54
	Track Excavator (C2 22)	72	58	54	51
	Dozer (C2.13)	78	64	60	57
	Dump Truck (C4.2)	78	64	60	57
Site Preparation Total (logarithmic summation)			68	65	61
Foundations	Tracked Excavator (C3.24)	74	60	56	53

Phase	Item of Plant (Ref. BS5228-1:2009+A1:2014)	BS5228 Item Noise Level at distance (dB LAeq,1hr)	Item Level 10m	Predicted Construction Noise Level at 20m Distance (dB LAeq,12 hr)	Predicted Construction Noise Level at 30m Distance (dB LAeq,12 hr)	Predicted Construction Noise Level at 45m Distance (dB LAeq,12 hr)
	Concrete Pump (C3.25)	78		64	60	57
	Compressor (D7 6)	77		63	59	56
	Poker Vibrator (C4 33)	78		64	60	57
	Large Rotary Bored Piling Rig (C3.14)	83		69	65	62
Foundations Total (logarithmic summation)				72	69	65
General Construction	Hand tools	81		67	63	60
	Tower Crane (C4.48)	76		62	58	55
	Pneumatic Circular Saw (D7.79)	75		61	57	54
	Internal fit – out	70		56	52	49
General Construction	Total		(logarithmic summation)	69	66	62
Landscaping	Dozer (C2.13)	78		64	60	57
	Dump Truck (C4.2)	78		64	60	57
	Surfacing (D8.25)	68		54	50	47
Landscaping Total (logarithmic summation)				67	64	60

Considering the calculated construction noise levels, the following impacts are predicted:

- When construction works are within 30m of the receptors it is expected that a potentially moderate to significant impact will occur. This is expected to impact NSL1 (Phase 1A and 1B of the masterplan, only if completed and operational during this construction stage) and NSL4 (rear of the dwellings on Dwyer Park) during periods where work is closest to the adjoining boundary.

- At distances greater than 45m from the identified receptors, no significant noise effects are anticipated across the site during the construction phase of the development.

It should be noted that the site spans approximately 500m in length and, hence, the vast majority of construction works will be undertaken at distances greater than 30 and 45m from the closest receptors.

10.4.2 Vibration

The main potential source of vibration during the construction programme is associated with piling and excavation works.

In order to assess potential vibration impacts at the closest sensitive buildings to the site works, a range of typical levels of vibration during augured piling have been determined through reference to published empirical data within BS 5228 – Part 2. The following vibration magnitudes associated with rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock are summarised below:

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Considering the low vibration levels at very close distances to augured piling rigs, and the increased distance to the closest receptor locations, vibration levels at the nearest receptors are not expected to pose any significance in terms of cosmetic or structural damage. At further distances from the works vibration magnitudes will dissipate further resulting in lower vibration levels to those noted above and hence are orders of magnitude below the limit values in Table 10-2. The vibration has the potential to be perceptible during periods where the work is closest to the receptor locations, however, it is not expected that it will be of such a magnitude to cause a significant impact. The resultant effect is negative, not significant and temporary.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in Table 10-2 during all activities. Mitigation and management of these works are discussed in Section 10.7.1.

10.5 Potential Noise Impacts during Operational Phase

10.5.1 Additional Vehicular Traffic on Public Roads

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads and junctions with and without the development. Traffic flow data in terms of the annual average daily traffic (AADT) figures has been assessed and the calculated change in noise levels during these two periods are summarised in Table 10-12, Table 10-13 and Table 10-14. Note that the change in noise levels calculated takes into account the entirety of the masterplan and hence can be considered a cumulative assessment.

Table 10-12 - Calculated change in traffic noise levels for Do Something scenario for year 2029

Route	Change in Noise Levels (dB)			
	A	B	C	D
J1	+1.3	0.0	+5.4	--

Route	Change in Noise Levels (dB)			
	A	B	C	D
J2	+0.2	0.0	+0.2	0.0
J3	+0.2	0.0	+0.2	0.0
J4	0.2	0.0	+0.2	0..
J5	0.0	+0.2	+0.2	+1.1
J6	+0.2	0.0	0.0	+1.4

Table 10-13 - Calculated change in traffic noise levels for Do Something scenario for year 2034

Route	Change in Noise Levels (dB)			
	A	B	C	D
J1	+1.3	0.0	+10.8	--
J2	+0.2	0.0	+0.2	0.0
J3	+0.2	0.0	+0.2	0.0
J4	+0.2	0.0	+0.2	0.0
J5	0.0	+0.2	+0.2	+1.1
J6	+0.2	0.0	0.0	+1.5

Table 10-14 - Calculated change in traffic noise levels for Do Something scenario for years 2044

Route	Change in Noise Levels (dB)			
	A	B	C	D
J1	+1.2	0.0	+10.3	--
J2	+0.2	0.0	+0.2	0.0
J3	+0.2	0.0	+0.2	0.0
J4	+0.2	0.0	+0.2	0.0
J5	0.0	+0.1	+0.2	+1.0
J6	+0.2	0.0	0.0	+1.4

The assessment indicates that a significant noise impact may occur at Junction 1, Arm C due to a change in noise level. All other assessed junctions indicate that noise impacts will be imperceptible to slight and not significant with reference to Table 10-3.

Given that Junction 1 Arm C is indicating a significant effect due to the change in noise level, it is appropriate to undertake a more detailed calculation to predict the noise level from road traffic at the receptor locations near to this junction.

The noise level associated with an event of short duration, such as a passing vehicle movement, may be expressed in terms of its Sound Exposure Level (LAX). The Sound Exposure Level can be used to calculate the contribution of an event or series of events to the overall noise level in a given period.

The appropriate formula is given below:

$$L_{Aeq,T} = L_{AX} + 10\log_{10}(N) - 10\log_{10}(T) + 10\log_{10}(r_1/r_2) \text{ dB}$$

where:

$L_{_}$ is the equivalent continuous sound level over the time period T (in seconds);

L_{AX} is the “A-weighted” Sound Exposure Level of the event considered(dB);

N is the number of events over the course of time period T;

r_1 is the distance at which LAX is expressed;

r_2 is the distance to the assessment location.

The assumed mean value of Sound Exposure Level for cars and HGV's is in the order of 73 dB L_{AX} and 88 dB L_{AX} respectively at a distance of 5 metres. These values have been used to calculate the noise levels as a result of cumulative road traffic with the proposed development place and the full development of the masterplan lands.

The resultant noise level calculated for receptors close to Junction 6 Arm C is 54 dB. Consequently, whilst the change in noise level can be described as significant, the overall noise level from the junction remains typical when considered in the context of an urban area and the local noise environment and hence, overall, a negative, not significant to slight, long-term effect is calculated.

10.5.2 Mechanical and Electrical Plant

Once operational, there will be building services plant items required to serve the development. These items of plant will be designed and located so that there is no negative impact on sensitive receivers within the development itself or on nearby sensitive receptors. The cumulative operational noise level from building services plant at the nearest noise sensitive locations external to the development will be designed/attenuated to meet the relevant BS 4142 noise criteria for day and night-time periods provided in Table 10-15 below. The criteria has been selected so that the noise from items of plant does not cause an adverse impact, as per the BS4142 rating system. When plant noise is controlled to these levels the effect is calculated to be negative, not significant and long-term.

Table 10-15 - Proposed Noise Criteria for Plant Noise

Day, dB $L_{Aeq,1hr}$	Night, dB $L_{Aeq,15min}$
45	37

10.5.3 Event Room Breakout Noise

The hotel portion of the development contains an event room and exercise room on the ground floor. At this stage it is not possible to predict the level of noise break-out from potential sources within the development. However, it is recommended that a comprehensive review of this issue should be undertaken during the design stage, prior to the development becoming operational. During this review the sound shall be so controlled that its level at any adjacent noise sensitive location shall not cause the ambient (measured in the absence of said sound) to increase, when assessed over 5 minute back to back periods. Similar criteria shall apply to the 63Hz & 125Hz octave band levels.

In relation to break-out noise from activity in the event room, the potential criteria discussed in Section 10.2.5 is considered appropriate here. Break-out noise will need be controlled to a level some 10 dB below prevailing ambient noise levels. Current baseline noise levels are expected to be lower than those when the development is in operation, hence, when the local infrastructure is sufficiently developed such that a more representative picture of the future noise environment within the development itself occurs it is recommended that an additional noise survey is undertaken to calculate appropriate noise thresholds in accordance with the criteria discussed in Section 10.2.5.

10.5.4 Inward Noise Assessment (ProPG Stage 1 – Noise Risk Assessment)

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 10.2 presents the basis of the initial noise risk assessment. It provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

Paragraph 2.9 of ProPG states that,

“The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a “typical worst case” 24 hour day either now or in the foreseeable future.”

In this instance a 3D computer noise model of the development site has been developed to predict the noise levels across the entire site in order to investigate the initial noise risk. Noise levels measured on site will be used to validate the model.

10.5.4.1 Model Validation

Noise levels recorded or calculated from the baseline noise survey were used to calibrate the noise model. It is considered that a strong correlation in respect of predicted noise levels has been achieved. Noise levels are calculated over daytime periods, (07:00 to 19:00 hrs) and night-time periods (23:00 to 07:00 hrs). Table 10-16 details the results of the noise model predictions and compares them to the measured values at the survey location.

Table 10-16 - Noise Model Validation

Location	Period	Measured (dB L _{Aeq})	Predicted in Model (dB L _{Aeq})
UN1	Day	57	58
	Night	53	53

10.5.4.2 ProPG Stage 1 - Noise Risk Assessment Conclusion

Giving consideration to the measured and predicted noise levels presented in the previous sections the site noise risk assessment has concluded that the level of risk across the site varies from negligible to medium noise risk.

ProPG states the following with respect to negligible to medium risks:

Negligible Risk These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

Low Risk At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

Medium Risk As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.

Given the above it can be concluded that the development site may be categorised as Negligible to Medium Risk and as such an Acoustic Design Strategy will be required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development.

It should be noted that ProPG states the following with regard to how the site noise risk assessment is to be used,

“2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design.”

Therefore, following the guidance contained in ProPG does not preclude residential development on sites that are identified as having medium noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitably designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

Note that in addition to the noise from rail pass-bys in the future there is the potential for noise from the proposed Bray sustainable transport bridge (ref PRR 21/869) which when operational may hold public transport such as buses and the LUAS. Future noise emissions from this development have been taken into account in the application of mitigation measures, however, given the limited detail available on traffic movements for the development it is not possible to derive a future noise level through calculation. Instead a conservative estimate has been made and a mitigation level applied to account for a potentially busy transport route.

10.5.5 Acoustic Design Strategy (ProPG Stage 2)

10.5.5.1 Façade Noise Levels

Noise levels have been predicted across the site during day and night-time periods with the proposed buildings in place. Where façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night it is possible to achieve reasonable internal noise levels while also ventilating the dwellings with open windows. Therefore, for those properties where the façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night no further mitigation is required.

Where façade levels are above these levels the sound insulation performance of the building façade becomes important and a minimum sound insulation performance specification is required for windows and vents to ensure that the internal noise criteria are achieved.

Red and Blue highlights in **Figure 10-5** identify façades where the noise levels are above these levels and where mitigation in the form of enhanced glazing and ventilation will be required. These affected façades face on to either the rail track to the east or the access road for the development. Two specifications of insulation are identified for these enhanced façades, these are discussed in Section 10.7. Note that any façade that is not highlighted has been predicted to fall below 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night, therefore mitigation is not required for these façades.



Figure 10-5 - Facades Requiring Enhanced Acoustic Specification (Highlighted in Red and Blue)

Balcony areas for Block E that face onto the rail tracks, and balcony spaces overlooking the access road are expected to exceed the recommended noise levels for external areas by 2 to 3 dB, however, the ProPG document allows for the impact of higher than desirable external noise levels to be offset through assessment of a hierarchy of measures including “a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings” or “a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)”. In this instance each block has communal external areas specific to the block where residents have access to areas meeting the external noise thresholds.

All other private external areas other than those previously stated are predicted to meet the external noise thresholds. It is considered that the objective of achieving suitable external noise levels is achieved within the overall site.

10.5.6 Inward Vibration Assessment

Table 10-17 presents the calculated VDV for day and night-time when taking account of the maximum measured VDV. The results indicate that vibration levels will be below the value where a low probability of adverse comment would be expected as defined within BS 6472-1 (2008). The results suggest that vibration mitigation measures are not necessary based upon a review of measured and calculated VDV values.

Whilst vibration levels may be perceptible at low levels during passing of commuter trains, comparison of the overall vibration dose value at the location of the building with the thresholds presented in Table 10-6 indicates that vibration will be at a level whereby an adverse comment would not be expected. The effect is considered to be negative, not significant and long-term.

Table 10-17 - Calculated VDV

Period	No. of Occurrences of Event	Calculated VDV Using Highest Measured Value
Daytime Period (07:00 to 23:00 hours)	223	0.16
Night-time Period (23:00 to 07:00 hours)	7	0.07

10.6 Do Nothing Scenario

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and across the development site itself will remain largely unchanged. The noise levels measured/noted during the baseline studies are considered representative of the Do-Nothing scenario. The Do-Nothing scenario is therefore considered to have a neutral impact.

10.7 Mitigation Measures

10.7.1 Construction Phase

With regard to construction activities, best practice control measures from construction sites within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2 will be used to control noise and vibration impacts. The implementation of all best practice noise and vibration control

methods will ensure potential impacts to nearby residential noise sensitive locations are not significant. This will be particularly important during excavation and foundation construction which are likely to be the activities to have the highest potential noise and vibration impact.

Noise-related mitigation methods are described below and will be implemented for the project in accordance with best practice. These methods include:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;
- During construction, the contractor will manage the works to comply with noise limits outlined in BS 5228-1:2009+A1 2014. Part 1 – Noise;
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures;
- Limiting the hours during which site activities which are likely to create high levels of noise or vibration are permitted; and,
- Monitoring levels of noise and vibration during critical periods and at sensitive locations (i.e. at the boundary between the development site and the school and residential buildings).

Furthermore, it is envisaged that a variety of practicable noise and vibration control measures will be employed. These will include:

- Selection of plant with low inherent potential for generation of noise and/ or vibration;
- Erection of good quality site hoarding to the site perimeters adjacent to sensitive receptors which will act as a noise barrier to general construction activity at ground level;
Erection of barriers as necessary around items such as generators or high duty compressors, and;
- Situate any noisy plant as far away from sensitive properties as permitted by site constraints.

10.7.2 Operational Phase – Mechanical and Electrical Plant

As part of the detailed design of the development, plant items with appropriate noise and vibration ratings and, where necessary, appropriately selected remedial measures (e.g. enclosures, silencers, anti-vibration mounts etc.) will be specified in order that the adopted plant noise criteria is achieved at the façades of noise sensitive properties, including those within the development itself.

10.7.3 Operational Phase – Event Room Breakout Noise

A noise survey is recommended when future local infrastructure is developed and operational so that appropriate noise thresholds can be set for event noise at local receptors. In addition, as part of the detailed design of the hotel, it is recommended that appropriate noise control measures are considered for the event room, such as enhanced sound insulation for the facades in order to minimise the potential for noise breakout. The specifications for the design would be informed by the expected level of noise internal to the event room.

10.7.4 Operational Phase – Inward Noise (Acoustic Design Strategy Part 2)

As is the case in most buildings, the glazed elements and ventilation paths of the building envelope are typically the weakest element from a sound insulation perspective. In general, all wall constructions (i.e. blockwork or concrete and spandrel elements) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal.

In this instance the facades highlighted in Figure 10-5 will be provided with upgraded acoustic glazing and ventilation that achieves the minimum sound insulation performance as set out in Table 10-18 and Table 10-19. Other facades in the development have no minimum requirement for sound insulation.

The sound insulation specifications are expressed in the following units:

R_w Weighted Sound Reduction Index – This is the value of the sound insulation performance of a partition or element measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature typically presents sound insulation data in terms of the R_w parameter.

$D_{n,e,w}$ Weighted element-normalized level difference. This is the value of sound insulation performance of a ventilator measured under laboratory conditions. It is a weighted single figure index that is derived from values of sound insulation across a defined frequency spectrum. Technical literature for acoustic ventilators typically presents sound insulation data in terms of the $D_{n,e,w}$ parameter.

Table 10-18 - Sound Insulation Performance Requirements for Upgraded Acoustic Glazing, SRI (dB)

Façade Ref	SRI (dB) per Octave Band Centre Frequency (Hz)						dB R_w
	125	250	500	1k	2k	4k	
Red	26	27	34	40	38	46	38
Blue	25	22	33	40	43	44	36

Table 10-19 - Sound Insulation Performance Requirements for Upgraded Acoustic Ventilation, SRI (dB)

Façade Ref	SRI (dB) per Octave Band Centre Frequency (Hz)						dB $D_{n,e,w}$
	125	250	500	1k	2k	4k	
Red & Blue	31	33	42	43	39	44	42

It is important to note that the acoustic performance specifications detailed herein in Table 10-18 and Table 10-19 are minimum requirements which apply to the overall glazing and ventilation systems. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

The assessment has demonstrated that the recommended internal noise criteria can be achieved through consideration of the proposed façade elements at the detailed design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage,

consequently, these may be subject to change as the project progresses. The overriding factor is that suitable glazing and ventilation systems are selected at design stage so that the internal noise levels presented in Section 10.2.6 are achieved.

10.8 Residual Impacts

10.8.1 Construction Noise

When construction works are undertaken within 30m of the receptors it is predicted that a negative, temporary and potentially significant impact may occur. It should be noted that this would be a worst case scenario where all items of plant are in operation within 30m of the identified receptors.

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Negative	Moderate to Significant	Temporary

When construction works are undertaken at a distance of 45m or more from the receptors the impact is predicted as negative, short-term and slight to moderate.

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Negative	Slight to Moderate	Short Term

10.8.2 Construction Vibration

Construction vibration impacts are as follows:

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Negative	Not Significant	Temporary

10.8.3 Additional Vehicular Traffic

The predicted impacts for Junction 6 Arm C are as follows:

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Neutral	Not Significant to Slight	Long Term

Effects at all other routes are predicted to be as follows:

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Neutral	Imperceptible to Slight	Long Term

10.8.4 Mechanical and Electrical Plant

The impacts are predicted as follows:

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Negative	Not Significant	Long Term

10.8.5 Inward Noise Impact

The impacts are predicted as follows:

<i>Quality</i>	<i>Significance</i>	<i>Duration</i>
Neutral	Not Significant	Long Term

10.9 Monitoring Requirements

There is a requirement to ensure that construction activities operate within the noise and vibration limits set out within this EIAR. There is also a requirement to undertake regular noise and vibration monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded. Noise monitoring shall be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Vibration monitoring shall be conducted in accordance with BS 6472 for human disturbance and BS ISO 4866:2010 for building damage.

10.10 Difficulties encountered during the preparation of this chapter

No particular difficulties were encountered when preparing this chapter.