7.3.6 Site Hydrogeology and Groundwater Levels

Groundwater strikes were generally not encountered within cohesive deposits during drilling with strikes recorded at three of the ten boreholes at depths ranging from 5.6mbGL (BH1) to 8.0mbGL (BH3 and BH10) . Groundwater monitoring standpipes were installed in five boreholes (locations shown in Figure 7.4) which allowed for the equilibrium groundwater level to be recorded. The groundwater levels recorded by Ground Investigations Ireland Ltd.(2015) are provided in Table 7-5 and Figure 7-4:

Based on the measured groundwater levels, groundwater flow direction is inferred to be to the east towards Dublin Bay which is consistent with the flow for the Dublin GWB. As noted in the site investigation report given the proximity of the Site to the coast groundwater levels would be expected to vary with the time of year, tidal influence, rainfall and other factors and while longer term data was not provided in the report, these potential variations in groundwater level are considered in this assessment (refer to Section 7.5).

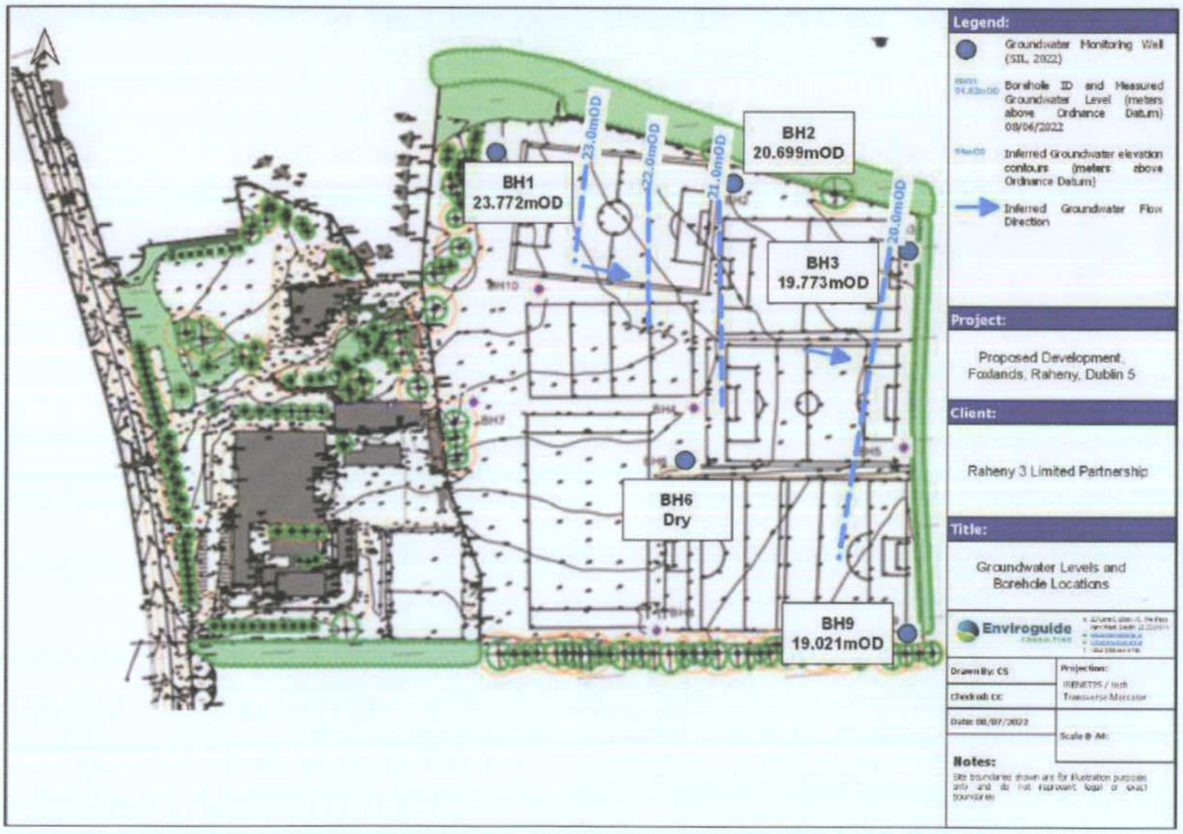

Figure 7-4 Groundwater Levels and Inferred Flow Direction (GIL, 2015)

Table 7-5 Groundwater Levels Measured Onsite (GIL, 2015)

Monitoring Location ID	Groundwater Strike During Drilling	Groundwater Level (mbGL)	Groundwater Level (mOD)
BH1	5.60	1.08	23.772
BH2	-	1.79	20.699
BH3	8.0	2.17	19.773
BH6	-	Dry	-
BH9	-	2.4	19.021

7.3.7 Hydrology

The Site is located within the Liffey and Dublin Bay Catchment (Catchment ID 09) and the Mayne SC_010 sub-catchment (Sub-Catchment ID 09_17).

The closest surface water course to the Site is the Naniken Stream (IE_EA_09S011100, Segment Code: 09_1469 and Waterbody name: Santry_020) adjoins the northern boundary of the Site and flows east and discharges to the Tolka Estuary transitional waterbody (IE_EA_090_0200) at James Larkin Road approximately 500m south of the Bull Island Causeway Road.

The Santry River is located 0.7km north of the Site (IE_EA_09S011100, Segment Code 09_2174 and Waterbody name: Santry_020) which flows east and discharges to the North Bull Island transitional waterbody (IE_EA_090_0100) immediately north of the Bull Island Causeway Road.

The Tolka River (IE_EA_09T011150) discharges to the Tolka Estuary transitional water body 4.4km west of the Site and the Toka Estuary is located 1.1km south of the Site. The Liffey Estuary Lower transitional waterbody (IE_EA_090_0100) is located approximately 3km south of the Site.

The surface water courses and relevant other water bodies within 2km of the Site described in Table 7-9 and presented in Figure 7-6.

7.3.8 Site Drainage

The site is currently greenfield and falls within the catchment of the Naniken Stream, located approximately 100m north of the site. Surface water currently infiltrates the ground, and any excess surface water flows overland and discharges onto the adjacent roads and ultimately to the existing public drainage network.

The existing foul network is comprised of a 1,350mm diameter North Dublin Drainage Scheme Trunk Sewer that discharges in an easterly direction immediately south of the site. There are also existing sewers in the Meadows development at the north-west of the site which connects to an existing 225mm sewer in Howth Road. There is no foul water sewer in Sybil Hill Road at the site entrance.

7.3.9 Flooding

A Site-Specific Flood Risk Assessment Report (SSFRA) has been produced for the Proposed Development Site (Waterman Moylan, 2022a).

The SSFRA concludes that the likelihood of tidal flooding is "extremely low" and no mitigation is required. Similarly, there is no mitigation required for fluvial flooding as the likelihood of its occurrence is also identified as "extremely low".

The SSFRA identifies a likelihood of flood "ranging from low to high" for pluvial (private and public drainage networks). Mitigation measures outlined to address the potential risk of pluvial flooding include implementing appropriate drainage design, SuDS and attenuation design, setting appropriate floor levels and overland flood routing.

The likelihood of groundwater flooding is identified as "low" and an overall residual risk is identified as "low" if appropriate mitigation measures are put in place including setting appropriate floor levels, flood routing and damp proofing membranes.

The SSFRA concludes that "As a result of the proposed mitigation measures, the residual risk of flooding from any source is low" (Waterman-Moylan, 2021).

7.3.10 Water quality

7.3.10.1 Surface Water Quality

The data for the EPA surface water quality monitoring stations was consulted and relevant data pertaining to the Site was reviewed. The closest surface watercourse to the Site is the Naniken Stream and there are a number of monitoring stations on that water course. The closest EPA monitoring stations relevant to the Site are shown in Table 7-6 Surface Water Quality Monitoring Stations.

Table 7-6 Surface Water Quality Monitoring Stations

Station Name and Code	Distance from Site	River/Stream
Naniken Stream- St Anne's Park monitoring station (Station Code RS09N040100)	1.32km Downstream	Naniken Stream
Bettyglen monitoring station (Station Code RS09S011100)	1.48km Downstream	Santry River
Santry – Br on Main St Raheny station (Station Code RS09S011000)	1km Upstream	Santry River
Santry – Howth Rd Br Raheny monitoring station (Station Code Rs09S010900)	1km Upstream	Santry River

A river Q-value status "Bad" was assigned for the Bettyglen monitoring station in 1998 (EPA, 2022). There is no monitoring data available for the Naniken Stream.

Water quality data is available for an EPA monitoring station at Bettyglen. Water quality is reported as inert status for water quality with reported overall downward trend in the reported analytical results for Total Oxidised Nitrogen as N and Ammonia-Total as N while an upwards trend was seen for Ortho-phosphate as P for the period of 2013-2018 (EPA, 2022).

Table 7-7 Surface Water Quality Results for SW1

Parameter	Units	SW1 07/03/2019	SW1 04/04/2019	SW1 14/05/2019	SW1 27/06/2019
Ammonia as N	mg/l	0.256	0.288	1.270	0.102
CBOD5	mg/l O2	3	< 2	2	4
Cadmium	ug/l	< 0.2	< 0.2	0.3	< 0.2
Chlorine, Free	mg/l	< 0.010	< 0.010	0.020	< 0.010
Chloride	mg/l	42.744	34.099	36.478	32.097
Chromium	ug/l	1.2	< 0.9	1.1	< 0.9
Chromium VI	mg/l	< 0.020	< 0.020	< 0.020	< 0.020
Chromium III	mg/l	< 0.020	< 0.020	< 0.020	< 0.020
COD	mg/l O2	9	8	11	28
Conductivity @ 20°C	uS/cm @20 °C	600.0	495.0	526.0	575.0
Copper	ug/l	3.1	7.2	3.8	< 2.0
Fluoride	mg/l	0.3	0.4	0.4	0.5
Hardness as CaCO3	mg/l	341.135	230.386	249.329	291.779
Lead	ug/l	2.2	4.4	2.2	< 1.7
Nickel	ug/L	1.6	1.3	1.6	0.8
Arsenic – Total	ug/L	0.9	< 1.0	< 9.0000	< 1.0
Total Cyanide Low	ug/L	< 10.0000	< 0.7000	< 1.0	< 0.7000
Orthophosphate as P	mg/l	0.115	0.146	0.096	< 0.025
PH	pH Unit	7.84	7.91	7.64	8.11
Total Suspended Solids	mg/l	< 2	< 2	2	2
Zinc	ug/l	10.2	15.2	13.1	6.6

Table 7-8: Surface Water Quality Results for SW2

Parameter	Units	SW2 07/03/2019	SW2 04/04/2019	SW2 14/05/2019	SW2 27/06/2019
Ammonia as N	mg/l	0.163	0.144	0.618	0.083
CBOD5	mg/l O2	2	< 2	< 2	< 2
Cadmium	ug/l	< 0.2	< 0.2	0.4	0.3
Chlorine, Free	mg/l	< 0.010	< 0.010	< 0.010	< 0.010
Chloride	mg/l	48.961	35.624	35.882	30.953
Chromium	ug/l	1.1	< 0.9	< 0.9	< 0.9
Chromium VI	mg/l	< 0.020	< 0.020	< 0.020	< 0.020
Chromium III	mg/l	< 0.020	< 0.020	< 0.020	< 0.020
COD	mg/l O2	10	10	10	26
Conductivity @ 20°C	uS/cm @ 20 °C	620.0	506.0	632.0	570.0
Copper	ug/l	5.6	3.4	3.5	< 2.0
Fluoride	mg/l	0.3	0.4	0.4	0.4
Hardness as CaCO3	mg/l	349.416	230.136	247.782	289.799
Lead	ug/l	2.1	4.6	2.7	< 1.7
Nickel	ug/L	1.1	1.8	< 0.5	1.1
Arsenic – Total	ug/L	1.0	1.1	1.2	< 1.0
Total Cyanide Low	ug/L	< 10.0000	< 0.7000	< 9.0000	< 0.7000
Orthophosphate as P	mg/l	0.048	0.075	0.066	0.068
PH	pH Unit	7.95	8.14	7.65	8.11
Total Suspended Solids	mg/l	< 2	< 2	< 2	< 2
Zinc	ug/l	11.6	11.5	8.5	5.6

Surface water sampling was carried out by Enviroguide Consulting on the Naniken stream on four separate occasions; 07 March 2019, 04 April 2019, 14 May 2019 and 27 June 2019 and is considered representative of baseline conditions at the Site. The laboratory results for SW1 are set out in Table 7-7 and the results for SW2 are set out in Table 7-8. The laboratory reports are included in Appendix J.

Surface water results were compared to the Environmental Quality Standards (EQS) values set out in S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 as amended.

The laboratory results indicated that Ammonia as N ranged between 0.102 and 1.270 mg/l as N which is in excess of the EQS for both upstream and downstream samples. Reported concentrations of Orthophosphate as P ranged between <0.02 and 0.146mg/l with higher concentrations at the upstream (SW1) location and exceedances of the EQS of 0.035mg/l as P (for Good Status).

All other analysed parameters were within the EQS limits.

7.3.10.2 Groundwater Quality

The EPA groundwater monitoring data was reviewed and there are no groundwater quality monitoring stations within 2km of the Site (EPA, 2022) however the EPA has assigned a 'Good' status to the groundwater within the Dublin GWB (refer to Section 7.3.12).

7.3.11 Water Use and Drinking Water Source Protection

There are no surface water features delineated as drinking water rivers or lakes in accordance with European Communities (Drinking Water) (No. 2) Regulations 2007 (SI no. 278/2007) within 2km of the Site. The bedrock aquifer of the Dublin GWB is delineated as a drinking water source.

There are two recorded groundwater sources within a 2km radius of the Proposed Development site (GSI, 2022) located 2.5km northwest of the Site at Coolock identified as being for "industrial use" with unknown groundwater yield. The locations of these wells are shown in Figure 7-5.

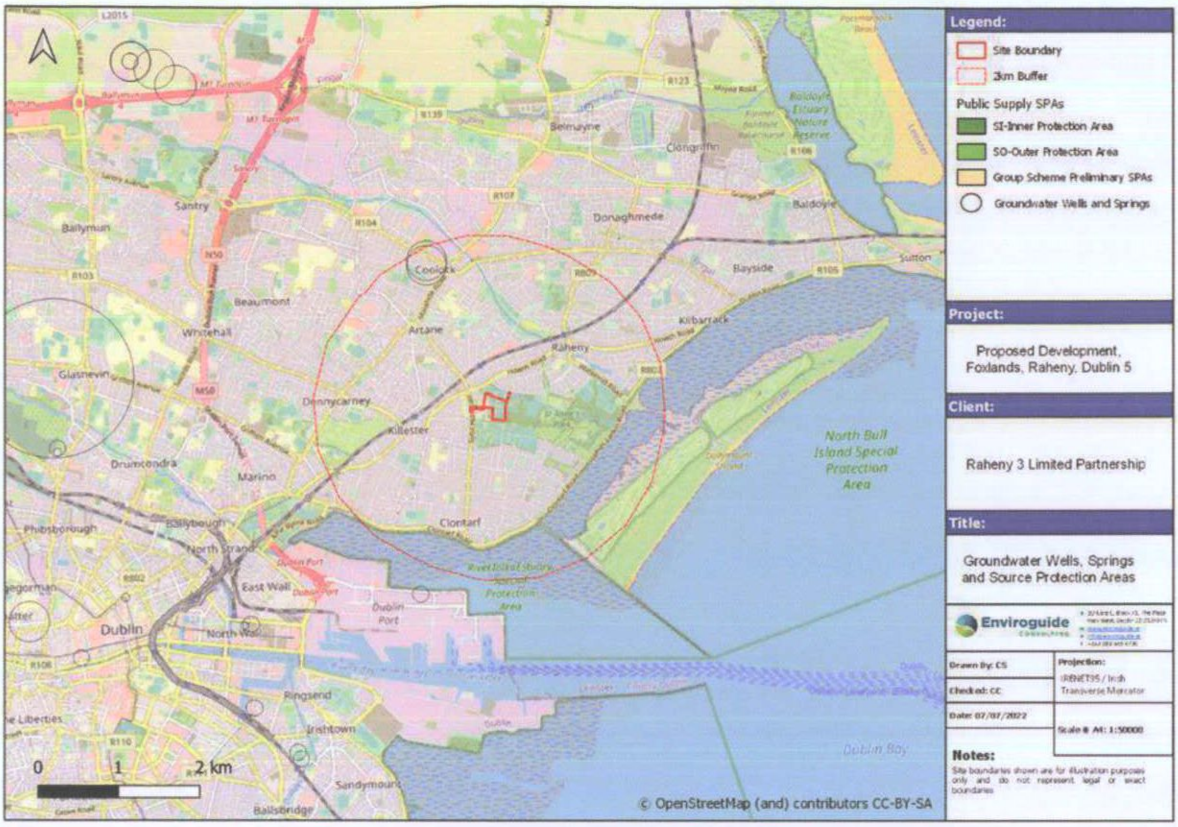

Figure 7-5 Groundwater Sources

7.3.12 Water Framework Directive Status

The Waterbody Status for river, groundwater and coastal water bodies located within a 2km radius of the Proposed Development Site and any water bodies considered to be hydraulically connected to the Site as recorded by the EPA (2022) in accordance with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003) are provided in Table 7 9 and shown in Figure 7-6. There are no identified unassigned water bodies within the study area of 2km or hydraulically connected to the Site.

Table 7-9: WFD Risk and Water body Status

Waterbody Name	Water body; EU code	Location from Site	Distance from Site (km)	WFD water body status (for the period of 2013-2018)	WFD 3rd cycle Risk Status	Hydraulic Connection to the Site
Surface Water Bodies						
Naniken Stream	IE_EA_09S01 1100	East	0.24	Moderate	At Risk	Adjoining the Site
Santry River	IE_EA_09S01 1100	North	1.2	Moderate	At Risk	Cross-gradient of the Site.
Coastal Water Bodies						
Dublin Bay	IE_EA_090_0 000	East	N/A	Good	Not at Risk	Potential distal connection.
Groundwater Bodies						
Dublin Groundwater Body	IE_EA_G_008	N/A	N/A	Good	Review	Underlying groundwater-body
Transitional Water Bodies						
Tolka Estuary	IE_EA_090_0 200	East	1.1	Moderate	At Risk	Downgradient and downstream of Site.
North Bull Island	IE_EA_090_0 100	East/ Northeast	1.5	Moderate	Review	Potential distal connection

Figure 7-6 Groundwater and Surface Water bodies and WFD Status

7.3.13 Designated Sites

There are a number of designated sites (Natura 2000 sites- Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) and other protected sites including Natural Heritage Areas (NHA) within a 15km radius of influence of the Site and details of these are provided in Chapter 5 (Biodiversity) of this EIAR the Natura Impact Statement (Enviroguide Consulting, 2022) prepared for the Proposed Development and the locations of these sites are shown in Figure 7-7.

The closest designated and protected sites with and those with a potential hydraulic connection to the Proposed Development Site are summarised in Table 7-10.

Table 7-10 Designated and Protected Sites with Hydraulic Connection to the Site

Site Name & Code	Direction from Site	Distance to Site	Hydraulic Connection to Site
Special Areas of Conservation			
Howth Head SAC (000202)	East	6.03km	Connection via groundwater/surface water/coastal water.

Site Name & Code	Direction from Site	Distance to Site	Hydraulic Connection to Site
Rockabill to Dalkey Island SAC (003000)	East	6.59km	Connection via groundwater/surface water/coastal water.
Ireland's Eye SAC (002193)	Northeast	8.8km	Connection via groundwater/surface water/coastal water.
North Dublin Bay SAC (000206)	East	2.6km	Connection via groundwater/surface water/coastal water.
Special Protection Areas			
Howth Head Coast SPA (004113)	East	9.4km	Connection via groundwater/surface water/coastal water.
Ireland's Eye SPA (004117)	East	1.75km	Connection via groundwater/surface water/coastal water.
North Bull Island SPA (004006)	East	1.75km	Connection via groundwater/surface water/coastal water.
North Dublin Bay SPA (004006)	East	1.2km	Connection via groundwater/surface water/coastal water.
Natural Heritage Areas (NHAs)			
There are no NHAs within 15km of the proposed development			
Proposed Natural Heritage Areas (pNHAs)			
Howth Head (000202)	Northeast	5.69km	Connection via groundwater/surface water/coastal water.
Ireland's Eye (000203)	Northeast	8.64km	Connection via groundwater/surface water/coastal water.
North Dublin Bay (000206)	South	1.56km	Connection via groundwater/surface water/coastal water..

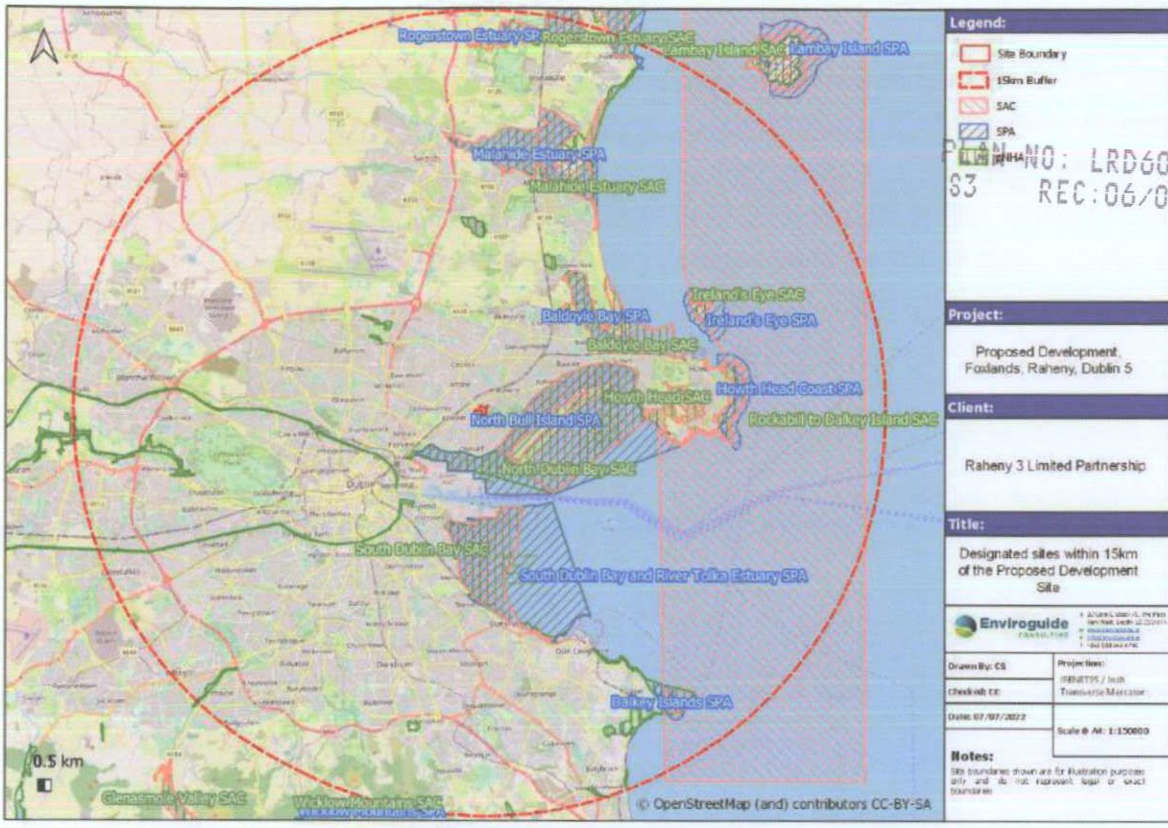

Figure 7-7 European Sites within 15km of the Proposed Development Site

7.3.14 Importance of the Receiving Environment

Surface water at the Site currently either infiltrates the ground or migrates offsite as overland flows. As outlined in Section 7.3.6 groundwater flow direction beneath the Site is to the east discharging to the Irish Sea.

In accordance with the criteria outlined in Table 7-1 and taking account of the hydrogeological setting of the Site, the attributes are considered to be of Low to Moderate importance based on the classification of the bedrock aquifers beneath the Site as Locally Important and Moderate. It is also noted that the GSI vulnerability rating for the Site is Low.

The receiving water bodies have been assigned a WFD Status of 'good' for groundwater, and 'good' for coastal water however, the surface water bodies in the vicinity of the Site are 'Moderate'.

7.4 Characteristics of the Proposed Development

7.4.1 General Description

The Proposed Development will consist of the construction of a residential and nursing home development set out in 7 No. Blocks, ranging in height from 4-7 storeys to accommodate 580 No. apartments, residential tenant amenity spaces, a creche and a 100-bed nursing home. The site will accommodate car parking spaces, bicycle parking spaces, storage, services and plant areas at both basement and podium level with vehicular and pedestrian access from Sybil Hill Road, via a proposed new access road. Landscaping will include extensive communal amenity areas, and a significant public open space provision. This is set out as follows:

- The 7 no. residential buildings include 6 no. apartment blocks and 1 no. mixed-use block ranging in height from 4-7 storeys to accommodate 580 no. apartments, residential tenant amenity spaces, a creche and a 100-bed nursing home. The breakdown of residential accommodation is as follows:
    - Block A accommodates 61 no. apartments comprising of 31 no. 1 bed units, 25 no. 2 bed units and 5 no. 3 bed units;
    - Block B accommodates 70 no. apartments comprising of 44 no. 1 bed units and 26 no. 2 bed units;
    - Block C accommodates 112 no. apartments comprising of 46 no. 1 bed units, 57 no. 2 bed units and 9 no. 3 bed units;
    - Block D accommodates 136 no. apartments comprising of 56 no. 1 bed units, 58 no. 2 bed units and 22 no. 3 bed units;
    - Block E accommodates 96 no. apartments comprising of 47 no. 1 bed units, 46 no. 2 bed units and 3 no. 3 bed units;
    - Block F accommodates 36 no. apartments comprising of 23 no. 1 bed units, 9 no. 2 bed units and 4 no. 3 bed units;
    - Block G (Mixed-Use) accommodates 69 no. apartments comprising of 25 no. 1 bed units, 27 no. 2 bed units and 17 no. 3 bed units. It also accommodates a nursing home with 100 no. bed spaces and a creche with 6 no. classrooms.
- The Proposed Development will include three single basements under Block C, D and G. Basements in Block D and G will be used for car parking while the basement under Block C will be used as a plant room.
- The Proposed Development will accommodate 520 no. car parking spaces and 1,574 no. cycle spaces (both residential and visitor).
- The residential amenity space will include a gym, concierge, lounge and workspace, games room, screen room, flexibly spaces and building management.
- 31.15% of the site area will be allocated as public open space.
- All blocks will be provided with a bin store except Blocks D and C which will have compactors.

7.4.2 Construction Phase

The Construction Proposed Development will require:

- Demolition waste from the existing prefabricated/modular buildings.
- Bulk excavation to reduce levels to construct the basements beneath Block C, D and G and the surface water drainage including an attenuation tank. The proposed invert levels and floor levels of the basements are summarised in Table 7-11.
- Construction of foul and storm water drainage and mains water connection.
- It is proposed to drain wastewater from the site by gravity to the existing 1,350mm wastewater sewer at the south-eastern corner of the site.

- In-stream works will be carried out with the construction of a pre-cast headwall for the surface water outfall to the Naniken Stream.

Table 7-11 Groundwater Monitoring Levels and Underground Structure Depth

Drainage or Structure Name	Invert Level/ Finished Floor Level (mOD)	Groundwater Level (mOD)
Storm Water Attenuation Tank	20.16	Dry
Basement Block C	19.825	20.699
Basement Block D	19.825	Dry
Basement Block G	19.30	19.021

7.4.3 Operational Phase

The following is extracted from the Engineering Assessment Report (Waterman Moylan, 2022).

Foul water from the Proposed Development will have capacity within the existing foul sewer network which has been confirmed by Irish Water in the Confirmation of Feasibility letter dated 9 December 2021. The Confirmation of Feasibility letter states that Irish Water has no objection to the proposals. The request for a Statement of Design Acceptance was submitted to Irish Water on 30th June 2022 and is currently pending (Refer to Appendix A and Appendix B of the Engineering Assessment Report; Waterman Moylan, 2022). Foul water from the Proposed Development will ultimately be treated at Ringsend WwTP and discharged to Dublin Bay. All below ground foul sewers will be constructed in accordance with current Irish Water requirements and all drains will be laid in compliance with current Building Regulations and the recommendations contained in the Technical Guidance Document H.

Internal drainage within the basement areas will generally drain by gravity via slung drainage to be strapped to the underside of the ground floor slab within a dedicated service zone and by gravity below ground to its outfall location in all other areas. The basements will not generate any foul water, and no pumping is proposed.

It is proposed to discharge surface water from the Site to the Naniken Stream. Discharge will be restricted to the greenfield equivalent runoff rate via a Hydrobrake or similar approved flow control device. The surface water network will be designed to accommodate the 1-in-5 year storm, with attenuation storage provided for the 1-in-100 year storm. Excess runoff will be attenuated in an underground storage tank located between Blocks D and F, south of Block E.

Surface water will pass through a Class 1 by-pass petrol interceptor prior to discharge to the Naniken (Waterman Moylan, 2022 Drg. No. P200).

A Storm Water Management Plan will be incorporated through the use of numerous SuDS techniques to treat and minimise surface water runoff from the site. The methodology used to develop a Storm Water Management Plan is based recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual (CIRIA C753). The following attenuation and SUDS measures will be incorporated into the Proposed Development as detailed in the Engineering Assessment Report (Waterman Moylan, 2022):

- Permeable paving
- Filter drains throughout Site
- Extensive green roofs on the buildings
- Tree pits located throughout the Site
- Underground attenuation tank
- Flow control device (Hydrobrake or similar) and
- Class 1 Bypass petrol interceptor located prior to outfall to Naniken Stream

7.5 Potential Impact of the Proposed Development

7.5.1 Construction Phase

Hydrogeological Flow Regime

Surface water currently discharges from the Site to the adjoining Naniken Stream and infiltrates through the unpaved surfaces. The Site is predominantly unpaved and there will be excavated and stripped soil during the construction phase however there will overall be an increase in hardstand areas (buildings, paved surfaces) introduced to the site during the post construction (Operational Phase) of the Proposed Development with 40% of the Site paved (Waterman Moylan, 2022). This could impact on the recharge potential at the Site but this will be only a localised area of the aquifer. Taking account of the urban setting of the Site, the limited potential for recharge into bedrock aquifer (which has a recharge coefficient of 7.5% of effective rainfall (GSI, 2022)) and the fact that 60% of the Site will remain unpaved wit there will be no overall impact on groundwater recharge to the bedrock aquifer within the Dublin GWB associated with the Proposed Development.

Based on the available data, there will be no requirement for large-scale dewatering of groundwater across the entire Site. There will be a requirement for localised dewatering during the construction of basements and other subsurface structures, in particular basement at Block C. However taking account of the potential variations in groundwater levels (refer to Section 7.3.6, Table 7-5 and Table 7-11) there is potential that groundwater may be locally encountered during deeper excavations required to construct the basements at Block D and Block G. Management of surface runoff and localised perched groundwater will be required in particular during wet weather.

There will be no abstraction of surface water or groundwater for use on site during works (i.e., dust suppression, welfare facilities, drinking water). Water supply will be from mains supply in accordance with a connection agreement from Irish Water and therefore there will be no associated impact on local water resources at the Site

Overall, it is considered that any impact on the hydrogeological regime of the locally important aquifer is unavoidable and there will be a 'negative', 'imperceptible', 'temporary' ('long-term' during the Operational Phase) within a very localised zone of the aquifer only and there will be no impact on the flow regime of receiving surface water bodies.

Water Quality

The potential sources of contamination that could impact on water quality associated with the Construction Phase include:

- Demolition of existing pre-fabricated structures and groundworks including bulk excavation of soil and sediment will be necessary for construction of the basements and other subsurface infrastructure including drainage. The handling, stockpiling, reprofiling and removal offsite of soils could result in generation of excessive suspended solids in surface water runoff.

- Instream and near stream works will be required to construct the surface water outfall to the Naniken Stream that could result in release of cementitious materials, suspended sediments or other contaminant to the water course.
- Storage and use of fuel, oils and chemicals used during construction that are classified as hazardous. If the accidental release of hazardous material including fuels, chemicals and materials being used on-site, through the failure of secondary containment or a materials handling accident, were to occur over open ground then these materials could infiltrate to the underlying groundwater or migrate via surface water runoff to offsite water courses.
- Imported materials including fill materials that are not of the appropriate quality could result in leaching or runoff of contaminants to the water environment.
- Export of waste materials from the Site to unauthorised facilities could result in an impact on water quality at the receiving / destination site.
- Discharges or leaks from temporary welfare facilities could introduce contaminants to the water environment.
- Wheel washing discharges that could be contaminated with hydrocarbons, brake dust, metals, road salt, cleaning agents and other traffic residue.
- Leaks and spills of substances during storage, transport, use and/or disposal. The introduction of drilling fluids through piling (foundation type to be confirmed).
- Construction of foundations including where piled foundations required could introduce a preferential pathway to groundwater for surface contaminants on Site where groundwater may be exposed or result in the release of contamination from drilling fluids or other construction materials (e.g. cementitious materials) to the subsurface.
- Release of wash water from the wheel-wash could result in localised introduction of contaminants including hydrocarbons and suspended solids to the receiving water environment.

The key pathways and pollutant linkages are:

- Infiltration of surface contaminants to ground and groundwater and offsite migration to:
  - Groundwater
  - Surface water (Naniken Stream)
  - Transitional / Coastal water (Tolka Estuary and associated coastal water bodies within Dublin Bay)
- Surface water runoff to
  - Surface Water (Naniken Stream)

- Transitional / Coastal water (Tolka Estuary and associated coastal water bodies within Dublin Bay via the Naniken Stream)

The potential risk to the receiving water is considered in the absence of standard and appropriate construction management and mitigation measures that will be in place.

The release of suspended solids entrained in surface runoff directly from the Site or from haul routes to/from Site could enter the receiving water could potentially result in a 'negative', 'significant' 'short-term' impact on receiving water quality within the Naniken Stream and receiving water in Tolka Estuary.

There is a potential risk associated with the cementitious materials or other hazardous compounds used during construction works including piling, basements and attenuation tank construction, foul water drainage, surface water discharge drainage, permeable pavements and other structures impacting on the underlying groundwater at the Site which may result in a 'negative', 'significant' and 'medium-term' impact on the receiving water environment at the Proposed Development.

In-stream works will be required for the installation of the outfall to the Naniken Stream. Where possible, the design for these structures includes the use of pre-cast concrete thereby reducing the risk of any direct impact to water quality. Wet concrete works will be avoided however there may be a requirement for concrete pours and the use of cementitious materials during the installation of the outfall and therefore a potential risk to the receiving water quality. The use of plant and equipment near or in the stream could result in release of suspended sediment or drips and leaks of hydrocarbons (fuel and lubricants) to the water course. Overall, the use of cementitious material at the Proposed Development Site may result in a 'negative', 'significant' and 'long-term' impact on the receiving water of the Naniken Stream and downstream water bodes at the Tolka Estuary.

There is a potential risk for the mobilisation or introduction of contaminants (i.e., grout, drilling fluids) during piling works whereby a preferential conduit for contaminants to migrate downwards to groundwater could be introduced with potential for migration off-site. It is considered that there could be a 'negative', 'moderate' and 'medium term' impact on the existing groundwater quality and receiving surface water.

All surplus materials and waste will require removal offsite. Waste management for the Construction Phase is set out in the Construction and Demolition Waste Management Plan (CDWMP) (Waterman Moylan, 2022) and assessed in Chapter 12 Material Assets of this EIAR. However, in the unlikely event that surplus soil or other waste materials are directed to an unauthorised location there is potential for a 'negative', 'moderate' and 'medium-term' impact on the water quality at any receiving unauthorised locations.

In the event of a worst-case scenario such as a fuel spill or release of other hazardous compounds occurring it is considered that this could result in a 'negative', 'significant', 'long-term' impact on the quality of the receiving water course depending on the nature of the incident.

7.5.2 Operational Phase

Hydrogeological Flow Regime

The potential impacts on groundwater flow regime associated with the Proposed Development including the increased hardstand cover, the basements and other subsurface structures are the same for the Construction Phase and Operational Phases and have been assessed and detailed in Section 7.5.

There will be an unavoidable 'negative', 'imperceptible', 'long-term' within a very localised zone of the aquifer only and there will be no impact on the flow regime of receiving surface water or other water bodies.

Drainage and Flood Risk

Both internal and external flooding have been assessed in the Flood Risk Assessment prepared for the Proposed Development prepared by Waterman Moylan (2022). The Flood Risk Assessment has been carried out in accordance with the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009. The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed and taking account of climate change, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low (Waterman Moylan, 2022).

The basements may intersect the groundwater table and therefore the potential for ingress of groundwater to the basement could occur if appropriate design measures are not implemented. This is accounted for in the SSFRA and the overall risk was assessed to be low.

Accordingly taking account of the findings of the Flood Risk Assessment the potential impact of flooding associated with the Proposed Development result in an overall 'neutral', 'imperceptible' 'long-term' on the Proposed Development and elsewhere.

Water Quality

There will be no risk to water quality including groundwater and surface water associated with the Operational Phase of the Proposed Development. It is considered that the design of the Proposed Development is in line with the objectives of the Water Framework Directive (2000/60/EC) to prevent or limit any potential impact on water quality. There will be no adverse impacts on the WFD status of the waterbodies in the vicinity of the Site listed out in Section 7.3.12.

There will be no significant sources of contamination at the Site during the operational phases taking account of the following embedded design considerations:

- There will be no bulk storage of petroleum hydrocarbon-based fuels used during the Operational Phase, thereby removing any potential contaminant sources associated with fuels.
- There will be no discharges to ground from drainage and only rainfall on public open spaces and landscape areas will infiltrate to ground.
- All surface water drainage from paved areas along roads and impermeable roads will be collected and managed within the surface water drainage and SuDS solutions as outlined in the Engineering Report (Waterman Moylan, 2022).

The key pathways and pollutant linkages are:

- Infiltration of surface contaminants to ground and groundwater and offsite migration to:
    - Groundwater aquifer and offsite
    - Surface water (Naniken Stream)
    - Coastal water (Dublin Bay)
- Surface water runoff to road gullies and sewers and migration to:
    - Bull Island Lagoon via surface water outfall into the Naniken Stream
- Foul water discharge to mains sewer and discharge via Ringsend WwTP to Dublin Bay.

The potential risk to the receiving water is considered in the absence of standard and appropriate construction management and mitigation measures.

The surface water management strategy includes a number of measures that will capture any potentially contaminating compounds (petroleum hydrocarbons, metals, and suspended sediments) in surface water runoff from roads and the impermeable areas that could potentially otherwise discharge to groundwater or the water courses within the Site and adjoining.

The measures incorporated in the SuDS design include filter drains around the perimeter of each block, green roofs, storage pond, permeable paving, by-pass interceptors and filter drains within the drainage and SuDS system. The filter drains will be effective in treating and removal of any contaminants (metals, polycyclic aromatic hydrocarbons (PAHs) and suspended solids) entrained in surface water runoff, the effectiveness of these SuDS measures is documented in TII guidance (TII, 2014) and the SuDS Manual (C753). The Proposed Development also includes Class 1 by-pass petrol interceptor prior to discharge to the Naniken Stream via a new headwall, which will be effective in removal of hydrocarbons that may enter the drainage system in particular in the event of worst-case scenario spill incident (e.g. collision on the roadway resulting in the loss of fuel form a vehicle). A non-return valve will be included before the new headwall at the surface water outfall to avoid any reversed flow.

Accordingly, any potential impact on receiving surface water and groundwater beneath the Proposed Development Site will be avoided taking into account the design proposals. Therefore, it is considered that the water quality protection criteria and objectives of the GDSDS and Water Framework Directive will be achieved.

As specified in the Engineering Assessment Report (Waterman Moylan, 2022) all below ground foul sewers will be constructed in accordance with current Irish Water requirements and Building Regulations. Therefore, any potential contaminant sources associated with drainage including foul sewers will be eliminated.

Overall, the foul and surface water drainage incorporating the SuDS proposals for the Proposed Development will result in an overall 'neutral', 'imperceptible' 'long-term' impact on receiving surface water quality and groundwater quality and associated receptors compared to the baseline conditions.

7.5.3 Potential Cumulative Impacts

7.5.3.1 Existing Planning Permissions

There are several existing planning permissions on record in the area surrounding the Proposed Development Site. They range from small-scale extensions and alterations to existing residential properties to some larger-scale developments. Developments considered for in-combination effects identified within the vicinity of the Proposed Development are as follows:

Planning Application Reference: 2857/18

Amendments to the permitted development (Reg. Ref. 4242/15; ABP Ref. PL29N.246250 and as amended by Reg. Ref. 2977/17, ABP Ref. PL29N.249043) at this 0.53 hectares site at Sybil Hill Road, Raheny Dublin 5. The site is bounded by St. Paul's School to the south, Sybil Hill Road to the west, The Meadows residential development to the east and north and the Kare Social Services Centre to the north. The site formerly incorporated No. 1, 1A and 1B Sybil Hill Road (and lands to the rear of same).

Planning Application Reference: 3167/19

Planning permission for development approved under Dublin City Council Reg. Ref. 4353/16 at the existing petrol filling station consisting of revisions to existing shop and forecourt including: (i) Change of use and internal alterations to ground floor to provide additional retail floorspace of 8 sq.m and ancillary facility for sales of hot food for consumption off the premises, (ii) New ground floor window and pay hatch to front elevation, (iii) Revisions to car parking layout, and (iv) all associated site, drainage and boundary development works. (Decision: Grant Permission. Decision Date: 09/09/2019).

Planning Application Reference: 2998/20

The development will consist of the following: construction of (i) a pergola structure consisting of a timber frame with retractable awning system above; (ii) sand and cement rendered block walls (0.8 m in height) with precast concrete capping to surround the proposed pergola structure; (iii) raised planted bedding along the block walls; and (iv) all site works necessary to facilitate the development. The proposed structure is located within the internal courtyard area at St. Paul's College. (Decision: Grant Permission. Decision Date: 19/10/2020).

Planning Application Reference: 3803/21

Permission for development at this site, which contains a Protected Structure known as Manresa House. The proposed development will consist of: 1) a new single storey, flat-roofed building located to the northeast of the protected structure, to provide for new reception, dining, cooking and associated ancillary spaces, with rooflights, solar panels and part sedum roof; 2) a new single-storey, flat-roofed open loggia structure forming a covered route from the existing Retreat Building to the proposed new building; 3) associated hard landscaping, including new terrace and external steps, 2no. disabled parking bays, and extensive planting works to the courtyard; 4) landscaping works, including the provision of 36 no. car-parking spaces, new planting to the west lawn and the formation of a new stormwater attenuation pond: and 5) the removal of an existing single-storey, pitched roof timber structure. (Decision: Grant Permission. Decision Date: 17/02/2022).

Potential Impacts

Capacity within the existing foul sewer network has been confirmed by Irish Water (Waterman Moylan, 2022). The foul water from the Proposed Development will ultimately be treated at Ringsend WwTP which operates under existing statutory consents. Furthermore, Irish Water have completed the first phase of upgrade works to Ringsend WwTP in December 2021, which increased the capacity of the facility by 400,000 P.E. These works, together with the further works will ultimately increase the capacity of the facility from 1.6 million PE to 2.4 million PE. This plant upgrade will result in an overall reduction in the final effluent discharge loading to the receiving waters.

As Irish Water have confirmed that there is capacity within the foul network (refer to Irish Water, 2022 Certificate of Feasibility as Appendix A in Waterman Moylan, 2022b) to accept foul water from the Proposed Development, there are no anticipated cumulative impacts on the receiving water environment associated with the Proposed Development due to discharges from Ringsend WwTP.

The Proposed Development will be connected to the existing mains water supply subject to agreement from Irish Water who issued a Confirmation of Feasibility for the connection on 1st October 2019 (reference number CDS19006864 – included as Appendix A of the Engineering Assessment; Report Waterman Moylan, 2022). The mains water supply is operated in accordance with relevant existing statutory consents therefore there will be no cumulative impacts associated with the Proposed Development on water resources.

The transport of material to and from the Site if not appropriately managed could result in sediment and debris being tracked offsite on trucks and other site vehicles from the Proposed Development and other development sites in the area. There is a possibility of impact for water courses at offsite locations in the immediate vicinity of the Site due to sediment that may be entrained in road runoff (i.e. Naniken Stream, Santry River, Tolka Estuary and North Bull Island).

There are no other identified cumulative impact on groundwater and surface water resources associated with the Proposed Development taking account of the existing hydrogeological and hydrological setting of the Site and design particulars of the Proposed Development.

7.5.4 "Do Nothing" Impact

In the 'Do Nothing' scenario it is considered that the Proposed Development did not proceed and the potential impact on the receiving hydrological and hydrogeological environment is considered.

In the "Do Nothing" scenario the site would not be developed there would be no altering of groundwater / surface water regime by drainage, increasing hard standing area and basement construction.

If the Proposed Development did not proceed the Proposed Development Site would remain as a greenfield Site and there would be no change to the hydrological and hydrogeological regime at the Proposed Development Site.

In the 'Do Nothing' scenario the housing supply requirements may be satisfied with a new residential development in another location.

7.6 Avoidance, Remedial & Mitigation Measures

These avoidance, remedial and mitigation measures, will ensure that there will be no significant impact on the receiving groundwater and surface water environment. Hence, the Proposed Development will not have any impact on compliance with the EU Water Framework Directive, European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended 2012 (SI No 327 of 2012), and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010), as amended 2012 (SI 149 of 2012) and 2016 (S.I. No. 366 of 2016).

7.6.1 Construction Phase

A Construction Environmental Management Plan (CEMP) and Construction and Demolition Waste Management Plan (CDWMP) will be implemented by the contractor to ensure, site-specific procedures and mitigation measures to monitor and control environmental impacts throughout the Construction Phase of the project and ensure that construction activities do not adversely impact the environment. The CEMP and CDWMP will take cognisance of the measures outlined in the EIAR and the Preliminary CDWMP (Waterman Moylan, 2022) and CEMP (Enviroguide Consulting, 2022) submitted under separate cover with the planning application for the Proposed Development.

The construction works will be managed with consideration of applicable regulations and standard international best practice including but not limited to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors;
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005;
- BPGCS005, Oil Storage Guidelines;
- EPA (2004) IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities;
- CIRIA 697, The SUDS Manual, 2007;
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004;
- Construction Industry Research and Information Association CIRIA C648: Control of water pollution from linear construction projects: Technical guidance (Murnane et al. 2006);
- CIRIA C648: Control of water pollution from linear construction projects: Site guide (Murnane et al. 2006); and
- Inland Fisheries Ireland (2016). Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters

7.6.1.1 Control and Management of Water

There will be no discharges to groundwater or surface water during the Construction Phase. Water runoff to adjoining roads will not be permitted.

There will be localised groundwater dewatering during the construction of the basement and management of water will include control of surface water runoff and pumping of water from excavations.

Where necessary the water will be treated onsite to remove sediment or other potentially contaminating compounds. The treated water will be tankered offsite or discharged to sewer only under licence from Irish Water as appropriate.

During earthworks there is the potential for suspended solids entrained in runoff to enter the gullies on the adjoining roads.

Silt fences will be appropriately located around earthworks areas as appropriate to manage runoff. The contractor is to ensure that no contaminated water/liquids leave the Proposed Development Site (as surface water and surface water run-off or otherwise), enter the local drainage system or direct discharge drainage ditches or water courses or springs in particular the Naniken Stream.

The quality of the discharge of water from excavations will be regularly monitored visually for a hydrocarbon sheen and suspended solids, as well as periodic laboratory testing.

Any erosion control measures (i.e. silt-traps, silt-fencing and swales) will be regularly maintained during the Construction Phase. Any required silt fences of silt-traps must not be places within 10m of any open water course of drainage ditch.

The flows of water into excavations are anticipated to be small and will be managed by sump pumping, which will be managed in accordance with best practice standards (CIRIA – C750) and regulatory consents.

7.6.1.2 In-stream Works and Protection of Water Courses

All open water courses adjacent to the site (namely the Naniken Stream) will be protected by a 10m constraint zone around the water course to avoid suspended sediment or other potential contaminants being released into the water course. Site vehicles will only be permitted within this 10m buffer to facilitate instream works to enable construction of the outfall to the Naniken Stream. Crossings of the Naniken Stream will not be required and will not be permitted except in an emergency scenario if required.

All instream works or works carried out at the Naniken Stream will follow the guidelines published by Inland Fisheries Ireland (IFI) 'Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters' (IFI, 2016) and The National Roads Authority (2018) (now Transport Infrastructure Ireland) 'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes' and other current best-practice standards at the time of construction.

Where instream works are required for the construction of outfalls, the following must be implemented in addition to other measures outlined in Section 7.6:

- Instream machine works will be avoided and if required any machines working in the watercourse must be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels.
- Instream earthworks must be executed so as to minimise the suspension of solids.
- Any over-pumping of temporary diversion of water required must include appropriate treatment of water before return to the water course

- Every care must be taken to insure against spillage of concrete or leakage of cement grout within cofferdams.

A suitably qualified Ecological Clerk of Works will be present on-site during the works being undertaken along the Naniken Stream in particular the construction of the surface water outfall.

Monitoring of all water protection measures and infrastructure (e.g., silt-traps, silt-fences and other operational controls) will be undertaken to ensure effective operation for the duration of the Construction Phase. Any damaged or defective infrastructure will be replaced immediately (within the same working day).

7.6.1.3 Control and Management of Soil and Bedrock

Prior to excavation, a detailed review of the final cut and fill model will be carried out to confirm cut and fill volumes. As the site is largely undeveloped contaminated soil is not expected to be encountered. Soil analytical data included in the Site Investigation Report (Appendix I) indicates the general absence of contamination associated with anthropogenic sources at the Site with the exception of localised areas of low-level petroleum hydrocarbon in the northwest corner and northeast corner of the Site respectively. These trace concentrations are not considered to pose an environmental or human health risk. These soils and any yet unidentified contaminated soils or other contaminated materials encountered during the works, will be managed in accordance with relevant guidelines including EPA 'Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites' (EPA, 2013) and guidance and standards current at the time of construction works. Potentially contaminated soil will be excavated and removed and disposed of off-site in accordance with the Waste Management Acts, 1996 as amended, and associated regulations and guidance.

Any surplus soil not suitable for re-use as a by-product and other waste materials arising from the Construction Phase will be removed offsite by an authorised contractor and sent to the appropriately authorised (licensed/permitted) receiving waste facilities.

7.6.1.4 Management of Stockpiles

Stockpiled soil and stone materials pending removal offsite or reuse onsite will be located in in designated areas only and there will be no storage of materials within 10m of any boundary, drains and watercourses. Where necessary, stockpiles will be surrounded with silt fencing to filter out any suspended solids from surface water arising from these materials (refer to Section 7.6.1.1).

While waste classification and acceptance at a waste facility is pending, excavated soil for recovery/disposal will be stockpiled as follows:

- A suitable temporary storage area will be identified and designated;
- All stockpiles will be assigned a stockpile number;
- Soil waste categories will be individually segregated; and all segregation, storage & stockpiling locations will be clearly delineated on the Site drawings;
- Erroneous pieces of concrete will be screened from the stockpiled soils and segregated separately;

- Non-hazardous and hazardous soil (if required to be stockpiled) will be stockpiled only on hard-standing or high-grade polythene sheeting to prevent cross-contamination of the soil below; and
- Soil stockpiles will be sealed to prevent run-off of rainwater and leaching of potential contaminants from the stockpiled material generation and/or the generation of dust.

Waste will be stored on-site, including concrete, asphalt and soil stockpiles, in such a manner as to:

- Prevent environmental pollution (bunded and/or covered storage, minimise noise generation and implement dust/odour control measures, as may be required);
- Maximise waste segregation to minimise potential cross contamination of waste streams and facilitate subsequent re-use, recycling and recovery; and
- Prevent hazards to site workers and the general public during construction phase (largely noise, vibration and dust).

7.6.1.5 ***Concrete Works***

The use of cementitious grout used during the construction of the basement and other infrastructure will avoid any contamination of the ground through the use of appropriate design and methods implemented by the Contractor and in accordance with industry standards.

All ready-mixed concrete will be delivered to the Proposed Development Site by truck. Concrete mixer trucks will not be permitted to wash out onsite with the exception of cleaning the chute into a container which will then be emptied into a skip for appropriate compliant removal offsite.

There will be a requirement for in-stream and near stream works for the construction of the outfall to the Naniken Stream. Pre-cast structures will be used where technically feasible in accordance with the drainage design specification. Avoidance and mitigation measures for the in-stream works are detailed in Section 7.6.1.2.

7.6.1.6 ***Piling Methodology***

The piling methodology to be implemented by the Contractor will minimise the potential for the introduction of any temporary conduit between any potential sources of contamination at the ground surface and underlying groundwater. The piling method will include procedures to ensure any potential impact to water quality is prevented including preventing surface runoff or other piling/drilling fluids from entering the pile bores and surrounding formation. Where there is a requirement to use lubricants, drilling fluids or additives the contractor will use water-based, biodegradable and non-hazardous compounds under controlled conditions.

7.6.1.7 Importation of Soil and Aggregates

Contract and procurement procedures will ensure that all aggregates and fill material required are sourced from reputable suppliers operating in a sustainable manner and in accordance with industry conformity and compliance standards and statutory obligations. The storage of imported materials will be located at least 10m away from any surface water features and surrounded with silt fencing to filter out suspended solids.

The importation of aggregates will be subject to management and control procedures which will include testing and assessment of the suitability for use in accordance with engineering and environmental specifications for the Proposed Development including the suitability of material that may be imported in accordance with a By-Product Notification under Article 27 of the European Communities (Waste Directive) Regulations 2011. Therefore, any unsuitable material will be identified, avoided and not imported to the Site.

7.6.1.8 Handling of Fuels and Hazardous Materials:

Fuel, oils and chemicals used during construction are classified as hazardous.

- Storage of fuel and hazardous materials will be undertaken with a view to protecting any essential services (electricity, water etc.) and the receiving land, soil and geology environment.
- Bulk quantities of fuel will not be stored at the Site.

There will be appropriate storage areas for any fuel, oils and chemicals. Storage will be within a clearly marked bund on an impervious base remote from any surface water features such as oil. Temporary oil interceptors will be installed for period of the construction phase. Fuel will only be stored in the quantities required for emergency use and re-fuelling. All drums to be quality approved and manufactured to a recognised standard. If drums are to be moved around the Site, they will be secured and moved on spill pallets. Drums will be loaded and unloaded by competent and trained personnel using appropriate equipment.

- Bunds will have regard to Environmental Protection Agency guidelines 'Storage and Transfer of Materials for Scheduled Activities' (EPA, 2004) and Enterprise Ireland. Best Practice Guide BPGCS005. Oil Storage Guidelines. All tank and drum storage areas will, as a minimum, be bunded to a volume not less than the greater of the following:
    - 110% of the capacity of the largest tank or drum within the bunded area; or
    - 25% of the total volume of substance that could be stored within the bunded area.
- Only emergency maintenance will be carried out on site;
- Emergency response procedures will be put in place, in the unlikely event of spillages of fuels or lubricants;
- Spill kits including oil absorbent material will be provided so that any spillage of fuels, lubricants or hydraulic oils will be immediately contained;
- In the event of a leak or spill from equipment in the instance of a mechanical breakdown during operation, any contaminated soil will be removed from the Site and compliantly disposed of off-site. Residual soil will be tested to validate that all potentially contaminated material has been removed. This procedure will be undertaken in accordance with current industry best practice procedures and EPA guidelines;
- Site staff will be familiar with emergency procedures in the event of accidental fuel spillages; and
- All staff on-site will be fully trained on the use of equipment to be used on-site.

Refuelling of plant and vehicles during the Construction Phase will only be permitted at designated refuelling station locations onsite and will be from a road tanker brought to site as required. Each station will be fully contained and equipped for spill response and a specially trained and dedicated Environmental and Emergency Spill Response team will be appointed by the contractor before the commencement of works onsite.

7.6.1.9 Welfare Facilities

Welfare facilities have the potential, if not managed appropriately, to release organic and other contaminants to ground or surface water courses. All waste from welfare facilities will be managed in accordance with the relevant statutory obligations through either a temporary connection to mains foul sewer (subject to receipt of the relevant consent from Irish Water) which will be constructed in accordance with Irish Water guidelines or by tankering of waste offsite by an appropriately authorised contractor in compliance with all legislative requirements.

7.6.1.10 Wheel-Wash and Water Treatment Facilities

The use of wheel-wash and water treatment facilities and infrastructures will be used where necessary including where outlined in Sections 7.6.1.1 through to 7.6.1.9. The correct use and management of these will be undertaken by the appointed contractor to ensure that there is no harm or impact to the receiving water environment.

To prevent tracking of dust and debris on haul routes offsite the following will be undertaken:

- Implement a wheel washing system where necessary.
- Use of dedicated internal haul routes and set down areas that will be covered with hardcore or similar.

To prevent fugitive runoff from the Site the following will be implemented:

- Silt traps, silt fences and tailing ponds will need to be provided by the contractor where necessary to prevent silts and soils being washed away by heavy rains during the course of the construction stage.
- Surface water runoff and water pumped from the excavation works will be discharged via a silt trap / settlement pond to the existing foul drainage network.
- Onsite water treatment system will be used if required to remove suspended solids and hydrocarbons.

All sludges and other waste from wheel-wash and water treatment infrastructure including silt fences will be removed from the Site by the contractor in accordance with all legislative requirements.

7.6.1.11 Decommissioning of Boreholes

Any site investigation and monitoring boreholes remaining at the Site that are no longer required will be decommissioned in accordance with the specifications outlined in EPA Advice Noted 14 (EPA, 2013) and current best-practice at the time of decommissioning. This will remove any potential direct conduit for contaminants to enter the groundwater directly and potentially migrate offsite.

7.6.2 Operational Phase

The Proposed Development design incorporates SuDS measures that will avoid and mitigate any potential impact on water quality. With regard to the proposed discharge of treated operational surface water from the Proposed Development to the Naniken Stream, the potential for surface water generated at the Site of the Proposed Development to cause significant effects to downstream sensitivities during the Operational Phase would be considered negligible due in part to the SUDS measures incorporated in the Project Design. Project specific SUDS measures are listed below: Green roofs;

- Filter drains;
- Permeable paving;
- Tree pits;
- Rain gardens;
- Detention basin;
- Underground attenuation and flow control; and
- Petrol interceptor

Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures in accordance with CIRIA SuDS Manual C753 will be incorporated into the overall management strategy for the Proposed Development There is no other requirement for mitigation measures for the Operational Phase of the Proposed Development

7.6.3 "Worst Case" Scenario

During the Construction Phase there is a potential risk of accidental release of petroleum hydrocarbons (e.g., a fuel spill) that could migrate to groundwater or surface water would result in in a 'negative', 'significant', 'long-term' impact on the quality of the receiving water depending on the nature of the incident in the absence of design avoidance and mitigation measures outlined in Section 7.6.1 and 7.6.2 and emergency response procedures as detailed in Section 13.3.1 and the CEMP (Enviroguide Consulting, 2022).

During the Operational Phase of the Proposed Development, surface water runoff including runoff of deleterious material (i.e., fuels from vehicles on-site) will be directed to the mains sewer via appropriate treatment (Class 1 by-pass interceptor) and not to groundwater or directly to surface water. In a 'Worst Case' scenario and in the absence of mitigation including SuDS measures, there is a potential risk of accidental release of untreated water via failure or rupture of the drainage system with potential impacts on the receiving water environment. It is considered that the potential risk of the release of untreated water will present a 'negative', 'significant' and 'long-term' impact on the receiving environment.

However, taking account of the avoidance and mitigation measures the worst-case scenarios are deemed to be an unlikely scenario.

7.6.4 Human Health

No public health issues have been identified for the Construction Phase or Operational Phase of the Proposed Development.

Appropriate industry standard and health and safety legislative requirements will be implemented during the Construction Phase that will be protective of site workers in particular associated with the instream works.

The water supply for the Proposed Development will be via connection to the public supply.

There are no identified groundwater sources in the vicinity of the Site, however, in the event of unidentified groundwater users (i.e., drinking water supply well) taking account of the design of the proposed development and the avoidance and mitigation measures there will be no potential risk to any drinking water sources associated with the Proposed Development.

7.6.5 Water Framework Directive

There are identified potential impacts to water quality associated with the Proposed Development for the Construction Phase and Operational phase in the absence of embedded design avoidance measures and mitigation measures that could impact on the Water Framework Directive Status of receiving water bodies.

The fact WFD status of 'Moderate' (Naniken Stream surface water and Tolka Estuary transitional water bodies) and a status of 'Good' (Dublin GWB Dublin Bay coastal water body) has been assigned the closest receiving water body receptors was considered for this assessment. As the risk status of 'Review' assigned to the Dublin GWB it was assumed that the status of 'At Risk' of not achieving WFD objectives was assigned for the Dublin GWB to enable a worst-case scenario assessment.

Based on a worst-case scenario there would be a potential impact on the WFD status of the receiving water bodies, in particular those 'at risk' with a 'moderate' status. However, taking account of the proposed design incorporating avoidance and mitigation measures (discussed in Section 7.6) the Proposed Development will not result in deterioration or alteration of the WFD status for water bodies associated with the Proposed Development Site.

7.7 Residual Impacts

Residual Impacts are defined as 'effects that are predicted to remain after all assessments and mitigation measures. They are the remaining 'environmental costs' of a project and are the final or intended effects of a development after mitigation measures have been applied to avoid or reduce adverse impacts.

The predicted impacts of the Construction and Operational Phases are described in Section 7.5 and summarised in Table 7.7 in terms of quality, significance, extent, likelihood, and duration and the residual impacts which take account of the avoidance, remedial and mitigation measures.

There are no likely significant adverse residual impacts on hydrology and hydrogeology anticipated regarding this Proposed Development.

Table 7-12 Summary of Residual Impacts

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Construction Phase								
Construction of basement and subsurface infrastructure and temporary dewatering.	Hydrogeological Flow Regime	Groundwater flow within the aquifer will not be impacted and dewatering will not be required	Negative	Imperceptible	Temporary	Direct	None	Imperceptible
Use of potentially hazardous materials cementitious materials.	Water Quality	Potential release of cementitious material during the construction of foundations, pavements, basement, pile walls and other structures.	Negative	Significant	Medium Term	Direct	The design will incorporate the use of pre-cast concrete structures where appropriate. The Contractor will carry out works in accordance with industry standards. Detailed design for piling to include methods to prevent impact water quality.	Imperceptible
Earthworks – release of suspended solids	Surface Water Quality	Potential for release of sediment to surface water	Negative	Significant	Short-term	Direct	Appropriate measures including silt fences and buffer zones to be used to prevent fugitive runoff including to	Imperceptible

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Construction Phase								
							Naniken Stream and adjoining roads	
Earthworks – removal of surplus material and waste	Water quality	Potential for release of sediment to surface water	Negative	Moderate	Medium-Term	In-direct	All surplus material and waste material will be removed offsite in accordance with detailed procedures in strict accordance with all waste management legislation and the procedures outlined in the CEMP	Imperceptible
In-stream Works at the Naniken Stream for construction of the outfall.	Water quality	Potential for release of sediment and other contaminants to surface water	Negative	Significant	Long Term	Direct	Appropriate measures including silt fences and buffer zones to be used to prevent fugitive runoff including to Naniken Stream. Pre-cast concrete to be used where feasible.	Imperceptible
Accidental release of deleterious materials including fuel and other materials being used on-site.	Groundwater / Surface Water	Potential (albeit low) for uncontrolled release of deleterious materials including fuels and other materials being used on-site, through the failure of secondary and tertiary containment or a materials handling accident.	Negative	Significant	Long Term	Direct / Worst Case	Procedures for the use and handling of all potentially hazardous compounds to be included in the CEMP to be prepared by the Contractor.	Imperceptible

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Construction Phase								
Piling Works	Introduce preferential pathway and impact on water quality	Potential for migration of contaminants during piling works via direct conduit to subsurface.	Negative	Moderate	Medium-Term	Direct	Detailed design piling and method to be prepared by the appointed contractor. Use of water-based, biodegradable non-hazardous substances to be used.	Imperceptible
Operational Phase								
Basement, and other infrastructure	Hydrogeological Flow Regime	Groundwater flow within the aquifer will not be impacted	Negative	Imperceptible	Long-term	Direct	None	Imperceptible
Surface Water Drainage and discharge to the Naniken Stream	Water Quality	Surface water drainage at the Proposed Development Site has been designed in accordance with SuDS and therefore it is anticipated that water quality will not be impacted	Neutral	Imperceptible	Long-term	Direct	SuDS incorporated in the design and therefore it is anticipated that water quality will not be impacted. Maintenance of SuDS will be required as part of the overall management strategy to be implemented.	Imperceptible
Surface Water Drainage	Flood Risk and surface water regime	The Site-Specific FRA identified that there is no risk of flood at the Site or elsewhere and the Proposed Development has been designed in accordance with the	Neutral	Imperceptible	Long-term	Direct	None required.	Imperceptible

Activity	Attribute	Predicted Impact	Quality	Significance	Duration	Type	Mitigation	Residual Impact
Construction Phase								
		principles of SuDS and satisfies the requirements of GDSDS (Waterman Moylan, 2022a).						
Discharge to foul sewer	Mains Sewer and receiving water at Ringsend WwTP	Discharges to sewer will only be permitted where authorised by Irish Water. Confirmation of Feasibility received from Irish Water (Irish Water, 2021; Reference CDS21002487)	Neutral	Imperceptible	Permanent	Indirect / Cumulative	None Required.	Imperceptible

7.8 Monitoring

7.8.1 Construction Phase

During the construction phase the following monitoring measures will be implemented:

- Monitoring and sampling of groundwater and surface water will be undertaken during critical stages of the construction works in particular during construction of the outfall at the Naniken and during bulk excavation works where groundwater may be encountered.
- Inspections and monitoring will be undertaken during excavations, piling and other groundworks to ensure that measures protective of water quality are fully implemented and effective.
- Discharges to sewers will be monitored in accordance with statutory consents (discharge licence).
- Routine monitoring and inspections during refuelling, concrete works to ensure no impacts and compliance with ameliorative, remedial and reductive measures.
- Materials management and waste audits will be carried out at regular intervals

7.8.2 Operational Phase

Ongoing regular operational monitoring and maintenance of drainage and the SuDS will be carried out.

No other monitoring is required during the Operational Phase.

7.9 Interactions

7.9.1 Population and Human Health

No public health issues associated with the Proposed Development Site and the receiving water environment including drinking water sources have been identified.

Appropriate industry standards and health and safety legislative requirements will be implemented during the construction phase that will be protective of site workers.

It is noted that specific issues relating to Public Heath associated with the Proposed Development are set out in Chapter 4 of this EIAR.

7.9.2 Material Assets - Water

Any discharges to the public foul sewer and abstractions from water supply from the Proposed Development will be under consent from Irish Water. An assessment of the potential impact of the Proposed Development on the Material Assets including built services, infrastructure, traffic, and waste management has been set out in Chapter 12 of this EIAR.

7.9.3 Land, Soil, Geology and Hydrogeology

An assessment of the potential impact of the Proposed Development on the existing land, soils and geological environment during the Operational Phase of the Proposed Development is set out in Chapter 6 Land, Soil and Geology.

7.9.4 Biodiversity

The Proposed Development will potentially impact ecological receptors via surface water runoff to road gullies and sewers and groundwater migration.

An assessment of the potential impacts of the Proposed Development on the Biodiversity of the Proposed Development Site, with emphasis on habitats, flora and fauna which may be impacted as a result of the Proposed Development is included in Chapter 5 of this EIAR. It also provides an assessment of the impacts of the Proposed Development on habitats and species, particularly those protected by national and international legislation or considered to be of particular conservation importance and proposes measures for the mitigation of these impacts.

7.9.5 Traffic

Any possibility of cumulative impacts on water courses at off-site locations in the immediate vicinity of the Site (i.e. The Naniken Stream and Tolka Estuary), due to sediment that may be entrained in road runoff due to Traffic activities and resulting tracked sediment and debris being tracked offsite during the Construction Phase of the Proposed Development are addressed in Section 7.5.3.2 in this Chapter. The Proposed Development will have no significant impact on overall traffic volumes at the Proposed Development Site during the Operational Phase and therefore traffic will not result in any significant impacts on water quality or quantity at sensitive water body receptors. Any specific issues relating to Traffic impacts associated with the Proposed Development are set out in Chapter 12 of this EIAR.

7.10 Difficulties Encountered When Compiling

There were no difficulties encountered when compiling the Hydrology and Hydrogeology Chapter of this EIAR.

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8 AIR QUALITY AND CLIMATE

8.1 Introduction

This Chapter will describe and assess the potential impacts on air quality and climate associated with the Proposed Development at Sybil Hill Road, Raheny, Dublin 5. The Chapter was prepared by Aoife Grogan (BA Hons, MSc) and Laura Griffin (BA Hons, MSc), Environmental Consultants, Enviroguide Consulting, Aoife and Laura have experience working on a number of EIARs and EIA Screening Reports for projects of a similar scale to the Proposed Development.

Taking into account Ambient Air Quality Standards, the baseline air quality will be examined along with the potential for release of emissions to the atmosphere and associated effects prior to and following mitigation measures. This Chapter will also describe and assess the potential impacts on micro and macro-climate as a result of the Proposed Development. Attention will be focused on Ireland's obligations under the Kyoto Protocol in the context of the overall climatic impact of the presence and absence of the Proposed Development.

8.1.1 Ambient Air Quality Standards

For the protection of health and ecosystems, EU directives apply air quality standards in Ireland and other EU member states for a range of pollutants. These rules include requirements for monitoring, assessment and management of ambient air quality. The first major instrument in tackling air pollution was the Air Quality Framework Directive 96/62/EC and its four daughter Directives. Each of these instruments was repealed with the introduction of Directive 2008/50/EC on ambient air quality and cleaner air for Europe in 2008 (as amended by Decision 2011/850/EU and Directive 2015/1480/EC) (the CAFE Directive), save for the "Fourth Daughter Directive" (Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air).

The CAFE Directive lays down measures aimed at:

1) defining and establishing objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole;
2) assessing the ambient air quality in Member States on the basis of common methods and criteria and, in particular, assessing concentrations in ambient air of certain pollutants;
3) providing information on ambient air quality in order to help combat pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures;
4) ensuring that such information on ambient air quality is made available to the public;
5) maintaining air quality where it is good and improve it in other cases;
6) promoting increased cooperation between the Member States in reducing air pollution.

Ambient air quality monitoring and assessment in Ireland is carried out in accordance with the requirements of the CAFE Directive. The CAFE Directive has been transposed into Irish legislation by the Air Quality Standards Regulations (S.I. No. 180 of 2011). The CAFE Directive requires EU member states to designate 'Zones' reflective of population density for the purpose of managing air quality. Four zones were defined in the Air Quality Standards Regulations (2011) and subsequently amended in 2013 to account for 2011 census population counts and to align with coal restricted areas in the Air Pollution Act (Marketing, Sale, Distribution and Burning of Specified Fuels) Regulations 2012. (S.I. No. 326 of 2012) (the 2012 Regulations).

The main areas defined in each zone are:

- **Zone A:** Dublin Conurbation
- **Zone B:** Cork Conurbation
- **Zone C:** Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise.
- **Zone D:** Rural Ireland, i.e., the remainder of the State excluding Zones A, B and C.

The Site of the Proposed Development is located on lands east of St Paul's College, Sybil Hill Road, Raheny, Dublin 5 and falls under the 'Zone A' category based on the EPA CAFE Directive.

The CAFE Directive outlines certain limit or target values specified by the five published directives that apply limits to specific air pollutants. These limits, outlined in Table 8-1, will be referred to as part of the Proposed Development assessment with respect to air quality.

Table 8-1: Limit Values of Cleaner Air for Europe (CAFE) Directive 2008/50/EC (Source: EPA, 2020)

Pollutant	Limit Value Objective	Averaging Period	Limit Value µg/m3	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
SO_2	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
SO_2		24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
SO_2	Protection of vegetation	Calendar year	20	7.5	Annual mean	19 July 2001
SO_2		1 Oct to 31 Mar	20	7.5	Winter mean	19 July 2001
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
NO_2		Calendar year	40	21	Annual mean	1 Jan 2010
$NO + NO_2$	Protection of ecosystems	Calendar year	30	16	Annual mean	19 July 2001

Pollutant	Limit Value Objective	Averaging Period	Limit Value µg/m3	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
PM10	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
PM10		Calendar year	40	-	Annual mean	1 Jan 2005
PM2.5 - Stage 1		Calendar year	25	-	Annual mean	1 Jan 2015
PM2.5 - Stage 2		Calendar year	20	-	Annual mean	1 Jan 2020
Lead		Calendar year	0.5	-	Annual mean	1 Jan 2005
Carbon Monoxide		8 hours	10,000	8,620	Not to be exceeded	1 Jan 2005
Benzene		Calendar year	5	1.5	Annual mean	1 Jan 2010

The EPA is the competent authority for the purpose of the CAFE Directive and is required to send an annual report to the Minister for Environment and the European Commission. The regulations further provide for the distribution of public information. This includes information on any exceedances of target values, the reasons for exceedances, the area(s) in which they occurred, and the relevant information regarding effects on human health and environmental impacts.

8.1.2 Climate Agreements

Climate change is recognised as one of the most serious global environmental problems and arguably the greatest challenge facing humanity today. While natural variations in climate over time are normal, anthropogenic activities have interfered greatly with the global atmospheric system by emitting substantial amounts of greenhouse gases (GHGs). This has caused a discernible effect on our global climate system, with continued change expected due to current and predicted trends of GHG emissions. In Ireland this is demonstrated by rising sea levels, changes in the ecosystem, and extreme weather events.

In March 1994, the United Nations Framework Convention on Climate Change (UNFCCC) was established as an intergovernmental effort to tackle the challenges posed by climate change. The Convention membership is almost universal, with 197 countries having ratified. Under the Convention, governments gather and share information on GHG emissions, national policies, and best practices. This information is then utilised to launch national strategies and international agreements to address GHG emissions. Following the formation of the UNFCCC, two major international climate change agreements were adopted: The Kyoto Protocol, and the Paris Agreement.

In April 1994, Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) and subsequently signed the Kyoto Protocol in 1997. The Kyoto Protocol is an international agreement linked to the UNFCCC which commits its parties to legally binding emission reduction targets. In order to ensure compliance with the protocol, the Intergovernmental Panel on Climate Change (IPCC) has outlined detailed guidelines on compiling National Greenhouse Gas Inventories. These are designed to estimate and report on national inventories of anthropogenic GHG emissions and removals. Under Article 4 of the Kyoto Protocol, Ireland agreed to limit the net anthropogenic growth of the six named GHGs to 13% above the 1990 level, spanning the period 2008 to 2012.

The second commitment period of the Kyoto Protocol was established by the Doha amendment which was adopted *in extremis* on the 8th of December 2012, to impose quantified emission limitation and reduction commitments (QELRCs) to Annex I (developed country) Parties during a commitment period from 2013 to 2020. 38 developed countries, inclusive of the EU and its 28 member states, are participating. Under the Doha amendment, participating countries have committed to an 18% reduction in emissions from 1990 levels. The EU has committed to reducing emissions in this period to 20% below 1990 levels. Ireland's QELRCs for the period 2013 to 2020 is 80% of its base year emissions. Ireland's compliance with the Doha amendment will be assessed based on the GHG inventory submission in 2022 for 1990-2020 data. As of October 2020, the Doha Amendment has received the required number of ratifications to enter into force. Once in force, the emission reduction commitments of participating developed countries and economies in transition (EITs) become legally binding.

In December 2015, the Paris Climate Change Conference (COP21) took place and was an important milestone in terms of international climate change agreements. The Paris Agreement sets out a global action plan to put the world on track to mitigate dangerous climate change by setting a global warming limit not to exceed 2°C above pre-industrial levels, with efforts to limit this to 1.5°C. As a contribution to the objectives of the agreement, countries have submitted comprehensive national climate action plans (nationally determined contributions, NDCs). Under this agreement, governments agreed to come together every 5 years to assess the collective progress towards the long-term goals and inform Parties in updating and enhancing their nationally determined contributions. Ireland will contribute to the Agreement through the NDC tabled by the EU on behalf of Member States in 2020, which commits to a 55% reduction in EU-wide emissions by 2030 compared to 1990. This is considered to be the current NDC maintained by the EU and its Member States under Article 4 of the Paris Agreement.

The EU has set itself targets for reducing its GHG emissions progressively up to 2050, these are outlined in the 2020 climate and energy package and the 2030 climate and energy policy framework. These targets are defined to assist the EU in transitioning to a low-carbon economy, as detailed in the 2050 low carbon roadmap. The 2020 package is a set of binding legislation to ensure that the EU meets its climate and energy targets for the year 2020. There are three key targets outlined in the package which were set by the EU in 2007 and enacted in legislation in 2009:

- 20% reduction in GHG emissions from 1990 levels;
- 20% of EU energy to be from renewable sources;
- 20% improvement in energy efficiency.

The 2030 climate and energy framework builds on the 2020 climate energy package and was adopted by EU leaders in October 2014. The framework sets three key targets for the year 2030:

- At least 40% cuts in GHG emissions from 1990 levels;
- At least 32% share for renewable energy;
- At least 32.5% improvement in energy efficiency.

The EU has acted in several areas in order to meet these targets, including the introduction of the Emissions Trading System (ETS). The ETS is the key tool used by the EU in cutting GHG emissions from large-scale facilities in the power, industrial, and aviation sectors. Around 45% of the EU's GHG emissions are covered by the ETS.

As part of the European Green Deal, the Commission proposed in September 2020 to raise the 2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55% compared to 1990. The European Climate Law came into force in July 2021 and writes into law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

8.1.2.1 National Policy Position in Ireland

National climate policy in Ireland recognises the threat of climate change to humanity and supports mobilisation of a comprehensive international response to climate change, and global transition to a low-carbon future.

The Climate Action and Low Carbon Development (Amendment) Act 2021 was enacted in 2021 and sets Ireland on a legally binding path to net-Zero emissions no later than 2050, and to a 51% reduction in emissions by the end of this decade. The Act provides the framework for Ireland to meet its international and EU climate commitments and to become a leader in addressing climate change.

The Irish Government recently published its Climate Action Plan (2021) which provides a detailed framework for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting Ireland on a path to reach net-zero emissions by no later than 2050, as committed to in the Programme for Government and as required by the Climate Act 2021. The Plan lists the actions needed to deliver on national climate targets and sets indicative ranges of emissions reductions for each sector of the economy. It will be updated annually, next in 2022, to ensure alignment with Ireland's legally binding economy-wide carbon budgets and sectoral ceilings.

Ireland's latest greenhouse gas (GHG) emissions 1990-2020 are provisional figures based on the SEAI's final energy balance released in September 2021 (EPA, 2021). In 2020, Ireland's GHG emissions are estimated to be 57.70 million tonnes carbon dioxide equivalent (Mt CO2eq), which is 3.6% lower (or 2.14 Mt CO2 eq) than emissions in 2019 (59.84 Mt CO2 eq). There was a decrease of 4.0% in emissions reported for 2019 compared to 2018. Emissions reductions have been recorded in six of the last ten years of inventory data (2010-2020). In 2020, national total emissions decreased by 3.6%, emissions in the stationary ETS sector decreased by 6.4% and emissions under the ESD (Effort Sharing Decision) decreased by

2.7%. In 2020, the energy industries, transport and agriculture sectors accounted for 70.1% of total GHG emissions. Agriculture is the single largest contributor to the overall emissions, at 37.1%. Transport, energy industries and the residential sector are the next largest contributors, at 17.9%, 15.0% and 12.3%, respectively (EPA, 2021).

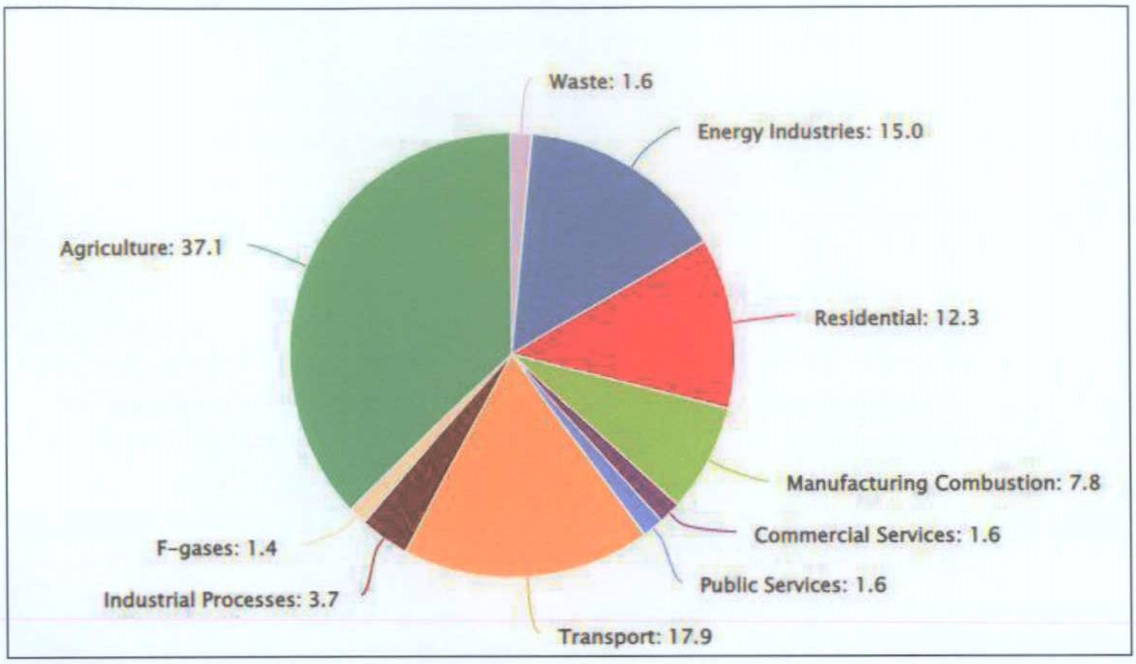

Figure 8-1: Ireland's Greenhouse Gas Emissions by Sector for 2020 (Source: EPA, 2021)

8.2 Study Methodology

Taking into account Ambient Air Quality Standards, the baseline air quality of the Site was examined using EPA monitoring data. Air quality impacts from the Proposed Development were then determined by a qualitative assessment of the nature and scale of dust generating activities associated with the construction phase of the project in accordance with relevant guidance (Transport Infrastructure Ireland (TII) 2011 Appendix 8; Institute of Air Quality Management (IAQM) 2014).

Operational Phase traffic impact assessment involved air dispersion modelling using the UK Design Manual for Roads and Bridges Screening Model (DMRB, UK Highways Agency 2007) (Version 1.03c), the NO_x to NO_2 Conversion Spreadsheet (UK Department for Environment, Food and Rural Affairs, 2017), and following all relevant guidance (TII, 2011; HA, 2007; EPA; UK DEFRA; IAQM).

A desktop study involving various national and international documents on climate change and analysis of synoptic meteorological data from the nearest Met Eireann station was also carried out in order to compile this chapter. Attention will be focused on Ireland's obligations under the Kyoto Protocol (including the Doha Amendment) and the Paris Agreement in the context of the overall climatic impact of the presence and absence of the Proposed Development.

8.3 The Existing and Receiving Environment (Baseline Situation)

The Site of the Proposed Development is located on lands east of St Paul's College, Sybil Hill Road, Raheny, Dublin 5. The site is bound to the north, east and south by St Anne's Park and to the west by residential development at The Meadows, Sybil Hill House (a Protected Structure) and St Paul's College. Vehicular access to the site is from Sybil Hill Road. Raheny is a northern suburb of Dublin, midway between Dublin City Centre and Howth. It is administered by Dublin City Council.

8.3.1 Air Quality

According to the 2012 Regulations (S.I. No. 326 of 2012) the proposed Site falls into 'Zone A' of Ireland which is described by the EPA as 'Dublin Conurbation'. The assessment carried out for the purposes of this Chapter confirmed that that existing ambient air quality in the vicinity of the Site is characteristic of a suburban location with the primary source of air emissions such as particulate matter, NO_2, and hydrocarbons being traffic and domestic fuel burning.

In conjunction with individual local authorities, the EPA undertakes ambient air quality monitoring at specific locations throughout the country in the urban and rural environment; an Air Quality Report based on data from 30 monitoring stations and a number of mobile air quality units is developed on an annual basis. The EPA's most recent publication 'Air Quality in Ireland, 2020' reports the quality of the air in Ireland based on the data from the National Ambient Air Quality Monitoring Network throughout the year 2020.

When assessing air quality, the EPA focuses on two main pollutants: particulate matter and nitrogen oxides. Measured concentrations of NO_2 for the years 2019 and 2020 are presented in Table 8-2 for Zone A monitoring stations. These results show that current levels of NO_2 are well below the annual mean and 1-hour maximum limit values. In the year 2019, annual mean concentrations of NO_2 ranged from 15 - 49 ug/m^3 across all Zone A stations, with no exceedance of the maximum hourly limit (EPA, 2020). In the year 2020, annual mean concentrations of NO_2 ranged from 11 - 30 ug/m^3 across all Zone A stations, with no exceedance of the maximum hourly limit (EPA, 2021).

The Dublin Port monitoring station is the closest station to the Site (ca. 2.5km) which continuously monitors for concentrations of nitrogen oxides (NO_2). Concentrations of NO_2 are also well below the threshold limits contained within the regulations at Dublin Port monitoring station, with an annual mean of 23 ug/m^3 measured in 2020 (EPA, 2021). Despite its close proximity, it is not considered that NO_2 measurements taken at Dublin Port would accurately represent ambient air conditions at the subject Site due to the suburban location of the Proposed Development. The Dublin Port monitoring station is located in an urban area with high traffic, transport, and combustion emissions.

The closest suburban background monitoring station to the Site which continuously monitors for concentrations of nitrogen oxides (NO_2) is located in Swords (ca. 9km to the north). Concentrations of NO_2 are also well below the threshold limits contained within the regulations at Swords monitoring station, with an annual mean of 15 ug/m^3 and 11 ug/m^3 measured in 2019 and 2020, respectively (EPA, 2020; EPA, 2021).

During 2020, the restriction of movement in Ireland due to the COVID-19 Pandemic had an impact on air quality nationally with a large-scale reduction in vehicular traffic. It is noted that the decrease in NO_2 levels during that year is a direct result of the restrictions placed on movements and construction due to COVID-19.

Based on the EPA monitoring data and taking account of the Site's environs and surrounding land-use, along with changes in vehicular and construction activity, a conservative estimate of current background NO_2 concentrations in the vicinity of the Site is 18 ug/m^3.

Table 8-2: Concentrations of NO_2 at Zone A Monitoring Stations

Station	Objective	Concentration (µg/m^3)		Limit or Threshold Value (ug/m^3)	Number of values >200µg/m^3
		2019	2020		
Winetavern St	Annual Mean NO_2	28	15	40	N/A
	Hourly Max NO_2	142	121.5	200	0
Davitt Road	Annual Mean NO_2	24	14	40	N/A
	Hourly Max NO_2	127	108.3	200	0
DAA	Annual Mean NO_2	-	23	40	N/A
	Hourly Max NO_2	-	88.8	200	0
St. Johns Road	Annual Mean NO_2	43	30	40	N/A
	Hourly Max NO_2	156	130.1	200	0
Rathmines	Annual Mean NO_2	22	13	40	N/A
	Hourly Max NO_2	183	170	200	0
Dun Laoghaire	Annual Mean NO_2	15	14	40	N/A
	Hourly Max NO_2	104	92.1	200	0
Ballyfermot	Annual Mean NO_2	20	12	40	N/A
	Hourly Max NO_2	124	107.7	200	0

Station	Objective	Concentration (μg/m³)		Limit or Threshold Value (ug/m³)	Number of values >200μg/m³
		2019	2020		
Blanchardstown	Annual Mean NO_2	31	12	40	N/A
	Hourly Max NO_2	163	164.6	200	0
Swords	Annual Mean NO_2	15	11	40	N/A
	Hourly Max NO_2	108	83.7	200	0
Dublin Port	Annual Mean NO_2	-	23	40	N/A
	Hourly Max NO_2	-	117.3	200	0
Pearse St	Annual Mean NO_2	49	27	40	N/A
	Hourly Max NO_2	151	142.3	200	0
Tallaght	Annual Mean NO_2	-	14	40	N/A
	Hourly Max NO_2	-	100.8	200	0
Ringsend	Annual Mean NO_2	24	18	40	N/A
	Hourly Max NO_2	109	123.8	200	0

Measured concentrations of PM_{10} for the years 2019 and 2020 are presented in Table 8-3 for Zone A monitoring stations. As is evident from these results, current levels of PM_{10} are well below the annual mean limit value. In the year 2019, annual mean concentrations of PM_{10} ranged from 11 – 19 ug/m³ across all Zone A stations, with no exceedance of short-term limit values (EPA, 2020). In the year 2020, annual mean concentrations of PM_{10} ranged from 10 – 20 ug/m³ across all Zone A stations, with no exceedance of short-term limit values (EPA, 2021).

The suburban background monitoring site of St. Anne's Park is located less than 1km from the Site of the Proposed Development and therefore is highly representative of background concentrations in the vicinity of the Proposed Development. This station continuously monitors for concentrations of PM_{10}. Concentrations of PM_{10} at St. Annes Park monitoring station are well below their respective limit values in 2019 and 2020, with an annual mean of 12 ug/m³ and 11 ug/m^3, respectively, and with no exceedances of the PM_{10} daily limit for the protection of human health (EPA, 2020; EPA, 2021).

Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the Proposed Development is 12 μg/m^3.

Table 8-3: Concentrations of PM_{10} at Zone A Monitoring Stations

Station	Objective	Concentration (μg/m^3)		Limit or Threshold Value
		2019	2020	
Winetavern St	Annual Mean PM_{10}	15	13	40 μg/m^3
	Days >50μg/m^3	9	0	35 days
Rathmines	Annual Mean PM_{10}	15	11	40 μg/m^3
	Days >50μg/m^3	9	2	35 days
Phoenix Park	Annual Mean PM_{10}	11	10	40 μg/m^3
	Days >50μg/m^3	2	0	35 days
Blanchardstow n	Annual Mean PM_{10}	19	15	40 μg/m^3
	Days >50μg/m^3	11	2	35 days
Dun Laoghaire	Annual Mean PM_{10}	12	12	40 μg/m^3
	Days >50μg/m^3	2	0	35 days
Ballyfermot	Annual Mean PM_{10}	14	12	40 μg/m^3
	Days >50μg/m^3	7	2	35 days
Tallaght	Annual Mean PM_{10}	12	10	40 μg/m^3
	Days >50μg/m^3	3	0	35 days
Ringsend	Annual Mean PM_{10}	19	17	40 μg/m^3
	Days >50μg/m^3	12	8	35 days
St. John's Road	Annual Mean PM_{10}	14	13	40 μg/m^3
	Days >50μg/m^3	5	0	35 days
St Annes Park	Annual Mean PM_{10}	12	11	40 μg/m^3
	Days >50μg/m^3	1	0	35 days
Dublin Airport	Annual Mean PM_{10}	-	13	40 μg/m^3
	Days >50μg/m^3	-	0	35 days

Station	Objective	Concentration (µg/m³)		Limit or Threshold Value
		2019	2020	
Davitt Road	Annual Mean PM_{10}	19	15	40 µg/m³
	Days >50µg/m³	15	4	35 days
Dublin Port	Annual Mean PM_{10}	-	20	40 µg/m³
	Days >50µg/m³	-	7	35 days
Finglas	Annual Mean PM_{10}	13	12	40 µg/m³
	Days >50µg/m³	2	0	35 days
Marino	Annual Mean PM_{10}	14	13	40 µg/m³
	Days >50µg/m³	4	0	35 days

8.3.2 Macroclimate

Ireland has a typical maritime climate, largely due to its proximity to the Atlantic Ocean and the presence of the Gulf Stream. Due to the moderating effects of the Gulf Stream, Ireland does not suffer the temperature extremes that are experienced by many other countries at a similar latitude. Mean annual temperatures generally range between 9°C and 10°C. Winters tend to be cool and windy while summers are mostly mild and less windy. The prevailing wind direction is between the south and west with average annual wind speeds ranging between 6 knots in parts of south Leinster to over 15 knots in the extreme north. Rainfall in Ireland occurs throughout the year with reasonable frequency. The highest rainfall occurs in the western half of the country and on high ground, and generally decreases towards the northeast. As the prevailing winds are from the west-southwest, the west of Ireland experiences the largest number of wet days. The area of least precipitation is along the eastern seaboard of the country.

8.3.3 Microclimate

The synoptic meteorological station at Dublin Airport is located approximately 6km northwest of the Proposed Development; and for the purposes of this chapter, weather data collected here may be considered similar to that which is experienced in the area of the subject Site.

The weather in the area of the subject Site is generally dominated by cool oceanic air masses, with cool winters, mild humid summers, and a lack of temperature extremes. Based on meteorological data at Dublin Airport over the last 3 years, the mean January temperature is 5.3°C, while the mean July temperature is 15.4°C. The prevailing wind direction is from a quadrant centred on the southwest. These are moderately warm winds from the Atlantic and they habitually bring rain. The expected annual rainfall for the eastern half of the country ranges between 750 and 1000mm. Easterly winds are less frequent, weaker, and tend to bring cooler weather from the northeast in spring and warmer weather from the southeast in summer.

8.3.3.1 Rainfall

Rainfall is a key indicator of changes in climate, as measurements of rainfall are fundamental to assessing the effects of climate change on the water cycle and water balance. Table 8-4 illustrates the monthly and annual rainfall data collected over a 3-year period (2018-2020) at Dublin Airport Weather Station. The annual rates of precipitation ranged from 709.4mm in 2018 to 886.1mm in 2019 with distribution of the highest monthly rainfall values falling mainly in the autumn and winter months. This is broadly within the expected range of the eastern half of the country.

Table 8-4: Monthly Rainfall Values (mm) for Dublin Airport Weather Station from January 2018 to December 2021 (Source: Met Eireann)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2021	115.1	55.0	32.1	10.8	83.5	12.6	72.9	65.3	42.0	78.8	11.7	85.5	**666.6**
2020	36.0	130.4	31.8	12.8	9.3	69.6	98.9	87.3	60.9	80.6	48.1	83.1	**748.8**
2019	26.8	30.5	92.5	74.6	33.4	82.9	41.0	91.9	104.6	77.2	173.0	57.7	**886.1**
LTA[6]	62.6	48.8	52.6	54.1	59.5	66.7	56.2	73.3	59.5	79.0	72.9	72.7	**757.9**

8.3.3.2 Wind

Wind at a particular location can be influenced by a number of factors, such as obstructions by trees or buildings, the nature of the terrain, and deflection by nearby mountains or hills. Wind blows most frequently from the south and west for open sites while winds from the northeast and north occur less often. The analysis of hourly weather data from Dublin Airport synoptic weather station over a period of 5 years suggests that the predominant wind direction blows from the southwest, with windspeeds of between 7 and 10 knots occurring most frequently.

Figure 8-2 provides a wind speed frequency distribution which represents wind speed classes and the frequency at which they occur (% of time) at Dublin Airport weather station over a period of 5 years. Wind speeds of 8 knots have the highest frequency, occurring approximately 8.6% of the time.

[6] The 'LTA' is average for the climatological long-term-average (LTA) reference period 1981-2010