



Enviroguide
CONSULTING

HYDROLOGICAL & HYDROGEOLOGICAL RISK ASSESSMENT

FOR

PROPOSED DEVELOPMENT

AT

DONORE AVENUE, DUBLIN 8


December, 2022


ON BEHALF OF


The Land Development Agency (LDA)



Prepared by
Enviroguide Consulting

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1 INTRODUCTION

Enviroguide Consulting (hereafter referred to as Enviroguide) was appointed by The Land Development Agency (hereafter referred to as the Applicant) to prepare a hydrological and hydrogeological risk assessment for the Proposed Development at the Donore Project, Donore Avenue, Dublin 8 (referred to hereafter as the Site).

1.1 Project Objective

The project objective was to establish the baseline hydrological and hydrogeological conditions at the Site and to identify the potential for any impacts on receptors hydraulically connected with the Proposed Development Site and specifically Natura 2000 sites and any impact on the WFD status of surface water bodies associated with the Site.

1.2 Project Scope

The scope of the assessment undertaken to meet the project objective included:

- A desk-based review of published information and information pertaining to the Site and Proposed Development provided by the Applicant;
- Develop a hydrogeological Conceptual Site Model (CSM) for the Site identifying potential Source-Pathway-Receptor linkages; and
- Identify and assess any potential impacts associated with the Proposed Development on hydraulically connected sensitive receptors associated with the Site and specifically:
 - Natura 2000 sites in the absence of any proposed design avoidance and mitigation measures for the Proposed Development; and
 - the WFD status of water bodies within the same river basin district as the Site.

This assessment is reliant on the design information for the Proposed Development and the Site provided by the Applicant.

1.3 Quality Assurance & Competence

This report was written by Fionnuala Joyce BSc., MSc., Hydrogeologist who has five years experience of hydrological and hydrogeological impact assessments. This report was written and reviewed by Claire Clifford BSc., MSc., PGeo., EurGeol. who is Technical Director - Contaminated Land and Hydrogeology with Enviroguide Consulting and is a Professional Geologist with the Institute of Geologists of Ireland. Claire has over 19 years experience in preparing hydrogeological and environmental risk assessments for a range of project types including Strategic Housing Developments in varying geological and hydrogeological settings.

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Site Location and Description

The Proposed Development Site occupies 3.26 hectares (Ha) and is bound to the south by a number of industrial units along South Circular Road, to the east and north-east by Donore Avenue and Ebenezer Terrace and by Margaret Kennedy Road to the north-west and Cameron Court beyond.

The Site location is presented in Figure 2-1.

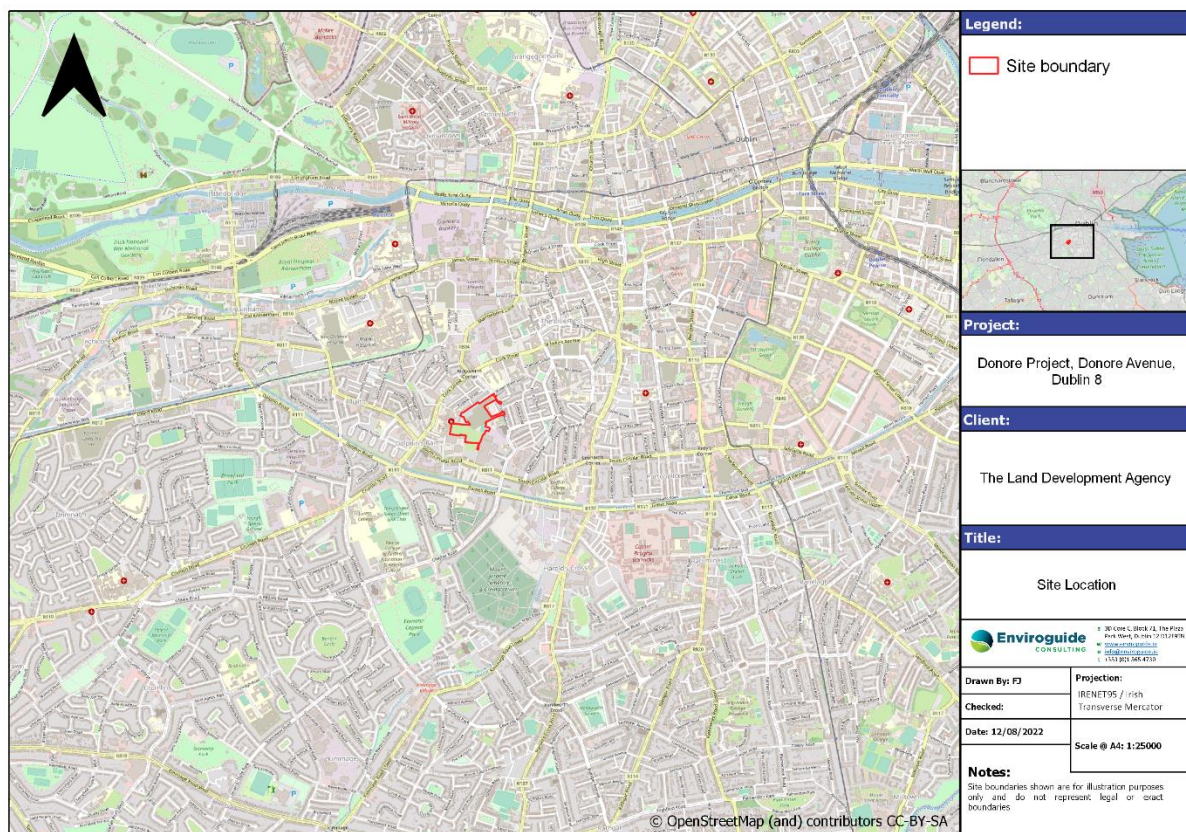


Figure 2-1: Site Location

2.2 Proposed Development

The Proposed Development, the planning application for which is accompanied by this EIAR, will consist of the construction of a residential scheme of 543 no. apartments on an overall site of 3.26 ha.

The Proposed Development will consist of the construction of a residential scheme of 543 no. apartments on an overall site of 3.26 ha (GFA of c. 53,227 sqm) containing the following mix of apartments:

- 225 No. 1 bedroom apartments (36 no. 1-person & 189 no. 2-person)
- 274 No. 2 bedroom apartments (including 52 No. 2 bed 3 person apartments and 222 No. 2 bed 4 person apartments)

- 44 No. 3 bedroom 5-person apartments
- A retail/café unit (168 m² mobility hub (52 m²) and 952 m² of community, artist workspace, arts and cultural space, including a creche, set out in 4 No. blocks.

The breakdown of each block will contain the following apartments:

- Block DCC1 comprises 111 No. apartments in a block of 6-7 storeys;
- Block DCC 3 comprises 247 No. apartments in a block of 6-15 storeys;
- Block DCC5 comprises 132 No. apartments in a block of 2-7 storeys;
- Block DCC6 comprises 53 No. apartments in a block of 7 storeys;

The Proposed Development will also provide for public open space of 3,408 sqm, communal amenity space of 4,417 sqm and an outdoor play space associated with the creche. Provision of private open space in the form of balconies or terraces is provided to all individual apartments.

The Proposed Development will provide 906 no. residential bicycle parking spaces which are located within secure bicycle stores. 5% of these are over-sized spaces which are for large bicycles, cargo bicycles and other non-standard bicycles. In addition, 138 spaces for visitors are distributed throughout the site.

A total of 79 no. car parking spaces are provided at undercroft level. Six of these are mobility impaired spaces (2 in each of DCC1, DCC3 & DCC5). 50% of standard spaces will be EV fitted. Up to 30 of the spaces will be reserved for car sharing (resident use only). A further 15 no. on-street spaces are proposed consisting of:

- 1 no. accessible bay (between DCC5 & DCC6)
- 1 no. short stay bay (between DCC5 & DCC6)
- 1 no. crèche set-down / loading bay (between DCC5 & DCC6)
- 1 no. set-down / loading bay (northern side of DCC5)
- 1 no. set-down/loading bay (northern side of DCC 3)
- 10 no. short stay spaces (north-east of DCC1)

In addition, 4 no. motorcycle spaces are also to be provided.

Vehicular, pedestrian and cyclist access routes are provided from a new entrance to the north-west from Margaret Kennedy Road. Provision for further vehicular, pedestrian and cyclist access points have been made to facilitate connections to the planned residential schemes on the Bailey Gibson & Player Wills sites for which there are extant permissions (Ref. No.'s ABP-307221-20 & ABP-308917-20).

The development will also provide for all associated ancillary site development infrastructure including site clearance & demolition of boundary wall along Margaret Kennedy Road and playing pitch on eastern side of site and associated fencing/lighting, the construction of foundations, ESB substations, switch room, water tank rooms, storage room, meter room, sprinkler tank room, comms room, bin storage, bicycle stores, green roofs, hard and soft landscaping, play equipment, boundary walls, attenuation area and all associated works and infrastructure to facilitate the development including connection to foul and surface water drainage and water supply.

To accommodate the Proposed Development the connection to the existing drainage infrastructure at the Proposed Development Site will be decommissioned during the construction phase of the development to divert some of the existing drainage across the Proposed Development Site and to facilitate the connections of the proposed surface water and foul water drainage (Refer AECOM, 2022. Drawing reference: STG-AEC-S1b-00-00-DRC-0000500).

The Proposed Development also has the potential for cumulative impacts with neighbouring projects as outlined in Section 2.4.

The proposed Site Layout is presented in Figure 2-2.



Figure 2-2: Proposed Site Layout (refer to DWG No.: STG-AEC-S1b-00-00-DR-C-000001, AECOM, 2022)

2.3 Proposed Site Drainage

The proposed drainage design for the Proposed Development is specified in detail in the Application Infrastructure Report (AECOM, 2022a). The proposed drainage design is presented in Figure 2-3.

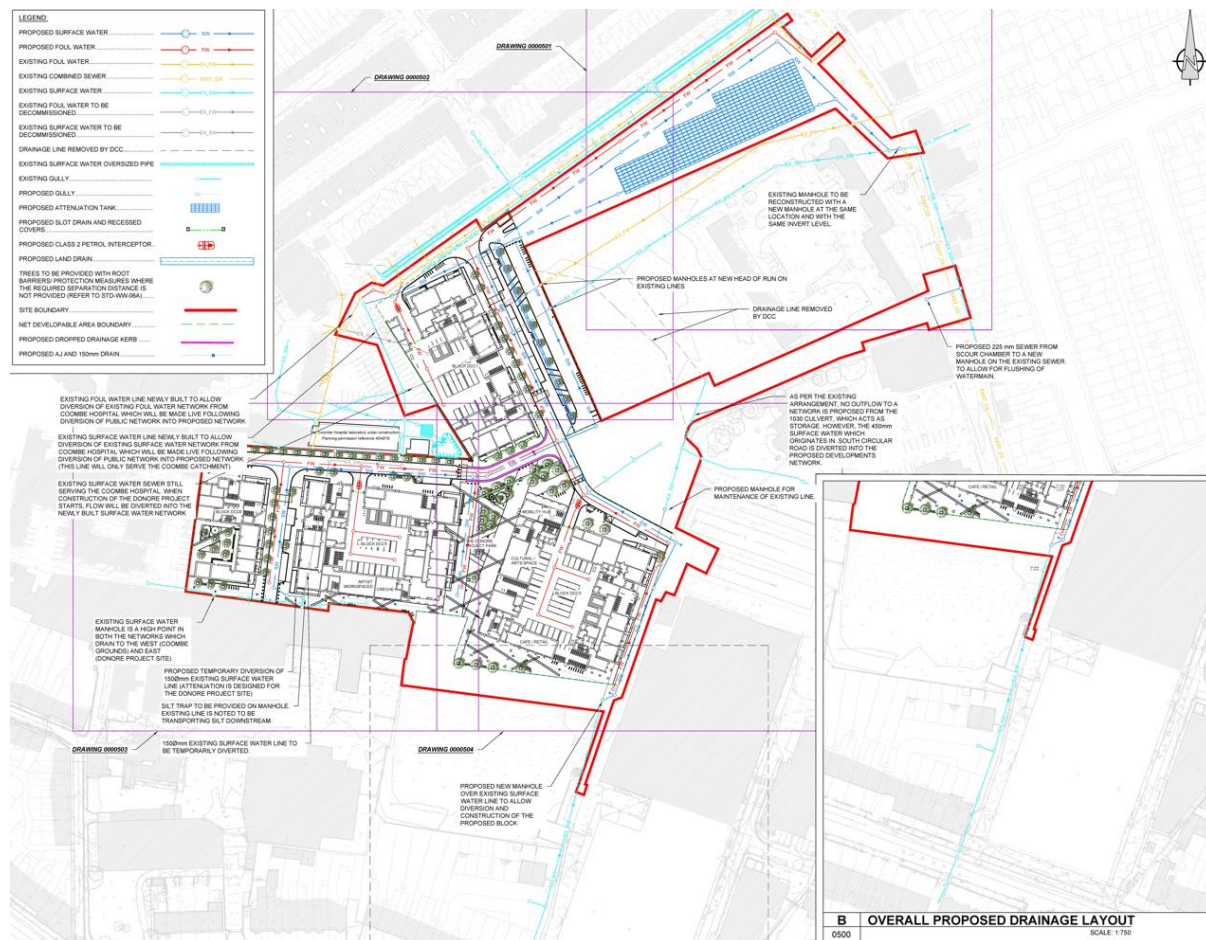


Figure 2-3: Proposed Drainage Layout (AECOM DWG Ref: STG-AEC-S1n-00-00-DR-C-0000500)

2.3.1 Foul Drainage

2.3.1.1 Existing Drainage

The existing foul drainage network at the Site comprises a 225mm combined sewer which currently collects wastewater from lands located west of the Site and discharges to an existing 1,020mm combined sewer located on Donore Avenue (AECOM, 2022a). Foul water from the Site is ultimately discharged via mains sewer to Ringsend Waste Water Treatment Plant (WWTP) and the treated effluent from the WWTP is discharged to Dublin Bay.

2.3.1.2 Proposed Drainage

It is proposed to divert the existing combined sewer 225mm foul sewer located at Margaret Kennedy Road which bounds north-western boundary of the Site.

As described in the Infrastructure Report (AECOM, 2022a) the existing foul water line will remain live until the full diversion has been constructed as far as Margaret Kennedy Road (AECOM, 2022a). The foul wastewater will divert the existing 225mm diameter combined sewer (currently collecting foul water from lands located west of the Site and flowing to the eastern side of the Site) from the west to connect to a 225mm diameter foul sewer located at Margaret Kennedy Road at the north-western boundary of the Site and will ultimately be redirected towards the northeast on completion of the foul drainage network to the Ringsend WWTP (AECOM, 2022a).

New foul drainage will be constructed at the Site to service the Proposed Development. The proposed foul drainage comprises foul water connections from the residential apartments, commercial spaces and undercroft car parking to the existing 1,020mm culvert located north of the Site on Donore Avenue (AECOM Drawing reference: STG-AEC-S1b-00-00-DRC-0000500).

Surface runoff from the undercroft areas beneath each of Blocks DCC1, DCC3 and DCC5 will be discharged via Class 1 interceptor (or similar approved) to the new foul drainage network onsite.

Foul drainage from the Proposed Development Site during the Operational Phase will ultimately discharge via the Irish Water network to Ringsend WWTP (Waste Water Discharge Licence ref.: D0034-01) (GSI, 2022).

A Confirmation of Feasibility (COF) received from Irish Water (COF Ref: CDS21000854 dated the 1st October 2021) confirms the proposed wastewater connections are feasible but specify that discharge from the Site will be required to limit peak discharges to 2dry weather flow (DWF) by a throttle. No objection to design submission is also confirmed in the Irish Water Statement of Design Acceptance (SoDA) dated 8th July 2022 (Refer Appendix D, AECOM 2022a). This is specified in the drainage design for the Proposed Development (AECOM, 2022a)

2.3.2 Surface Water drainage

2.3.2.1 Existing Surface Water Drainage

There is an existing surface water drainage network at the Site as outlined in the Application Infrastructure Report (AECOM, 2022a) comprising the following:

- A 150mm surface water connection directs surface water from lands located to the south-west of the Site (previously the Bailey-Gibson warehouse) through the Site, to connect to a 300mm sewer located in lands west of the Site before discharging to a 1m stormwater culvert located to the north of the Site on Donore Avenue;
- The remains of a 1,030mm surface water concrete culvert was identified in the northern portion of the Site which flows to a surface water storage network located to the west of the Site which is then directed to a 450mm sewer located adjoining the eastern Site boundary as described below; and
- The 450mm sewer is located adjoining the eastern Site boundary however, the outfall location for this is not known at the time of writing this report.

As existing surface water drainage traverses the proposed buildings, diversion of the existing drainage through and around the Site will be required to connect this to the proposed surface water drainage network as detailed in the Application Infrastructure Report (AECOM, 2022a)

2.3.2.2 Proposed Surface Water Drainage

Surface water management for the Proposed Development as outlined in the Application Infrastructure Report (AECOM, 2022a) is designed to comply with the 'Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume 2, New Developments, 2005' and the 'Greater Dublin Regional Code of Practice for Drainage Works, V6.0 2005'. CIRIA Design Manuals C753, C697 and C609 have also been used to design the surface water drainage system within the Site. As set out within AECOM's

Application Infrastructure Report, it is proposed to use a sustainable urban drainage systems (SuDS) approach to stormwater management throughout the Site. The SUDS measures will include where appropriate: green roofs, permeable pavements, swales, porous asphalt and bio-retention / rain gardens.

Surface water will be directed to a Class 1 petrol interceptor (or similar approved) located upstream of the proposed attenuation tank to be located in the northern portion of the Site.

Treated surface water from the attenuation tank will be directed from the proposed attenuation tank and discharged to the existing 1.2m diameter surface water sewer located on Donore Avenue to the north-east of the Site. Surface water from the Site will ultimately be discharged at an outfall point at the Poddle Stream located approximately 0.65km north-east of the Proposed Development.

Surface water from roofs and terraces will be directed through extensive and intensive green roofs and permeable paving before being directed to the proposed drainage network.

Surface water from roads and hardstanding paths and roadways at the Site will be directed to rain gardens/ bio-retention areas, porous asphalt and swales and land drains to allow evapotranspiration or to be filtered through the substrate before entering the proposed drainage network.

As outlined in Section 2.3.1.2 surface runoff from the undercroft areas will be discharged to VI Class 1 petrol interceptor to foul drainage.

2.3.3 Water Supply

It is proposed to supply the Site from watermain using a new 200mm connection to the existing 6-inch watermain located on Donore Avenue directly to the east of the Proposed Development Site.

IW have provided a Confirmation of Feasibility (COF Ref: CDS21000854 dated 1st October 2022), that confirms the proposal for a connection to the IW supply main is “Feasible Subject to upgrades” with upgrades to include a 200mm ID pipe connection main with a connection to the new 250mm ID pipe to the south-west of the Site as well as a secondary connection comprising a 200mm ID pipe with a control valve (Refer Appendix B of AECOM 2022a)

The water supply infrastructure at the Proposed Development will be designed and constructed in accordance with current IW Code of Practice for Water Infrastructure.

2.3.4 Subsurface Structures

Site clearance and excavation required to reduce levels to construct the foundations, undercroft levels beneath Blocks DCC1, DCC3 and DCC5 and the surface water drainage including an attenuation tank. The finished flood levels for the undercroft area range from 19.10mOD (DCC1) to 20.2mOD (DCC3 and DCC5). The attenuation tank will be constructed as a 1.2m deep tank (AECOM, 2022a Drawing Ref.: STG-AEC-S1b-00-00-DR-C-0000500). Piling for the construction of foundations to a maximum depth of 9mbGL.

Excavated material that cannot be reused on-site will be removed offsite and authorised reuse or recovery and if necessary, disposal in accordance with waste management legislation

2.4 Existing Planning Permissions

A review of other off-site developments and permitted developments was completed as part of this assessment. The following projects and plans were reviewed and considered for possible cumulative effects with the Proposed Development as outlined below in Table 2-1.

Table 2-1: Recent applications granted permission in the vicinity of the Proposed Development

Planning No.	Ref	Applicant Name	Summary of Development
3537/21		Coombe Lying-in Hospital	<p>Planning permission for development at the Coombe Women and Infants University Hospital, Dolphin's Barn Street, Dublin 8, D08 XW7X on a 0.15 hectare site to the south-east of the hospital site, such site also including the existing Colposcopy building.</p> <p>The development for which planning permission is sought comprises of the development of a new dedicated Colposcopy/Women's Health Unit building of 3 no. storeys plus rooftop plant room which will be attached to the existing Colposcopy building to the west by way of glazed link. The development will include the partial demolition of the eastern meeting room and lobby area wing to the existing Colposcopy building to facilitate the connection to the new building. The proposed building comprises of a 988 sq.m gross floor area building. The building will comprise of: (i) at ground floor level; a waiting area, 2 wc's (1 accessible), 1 plant room, 1 meeting room, 3 gynaecology examination rooms (with associated changing rooms), 1 utility room, a waste room, an early pregnancy assessment unit with dedicated entrance, 2 assessment rooms, reflection room, 1 wc, and an office/reception; (ii) at first floor; a waiting area, a check in room, a supplies store, 2 wc's (1 accessible), 4 colposcopy examination rooms and with associated changing and consultation areas, a utility and a waste room; (iii) at second floor; a meeting room, 2 staff changing rooms (1 accessible with shower and wc), a wc, a staff canteen, a photocopier room and 4 staff office rooms.</p> <p>The proposed Colposcopy building will involve the loss of 10 existing parking spaces, at the south- eastern corner of the hospital site. 2 number accessible car parking spaces will be provided to the south of the proposed extension.</p> <p>Planning permission is also sought for site drainage, a glazed link to the existing Colposcopy building, site landscaping works, and all other associated and ancillary works. Access is via the main hospital campus which is accessed from Dolphin's Barn Street.</p> <p>Grant Permission 25 Apr 2022</p>
SHD0031/20 ABP 308917-20		DBTR-SCR1 Fund, a Sub-Fund of the CWTC Multi Family ICAV,	<p>Demolition of all buildings excluding the original fabric of the former Player Wills Factory, construction of 492 no. Build to Rent apartments, 240 no. Build to Rent shared accommodation along, creche and associated site works.</p> <p>Grant Permission 15 Apr 2021</p>
ABP-307221-20		DBTR-SCR1 Fund aSub-Fund of the	<p>Demolition of all structures, construction of 416 no. residential units (4 no. houses, 412 no. apartments) and associated site works.</p>

Planning Ref No.	Applicant Name	Summary of Development
(BG1)	CWTC Multi Family ICAV	Planning Permission Granted with Conditions 14/09/2020
4049/19	The Coombe Women & Infant's University Hospital	<p>The development will consist of a new four storey laboratory building (1340m²) within the existing Coombe site with the provision of rooftop plant and 2 no. rear extensions to the existing adjacent laboratory building to include a new link, office and store (68m²) with all associated site works. This application site is in S.D.R.A. no.12, St Teresa's Gardens and Environs Strategic Development and Regeneration Area.</p> <p>Grant Permission 11 Feb 2020</p>
2475/18	D.C.C. Housing Development	<p>Pursuant to the requirements of the above, notice is hereby given of the intention to amend the previously permitted development comprising 50 no. units (16 no. apartments, 24 no. 3 bedroom terraced houses and 10 no. 2 bedroom terraced units - Planning ref 2033/14) to allow for the construction of an additional 4 no. terraced residential units and associated works; amendments to the design of 12 no. previously permitted units; development of a temporary grass multisport pitch in addition to the previously permitted park development (Phase A); demolition of 2 no. existing flat blocks to facilitate the future provision of a landmark park (Phase B) with full size multisport pitch and associated works at St. Teresa's Gardens, Donore Avenue, Dublin 8.</p>
ABP-314171-22 (BG2)	<p>CWTC Multi Family ICAV acting solely in respect of its sub fund DBTR SCR1 Fund</p>	<p>Demolition of buildings, construction of 345 no. residential units (292 no. Build to Rent apartments, 49 no. Build to Sell apartments, 4 no. Build to Sell Houses) creche and associated site works.</p> <p>Case is due to be decided by 14/11/2022</p> <p>www.bgscr1shd2.ie</p>

It is noted following a review of the applications specified in Table 2-1 that applications ABP-307221-20 (BG1) and ABP-314171-22 (BG2) have been submitted for the same site however, only one of these applications will progress for development if the submissions for the site are approved.

3 SITE SETTING

3.1 Topography

The regional topography generally slopes towards the north and to the east (towards the Liffey Estuary Upper and the Poddle Stream) around the Proposed Development Site from the regional highpoint of Belgard Park which is located approximately 8.23km southwest of the Proposed Development.

The topography at the Site is generally even with elevations 18.08mOD in the centre of the Site to 19.56maOD in the southern portion of the Proposed Development (Murphy Geospatial Ltd., 2021).

3.2 Rainfall

Monthly rainfall data for the Site available for 1km x 1km grids (for the period 1981 to 2010) was sourced from Met Éireann (Walsh, 2012) and is presented in Table 3-1. The average annual potential evapotranspiration (PE) from the Dublin Airport station, located approximately 9.4km north of the Site for the period 2021 to 2022 is recorded as 554mm (Met Éireann, 2022).

Table 3-1: Long-term mean monthly rainfall data (mm) (Walsh, 2012)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
62	48	53	50	57	60	50	64	58	76	72	71	722
Note: 1km x 1km Irish Grid Coordinates selected for the Site = X (Easting): 314000, Y (Northing): 232000 Mean monthly rainfall data as mm												

3.3 Regional Hydrology and Catchment

The Proposed Development Site is located in the Liffey and Dublin Bay Catchment (Catchment I.D 09) and in the Dodder_SC_010 Sub-catchment (Sub-catchment I.D.09_16) (EPA, 2022).

The Site is located within Hydrometric Area 09 and within the Poddle_010 River Sub-basin (EPA, 2022).

The EPA records a number of surface waterbodies with a potential hydraulic connection to the Proposed Development Site which include the following:

- The Grand Canal Main Line (EU code: IE_09_AWB_GCMLE) is located approximately 0.27km to the south of the Site however there is no identified hydraulic connection to the Site;
- The Camac River (EU Code: IE_EA_09C020500) is located approximately 1.1km north-west of the Site and flows in a northeast direction where it joins the Liffey Estuary Upper transitional waterbody. No direct connection can be identified from the Proposed Development Site to this waterbody;
- The Poddle Stream (EPA Code: 09P03) is located approximately 0.6km east of the Site and flows in a northwards direction where it joins the Liffey Estuary Upper transitional waterbody, which is located approximately 1.3km north of the Site. The

Poddle Stream is culverted as it passes the Proposed Development Site from south of the Grand Canal to where it discharges to the Liffey Estuary. This reduces the likelihood of there being a hydraulic connection via groundwater migration. A hydraulic connection is identified from the Site to this waterbody via the existing surface water drainage network at the Site.

- The Liffey Estuary Upper transitional waterbody (EU Code: IE_EA_090_0400) is located approximately 1.3km north of the Site and is connected to the Liffey Estuary Lower transitional waterbody (EU Code: IE_EA_090_0300) and to the Dublin Bay coastal waterbody (EU Code: IE_EA_090_0000).

All relevant watercourses to the Proposed Development are presented in Figure 3-1.

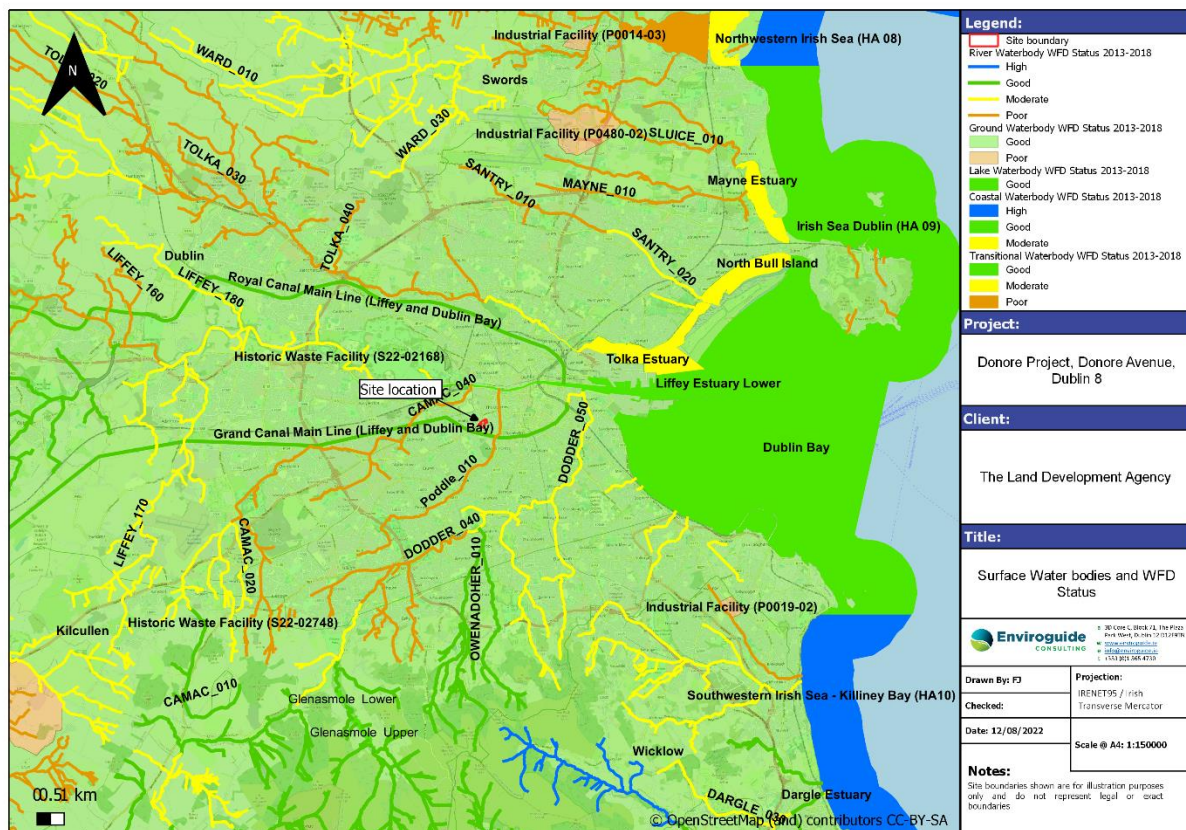


Figure 3-1: Surface water bodies and WFD Status

3.4 Flood Risk

A Site-specific flood risk assessment report (SSFRA) was produced (AECOM, 2022b) for the Proposed Development Site which assessed the potential flood risk associated with fluvial, groundwater, coastal and pluvial flooding.

The FRA identifies that tidal flooding is not predicted to affect the Site including during a high-end scenario when climate change is considered (AECOM, 2022b).

It is concluded that there is no risk of groundwater flooding predicted for the Site (AECOM, 2022b).

The SSFRA identifies that the Site area is at minimal risk of fluvial flooding (AECOM, 2022b).

The Site is considered to be at risk of pluvial flooding in the event of high intensity rainfall (AECOM, 2022b).

The SSFRA identifies the site as being classified as a “Highly Vulnerable Development” and a justification test was completed for the development (AECOM, 2022b).

The SSFRA concludes that *“a new proposed surface water network will be constructed, ensuring that no flooding would occur on site and reducing the volume of runoff entering the sewers predicted to flood”* (AECOM, 2022b).

3.5 Soil and Subsoil

The soil beneath the Site is mapped as “Made ground” (MADE) described as “Made/ built land” (GSI, 2022). The underlying soils are presented in Figure 3-2.

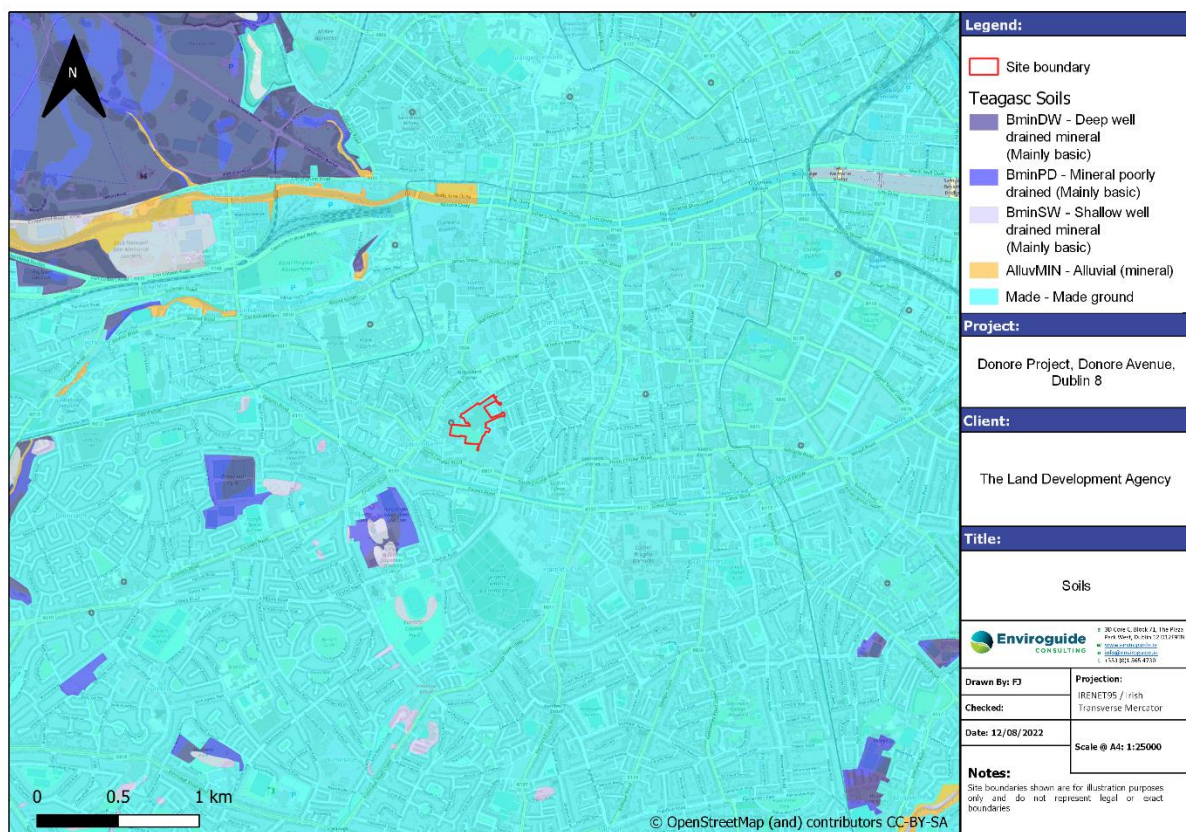


Figure 3-2: Soils

The quaternary sediments beneath the Site are mapped as Till derived from limestones (TLs) (GSI, 2022). The quaternary sediments are presented in Figure 3-3.

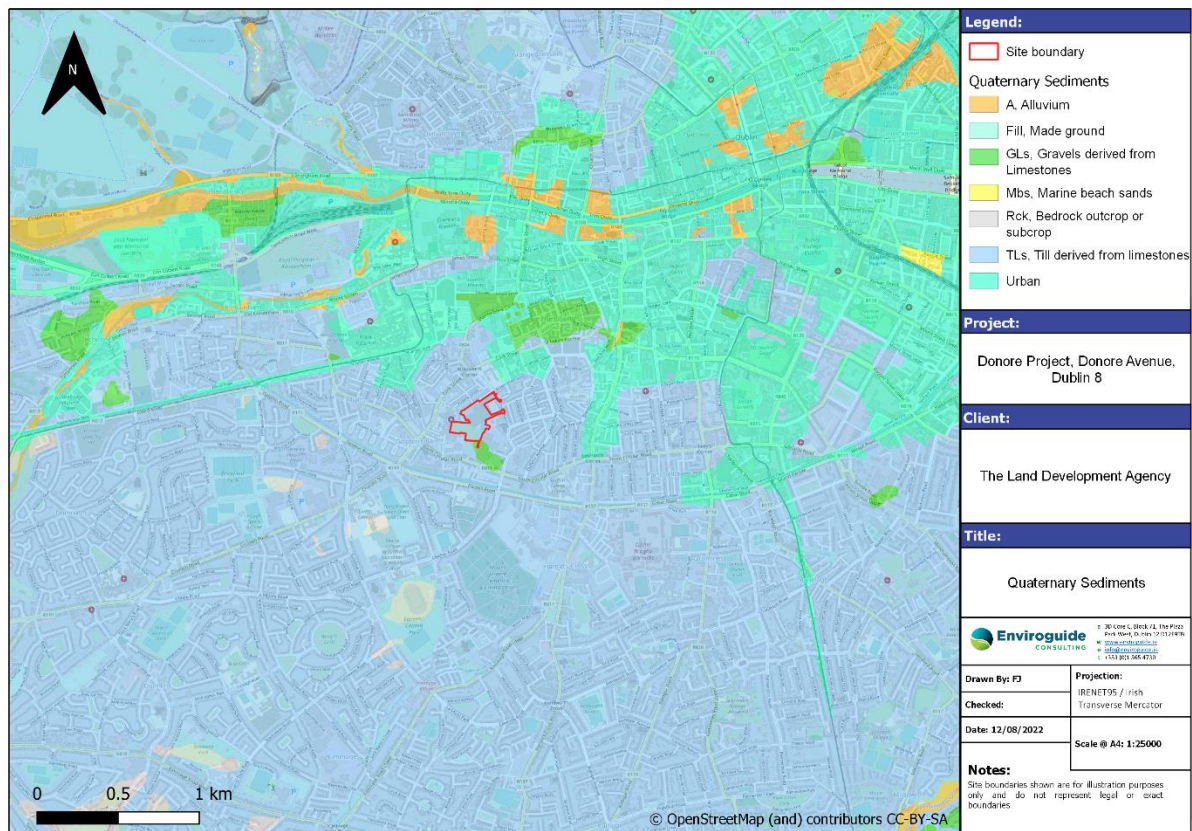


Figure 3-3: Quaternary Sediments

3.6 Bedrock Geology

The GSI has mapped the bedrock beneath the Site as the Lucan Formation (New Code: CDLUCN; Stratigraphic Code: LU) which is described as “Dark limestones & shale” and is recorded as having a thickness ranging from 300m to 800m (GSI, 2022). The GSI bedrock geology map is presented in Figure 3-4.

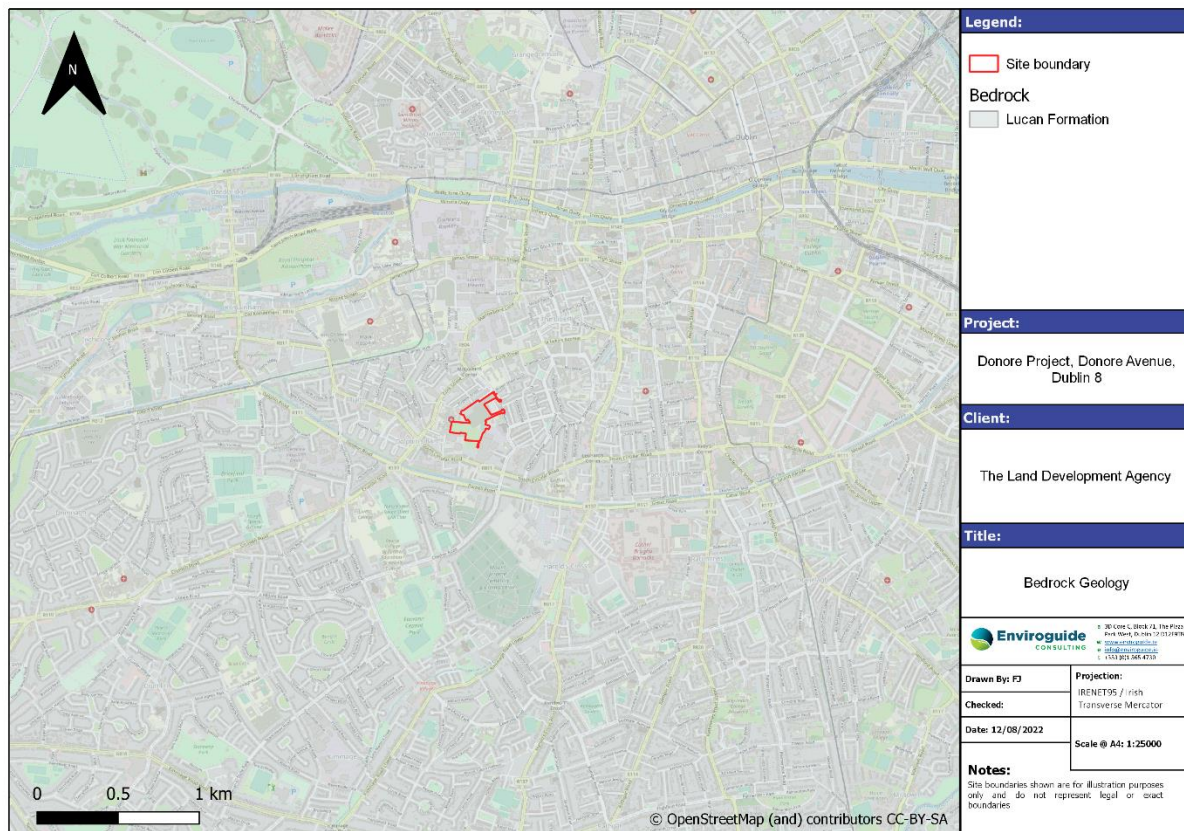


Figure 3-4: Bedrock Geology

3.7 Recharge

The GSI (GSI, 2022) has calculated an Effective Rainfall (ER) value of 285.2mm/year for the Site. The GSI (GSI, 2022) calculated recharge coefficient of 20% applied to the lands within Site. A recharge cap of 57mm/year has been applied to lands beneath Site (GSI, 2022).

3.8 Aquifer Classification and Vulnerability Rating

The bedrock aquifer identified beneath the Site is mapped as “Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones” (LI) (GSI, 2022).

The groundwater vulnerability rating assigned to groundwater beneath the majority of Site is mapped as “*Moderate*” (M) Vulnerability to contamination where it is indicated that the depth to bedrock from the ground surface is between 5m to 10m and has a “Low” subsoil Permeability (GSI, 2022). The Groundwater Vulnerability Rating assigned to groundwater beneath the south-eastern portion of the Site is mapped as “High” (H)” (GSI, 2022). The GSI Groundwater Aquifer Classification map is provided in Figure 3-5 and the Groundwater Vulnerability map is presented in Figure 3-6. The is consistent to the findings of the Site investigation with the top of bedrock was encountered at depths ranging between 4.2metres below ground level (mbGL) and 6.6mbGL beneath a stiff clay overburden (GII, 2021).

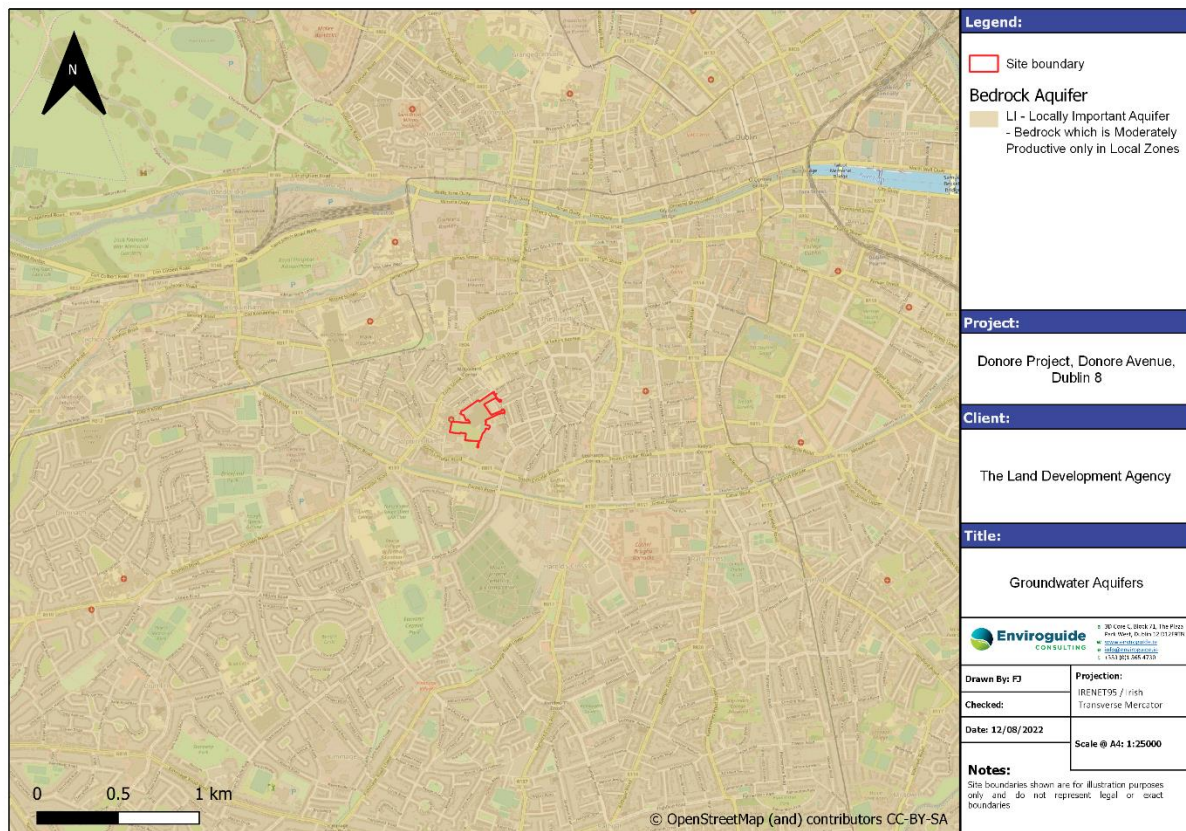


Figure 3-5: Groundwater Aquifers

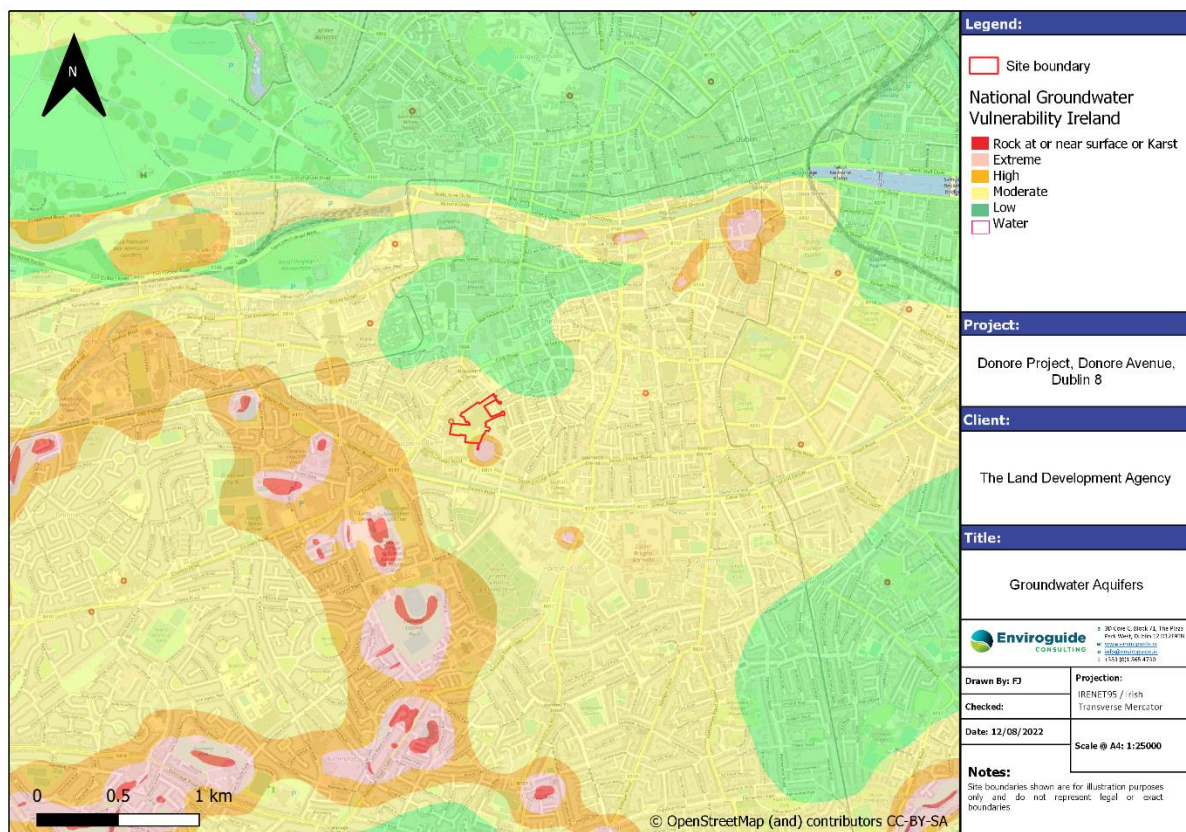


Figure 3-6: Groundwater Vulnerability

3.9 Regional Hydrogeology

The bedrock aquifer beneath the Site is within the Dublin GWB (EU Code: IE_EA_G_008). The Dublin GWB covers some 837km² and occupies an area across Co. Dublin, Co. Kildare, and Co. Meath (GSI, 2022).

The GSI description of the Dublin GWB identifies that the dominant recharge process in the Dublin City area will be from leaking sewers, mains and storm drains where the ground has been surfaced, while elsewhere recharge will occur via rainfall percolating through the subsoil. Due to the generally low permeability of the underlying aquifer in the groundwater body, a high proportion of the recharge will then discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer.

The GSI (Dublin GWB Report) identifies that the general groundwater flow direction in the aquifer is towards the coast and also towards the Liffey Estuary Upper, Liffey Estuary Lower and Dublin City. Groundwater circulation from recharge to discharge points will more commonly take place over a distance of less than a kilometre.

3.10 Water Quality Data

3.10.1 Surface water quality

There are no recorded surface water monitoring stations located on the Poddle Stream however there is available EPA water quality monitoring data for the station located on the Liffey Estuary Lower (Refer to Table 3-2). The EPA data indicates that there is an upward trend in Total Ammonia, total Oxidised Nitrogen and Ortho-phosphate (as P) for the water course for the period 2013-2018, while an upward trend in the concentration of Chloride was observed from 2018 to 2022 (EPA, 2022). The biotic indices also known as Q values, which reflect the average water quality, were assessed by the EPA at the “LIFFEY – Islandbridge – UCS Boat Club” which is located upstream relative to the Site monitoring station and are presented in Table 3-2.

Table 3-2: EPA monitoring stations and assigned Q values

EPA Monitoring Station name	Station Code	Location from Site	Distance from Site (km)	Assigned value	Q
LIFFEY – Islandbridge – UCS Boat Club	RS09L012400	North-west	2.27	3 “Poor”	

3.10.2 Groundwater Quality

There are no groundwater monitoring stations located within the vicinity of the Proposed Development Site (within a 2km radius of the Site). The closest groundwater monitoring station to the Site for which there is available data which is located in the Dublin Groundwater Body is the Ryewater RW1 groundwater monitoring station which is located approximately 19.2km north-west of the Site (EPA, 2022).

Groundwater quality data for the Site is included in Section 4.5.

3.11 Designated and Protected Sites (Natura 2000)

The Habitats Directive 92/43/EEC seeks to conserve natural habitats and wild fauna and flora by the designation of Special Areas of Conservation (SACs) and the Birds Directive (2009/147/EC) seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs). SACs and SPAs are collectively known as Natura 2000 or European sites (referred to hereafter as Natura 2000 site).

There are no Natura 2000 sites located in the immediate vicinity (within a 2km radius) of the Site however, a potential hydraulic connection is identified between the Proposed Development Site and the Natura 2000s described in Table 3-3 and presented in Figure 3-7.

Table 3-3: Designated and Protected Sites and Areas with a potential hydraulic connection to the Proposed Development Site

Site Code	Site Name	Distance from Proposed Development Site (km)
Special Areas of Conservation (SAC)		
0030000	South Dublin Bay SAC	7.2
000206	North Dublin Bay SAC	8.8
Special Protection Areas (SPA)		
004006	North Bull Island SPA	8.7
004024	South Dublin Bay and River Tolka Estuary SPA	7.1

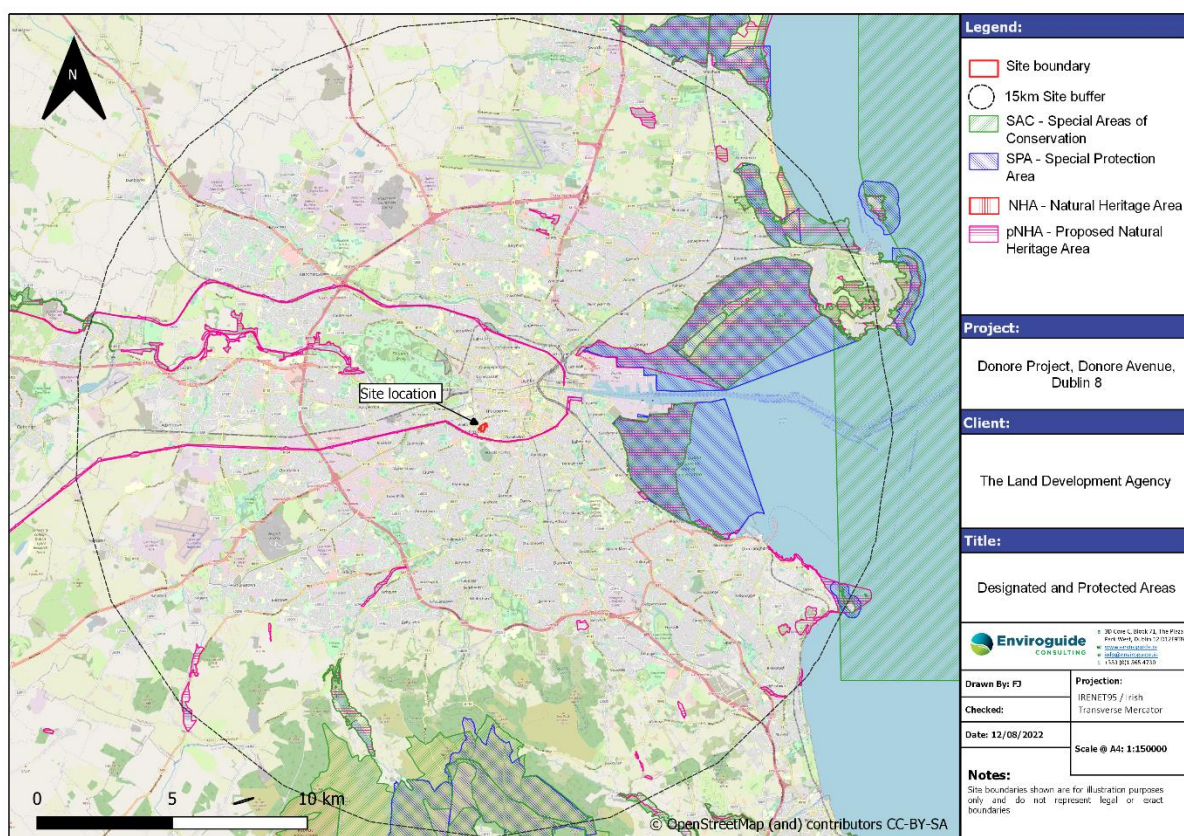


Figure 3-7: Designated and Protected Areas

3.12 Water Framework Directive (WFD status)

The Waterbody Status for river, groundwater, transitional and coastal water bodies relevant to the Proposed Development as recorded by the EPA (2022) in accordance with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003) are provided in Table 3-4 and the WFD Status in Figure 3-1.

Table 3-4: WFD Risk and Water Body Status

Waterbody Name	Water body; EU code	Location from Site	Distance from Site (km)	WFD water body status (2013-2018)	WFD 3 rd cycle Risk Status	Hydraulic Connection to the Site
Surface Water Bodies						
Poddle Stream	09P03	East	0.6	Poor	At Risk	Downstream of the Site
Camac River	IE_EA_09C0 20500	North	1.1	Poor	At Risk	No direct connection identified with the Site
Canal Water Bodies						
Grand Canal Main Line	IE_09_AWB _GCMLE	South	0.27	Good	Not at risk	No direct connection identified with the Site
Transitional Water Bodies						
Liffey Estuary Upper	IE_EA_090_ 0400	North-east	1.3	Good	Review	Downstream of the Poddle Stream

Waterbody Name	Water body; EU code	Location from Site	Distance from Site (km)	WFD water body status (2013-2018)	WFD 3 rd cycle Risk Status	Hydraulic Connection to the Site
Liffey Estuary Lower	IE_EA_090_0300	North-east	2.7	Good	Review	Downstream of the Poddle Stream
Coastal Water Bodies						
Dublin Bay	IE_EA_090_0000	East	8.78	Good	Not at Risk	Downstream of the Poddle Stream
Groundwater Bodies						
Dublin Groundwater Body	IE_EA_G_008	N/A	N/A	Good	Review	Underlying groundwater body

4 SITE INVESTIGATION AND ASSESSMENT RESULTS

4.1 Site Investigation

A Site investigation and environmental assessment was completed for the Proposed Development Site by Ground Investigations Ireland Ltd. (GII) (GII, 2021). The scope of the Site investigation and assessment included intrusive Site investigation, monitoring and sampling of soil, groundwater and a Generic Quantitative Risk Assessment (GQRA) was completed. The scope of the Site investigation is provided in the documents “Waste Classification & GQRA Report” (GII, 2021).

The relevant results of the Site investigation and GQRA are outlined in Sections 4.2 to 4.5.



Figure 4-1: Site Investigation Points (Source: GII, 2021)

4.2 Soil and Geology

The soil and geology encountered during the Site investigation (GII, 2021) is summarised as

MADE GROUND as brown or grey slightly sandy, gravelly CLAY and / or grey, clayey GRAVEL with containing fragments of concrete, red brick, glass, ceramic and plastic to depths of 0.7mbGL and 3.0mbGL. The made ground is underlain by stiff, grey to brown, slightly sandy, slightly gravelly CLAY

Bedrock was encountered between 4.2mbGL and 6.6mbGL beneath the stiff clay and comprised of interbedded grey thinly laminated, fine-grained Limestone and dark grey, fine-grained Mudstone.

4.3 Soil Analytical Results

Soil analytical data for samples collected from the Site is provided in the Site investigation report (GII, 2021) and key data is summarised below.

The made ground soils at the Site were identified to contain varying concentrations of metals however, it was identified that these concentrations of metals do not pose a risk to the receiving groundwater (GII, 2021).

Soil was identified to contain petroleum hydrocarbons (total aliphatic and aromatic C5-C40 (TPH)) in ten of the sixty-one soil samples at concentrations ranging to a maximum of 660mg/kg (WS05 0-1.0m 190mg/kg; WS09A 0.0-0.85m 660mg/kg; BH01 0-1.6m 286mg/kg; BH02 0.0-1.4m 456mg/kg; BH05 0.2-1.60m 171mg/kg; BH09 0.0-0.9m 105mg/kg; BH11 0.0-0.7m 144mg/kg; BH14 0.3-0.9m 96 mg/kg; BH15 0.3-0.8 m 120mg/kg; BH170-0.6m 208mg/kg). Where petroleum hydrocarbons were reported this was generally in the upper 1.6m of soil and petroleum hydrocarbons were not detected in samples from deeper depth. The reported soil concentrations for petroleum hydrocarbons at all other samples locations were below laboratory limit of detection (<52mg/kg).

Reported concentrations of MTBE and BTEX (benzene toluene, ethylbenzene and xylene) were reported as less than laboratory limit of detection for all samples.

Soil was identified to contain detectable concentrations of total Polycyclic Aromatic Hydrocarbons (PAH Total 17) in 24 of the 61 samples analysed at concentrations ranging up to a maximum of 22.52mg/kg (total PAHs reported at 22.52mg/kg at Site investigation location WS05 in the southern portion of the Site). PAHs were reported for samples collected from the upper 2.7m of soil and were not detected in samples collected below this depth.

As up to 2.5m of soil will be excavated from the Site the identified soil contamination in the made ground and shallow soils will likely be removed from the Site thereby removing the associated potential sources of contamination.

Site investigation locations are presented in Figure 4-1.

4.4 Groundwater Levels

During Site investigation carried out by Ground Investigations Ireland Ltd. (GII) groundwater strike was encountered between 1mbGL and 4.9mbGL (14.33mOD and 18.32mOD) when carrying out excavation and drilling at trial pits, trenches and borehole locations at the Proposed Development Site.

Groundwater level measurements at monitoring wells at the Proposed Development were recorded by GII on the 13th October 2021 and are presented in Table 4-1.

Table 4-1: Measured Water Levels 13/10/2021

Monitoring Location ID	Groundwater Strike During Drilling (mBGL)	Groundwater Level 13/10/2021 (mbGL)	Groundwater Level (mOD)
BH01	4.7	1.73	17.37
BH05	4.2	1.19	18
BH06	None recorded	0.67	18.65
BH14	3.8	0.86	18.31
BH17	4.2	0.43	18.98
Data sourced from GII, 2021. Saint Teresa's Garden Waste Classification & GQRA Report.			

Based on the measured groundwater levels (Table 4-1) the inferred groundwater flow direction at the Proposed Development is to the north-east as shown in Figure 4-1.

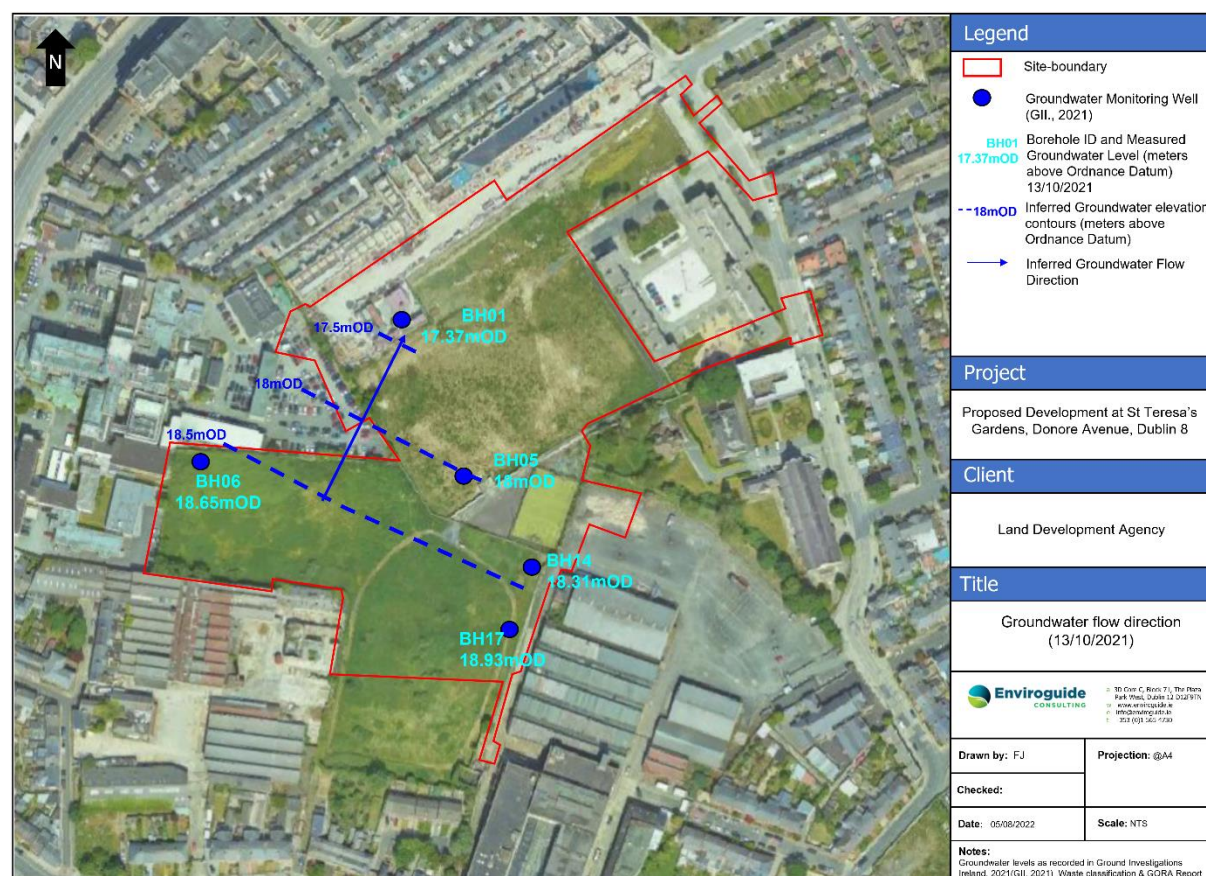


Figure 4-2: Inferred Groundwater Flow Direction

4.5 Groundwater Analytical Data

Samples of shallow groundwater from within the bedrock aquifer were collected from five installed groundwater monitoring wells (BH01, BH05, BH06, BH14 and BH17) at the Proposed Development Site.

Detectable concentrations of Total Petroleum hydrocarbons (TPH – Total aliphatics and aromatics C5-C35) were reported for groundwater samples from monitoring wells located in the north-west and at the eastern boundary of the Site at concentrations ranging to a maximum of 2,290ug/l in BH01 located in the northern portion of the Site (BH01: 2,290ug/l; BH03: 830ug/l; BH14: 1,989ug/l; and BH17:700ug/l) which exceed the Groundwater Regulations Groundwater Threshold Values (GTV) (S.I. No. 9 of 2010 as amended) of 7.5ug/l for TPH. Detectable trace concentrations of individual Polycyclic Aromatic Hydrocarbon (PAH) parameters were reported for samples collected from BH01 and BH17, however the total PAH6 (<0.068ug/l) and total PAH17 (<0.295ug/l) were reported as below laboratory limit of detection (LOD) and the Groundwater Regulation GTV for PAH6 (0.075ug/l) and therefore not considered to be indicative of groundwater impacts. Elevated PAH6 concentration was reported for the sample from BH05 at the eastern boundary of the Site with an elevated PAH6 concentration of 1.38ug/l in excess of the GTV (GII, 2021).

Reported concentrations of MTBE and BTEX (benzene toluene, ethylbenzene and xylene) were reported as less than laboratory limit of detection for all samples.

It is noted that while there are localised groundwater impacts identified, the Site is underlain by stiff glacial till which is likely to limit downward migration of contaminants from the Site and due to the limited and relatively poorly connected network of fissures and joints and low fissure permeability decreases risk of contaminant travel from the Site within the aquifer (GII, 2021).

5 RISK ASSESSMENT

5.1 Risk Assessment Method

A risk-based and receptor-focussed approach was adopted for this assessment of any impact to the receiving hydrological and hydrogeological (water) environment associated with the Proposed Development. The basis for a risk assessment is the Conceptual Site Model (CSM) or Source-Pathway-Receptor (SPR) model which underpins the Directive 2000/60/EC (Water Framework Directive) amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU that has been transposed to Irish legislation as European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended, as well as EPA guidelines on the protection of groundwater and surface water resources including associated aquatic ecosystems and human health receptors (e.g., groundwater supply users), the EPA Guidance on the Authorisation of Discharges to Groundwater (EPA, 2011) and the EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA, 2013) on the protection of groundwater and surface water resources including associated aquatic ecosystems and human health receptors (e.g., groundwater supply users).

A risk assessment is undertaken to provide an understanding of the risk associated with the presence of any potentially contaminating materials and/or activities on a Site. If one or more of the three elements of the pollutant linkages are missing, the exposure pathway is considered incomplete and there is no risk associated with the activity or contaminant source (i.e., it does not present a means of exposure).

The preliminary CSM was developed to describe potential source-pathway-receptor linkages for the Site.

The objective of the WFD is no deterioration of the water quality status, and the “prevent or limit” objective is a key element of achieving that WFD status for all water bodies regardless of the water quality status of the water body. The ‘prevent or limit’ objective is a key element to achieving the WFD status and water quality objectives and in principle, prevent or limit measures (i.e. avoidance and mitigation) are the first line of defence in restricting inputs of pollutants from the Proposed Development (i.e., ‘source’ removal) and any potential impact or deterioration of water quality status or WFD status of the receiving water body.

In this assessment all three elements of the Source-Pathway-Receptor model or CSM will be considered, and any potential linkages evaluated and assessed to determine if the development could potentially impact upon any identified receptors including Natura 2000 sites as well as the WFD Status of the water bodies associated with the Site.

5.2 Conceptual Site Model

A conceptual site model (CSM) represents the characteristics of the Proposed Development and identifies the possible relationships and potential risks between contaminant sources, pathways and receptors. These three essential elements of the CSM are described as:

- A **source** – a substance that is in, on or under the land and has the potential to cause harm or pollution;

- A **pathway** – a transport route or means by which a receptor can be exposed to, or affected by, a contaminant source; and,
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.

The term pollutant linkage is used to describe a particular combination of source–pathway–receptor. Each of these elements can exist independently, but they create a risk only where they are linked together so that a particular contaminant affects a particular receptor through a particular pathway i.e. a pollutant linkage.

The conceptualisation of the Site model for this assessment includes identifying hydraulic pathways from the Site and those receptors which are connected hydraulically with the Site, in the absence of any avoidance and mitigation measures during the Construction and Operational Phases of the Proposed Development.

5.2.1 Potential Sources

Construction Phase

Potential sources of contamination that could impact on water quality based on the design of the Proposed Development include:

- Soil (made ground) and shallow groundwater at the Site impacted with TPH, PAHs and metals has been identified. However, the metals in soil do not pose a risk of leaching from soil to underlying groundwater and the identified potential risk associated with offsite migration of impacted groundwater is low (GII, 2021);
 - Potential for leaching of contaminants to groundwater beneath the Site in particular if exposed;
 - During groundworks contaminants in soil could potentially become entrained in surface runoff; and
 - Shallow groundwater at the Site has been impacted with TPH and PAHs and could potentially be discharged from works areas to groundwater or surface water drainage.
- Storage and use of fuel, oils and chemicals used during construction which in the event of an accidental release could infiltrate to the underlying groundwater or migrate via surface water runoff to offsite water bodies;
- Use of concrete and cementitious materials or other potentially hazardous materials (e.g. drilling fluids during piling) during construction in particular for below ground structures and foundations including piling where shallow groundwater may be encountered;
- Accidental release of wash-water or foul water from facilities at the Site (e.g. wheel wash, welfare facilities) and accidental release of hazardous or deleterious material including fuels, chemicals and materials required for construction; and
- Release of foul water from existing foul water drainage at the Proposed Development Site during decommissioning or connection to live sewers.

Operational Phase

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

- There will be no bulk storage of petroleum hydrocarbon-based fuels or other hazardous materials during the Operational Phase and therefore not considered as a potential contaminant source;
- The proposed design incorporates removal of soil to a depth of up to 2.5m below ground and introduction of impermeable surface (buildings) thereby minimising the potential for leaching and mobilisation of any residual contamination. The potential risk to downgradient water bodies associated with residual soil and groundwater at the Site is low (GII, 2021);
- There will be no discharges to ground from drainage and only rainfall on public open spaces and unpaved landscaped areas will infiltrate to ground;
- Runoff from paved areas and roadways are proposed to drain to swales, tree pits and raingardens/ bio-retention to be treated by filtration through the substrate before entering and managed within the surface water drainage and SuDS solutions (AECOM, 2022a);
- Drainage from the undercroft carparking is considered the highest risk area, will be collected and discharged to the foul sewer via a petrol interceptor (AECOM, 2022a); and
- Foul water will discharge to the onsite drainage and to the existing foul sewer network via the onsite foul drainage network to the offsite Irish Water foul network. As specified in the drainage design (AECOM, 2022a) 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.

5.2.2 Pathways

The following potential pathways are identified for the Site and the Proposed Development and summarised below:

- Infiltration of contaminants to the subsurface and bedrock aquifer including infiltration via potential conduits introduced through piling and other groundworks. Note that during the operational phase there will be no discharges to ground with the exception of rainfall on landscaped areas. There will be limited potential for leaching of residual contaminants during the Operational Phase taking account of the impermeable surfaces incorporated in the design;
- Vertical and lateral migration via groundwater beneath and downgradient of the Site towards downgradient receptors:
 - The presence of low permeability stiff clay will minimise any potential for vertical migration to the bedrock aquifer and due to the nature of the bedrock aquifer including limited poorly connected fracture permeability and relatively short

flow-paths there will be reduced potential for offsite migration within the aquifer;
and

- The Poddle Stream is culverted from the Grand Canal to the Liffey Estuary Upper and therefore groundwater discharge into the Poddle Stream will be negligible and is not considered further as a pathway.
- Surface water runoff discharge via mains drainage and the outfall to the Poddle Stream and downstream water courses and water bodies including the River Liffey;
- Runoff from the undercroft car parks will discharge via Class 1 interceptor to foul drainage; and
- Foul drainage via discharge to Irish Water network and ultimately to Dublin Bay via discharge from Ringsend WWTP. The most recent available Annual Environmental Report (AER) is for 2020 (Irish Water, 2021) for the facility identifies non-compliance with the Emission Limit Values (ELV) specified in the discharge licence (D0034-01). Any such exceedances and associated impact to water quality identified in the AER are considered baseline conditions for the Proposed Development. Importantly the 2020 AER notes that '*primary discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status in the Liffey Estuary*'. Furthermore, the upgrades to Ringsend WWTP which have commenced and is expected to be completed in 2025 will result in an increased capacity from 1.6 million PE to 2.4 million PE and will result in an overall reduction in the final effluent discharge loading to the receiving waters (Irish Water, 2016).

5.2.3 Receptors

The receptors considered with a hydrological connection to the Proposed Development Site in this assessment include the following:

- Groundwater Bodies:
 - Bedrock Aquifer of the Dublin Groundwater Body beneath and downgradient of the Proposed Development Site;
- Surface Water Bodies:
 - Poddle Stream and downstream water courses;
 - Liffey Estuary Upper and Liffey Estuary Lower Transitional Water Bodies (downstream of the Poddle Stream); and
 - The Camac River and Grand Canal are located upgradient of the Site and therefore not considered as receptors for this assessment.
- Coastal Waterbodies:
 - The Dublin Bay coastal waterbody;
- Natura 2000 sites:
 - North Dublin Bay SAC;
 - South Dublin Bay SAC;

- North Bull Island SPA; and
- South Dublin Bay and River Tolka Estuary SPA.

5.3 Risk Evaluation

A risk-based assessment based on the CSM, and Source-Pathway-Receptor model of the potential risk linkages associated with the construction and post construction phase of the Proposed Development was undertaken. The results were evaluated to determine if the Proposed Development could potentially impact on receptors associated with the Site, including onsite and offsite.

The Conceptual Site Model is presented in Table 5-2 together with the findings of the risk assessment and where necessary design avoidance and mitigation measures are outlined.

Table 5-1: Conceptual Site Model (Source – Pathway – Receptor) and Risk Evaluation

Source	Pathway	Receptor	Risk Evaluation and Avoidance
Construction Phase			
<p>Surface Runoff potentially impacted with</p> <ul style="list-style-type: none"> • entrained sediment from stockpiles including potentially contaminated soil. • fuel or other hazardous materials • contaminated groundwater pumped from excavations. 	<p>Surface Water Drainage including existing drains onsite and drainage gullies on adjoining roads / properties.</p>	<p>Poddle Stream and downstream water bodies.</p> <p>North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA)</p>	<p>Moderate to Low Risk (worst-case unmitigated scenario)</p> <p>Potential risk (moderate to low) to impact water quality in the receiving Poddle Stream in the worst-case unmitigated scenario. There will be attenuation and assimilation within the drainage network prior to discharge to the Poddle Stream where further attenuation will occur therefore minimising any potential impact. There is no identified risk to receiving downstream water bodies including the Liffey estuary Upper and Liffey Estuary Lower transitional waterbodies and the Dublin Bay coastal waterbody.</p> <p>Construction works will be undertaken in accordance with the CEMP for the Proposed Development. Construction measures including pollution control measures and water management will be implemented.</p>
<p>Discharge of Contaminants to Ground/Groundwater including accidental release of fuel or other deleterious materials (cementitious materials, wash-water, foul water, contaminated groundwater)</p>	<p>Vertical Migration to Bedrock Aquifer and Migration Offsite</p>	<p>Bedrock beneath and downgradient of the Site.</p> <p>Downstream water bodies (Poddle Stream, River Liffey)</p>	<p>Low Risk (worst-case unmitigated scenario)</p> <p>There is no identified risk associated with groundwater migration offsite to the Poddle Stream which is culverted, and downstream water courses.</p> <p>There is reduced potential for vertical and lateral migration via groundwater due to the nature and characteristics of the overburden and aquifer with limited potential for offsite migration.</p> <p>Therefore, there is no identified risk associated with potential discharge of groundwater to downgradient water bodies (River Liffey, Dublin Bay and Natura 2000 sites) in the absence of any mitigation.</p>

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			Appropriate design avoidance and mitigation measures will be implemented to prevent any potential impact to the receiving water quality within the bedrock aquifer beneath the Site.
Groundworks and excavation of contaminated soils and mobilising of soil	Vertical Migration to Bedrock Aquifer and Migration Offsite	Bedrock Aquifer beneath and downgradient of the Site. Downstream water bodies (Poddle Stream, River Liffey)	<p>Low Risk (worst-case unmitigated scenario)</p> <p>Excavation of potentially contaminated soil and groundwater could result in mobilisation of contaminants.</p> <p>There is no identified risk associated with groundwater migration offsite to the Poddle Stream which is culverted, and downstream water courses.</p> <p>There is reduced potential for vertical and lateral migration via groundwater due to the nature and characteristics of the overburden and aquifer with limited potential for offsite migration.</p> <p>There may be a risk to groundwater immediately beneath and immediately downgradient of the Site however, there is no identified risk to downgradient aquifer and water bodies (River Liffey, Dublin Bay and Natura 2000 sites) in the absence of any mitigation. The design requirement to excavate soil including potentially contaminated soil will result in an overall site betterment.</p> <p>Appropriate design avoidance and mitigation measures will be implemented to prevent any potential impact to the receiving water quality within the bedrock aquifer beneath the Site.</p>
Operational Phase			
Site Condition and residual soil and groundwater beneath the Site	Vertical Migration to Bedrock Aquifer and Migration Offsite	Bedrock Aquifer beneath and downgradient of the Site. Downstream water bodies (Poddle Stream, River Liffey)	<p>Low Risk</p> <p>There is no identified risk associated with groundwater migration offsite to the Poddle Stream which is culverted, and downstream water courses.</p> <p>The design requirement to excavate soil including potentially contaminated soil will result in an overall site betterment. The Site will have an increased impermeable cover due to buildings, roads and paved areas which will reduce infiltration and limit any potential for vertical migration via soil and soil leaching.</p> <p>There is reduced potential for vertical and lateral migration via groundwater due to the nature and characteristics of the overburden and aquifer with limited potential for offsite migration.</p>

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			There is no identified risk to downgradient aquifer and water bodies (River Liffey, Dublin Bay and Natura 2000 sites) in the absence of any mitigation.
Surface water runoff and entrained contaminants including a worst-case unmitigated fuel spill on roadway.	Discharge to onsite drainage and via mains sewer to the Poddle Stream.	Poddle Stream and associated downstream water courses / water bodies Liffey Estuary Lower, Liffey Estuary Upper and Dublin Bay coastal waterbody; and North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA)	Moderate to Low Risk (worst-case unmitigated scenario) Potential risk (moderate to low) to impact water quality in the receiving Poddle Stream in the worst-case unmitigated scenario. However, there will be attenuation and assimilation within the drainage network prior to discharge to the Poddle Stream where further attenuation will occur therefore minimising any potential impact. There is no identified risk to receiving downstream water bodies (River Liffey, Dublin Bay and Natura 2000 sites) in the absence of mitigation. Surface runoff the Site will be managed and treated in accordance with SUDS and GDSDS prior to discharge to the main drainage network and Poddle Stream preventing any potential impact on water quality to the receiving water courses.
Foul Water Discharge (including drainage from undercroft carpark areas)	Discharge to the IW Foul Network and via discharged from Ringsend WWTP	Dublin Bay coastal waterbody; North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA)	Negligible Risk Foul water from the Site will only be discharged only under consent from IW NS will ultimately discharge via the Ringsend WWTP to Dublin Bay which operates under the existing statutory approvals including the discharge licence issued by the EPA (D0034-01). IW issued COF (AECOM, 2022a). confirming that there is capacity in the foul network to accept foul water from the Proposed Development. In the event of a worst-case scenario fuel spill from a vehicle in the undercroft area and in the absence of mitigation (i.e. treatment via the Class 1 interceptors) it is considered that there would be adequate dilution and attenuation within the network to assimilate any contaminants associated with such an incident discharged from the Site prior to treatment at Ringsend WWTP. Therefore, taking account of the baseline conditions and the COF from IW for the Proposed Development it is considered there will be no impact on receiving water quality associated with the foul water from Proposed Development.

The key findings of the risk assessment and evaluation of potential impacts on the receiving water environment are summarised as follows including the worst-case scenario in the absence of any mitigation and avoidance measures that are embedded in the design for the Proposed Development

The removal of made ground including contaminated soils will result in overall Site betterment and the removal of this source of contamination and associated potential risk to groundwater and downgradient receiving water bodies.

There is a potential risk to water quality during the construction works where groundwater may be encountered during groundworks and bulk excavations in particular in a worst-case scenario accidental release of contaminants. Due to the reduced potential for infiltration to groundwater afforded with the presence of the stiff clay above the bedrock aquifer and limited offsite migration via the limited poorly connected fractures within the bedrock aquifer while there is a potential risk to groundwater beneath and immediately downgradient of the Site. However, there is no risk to the water quality of the overall Dublin GWB and hydraulically connected downgradient receiving surface water courses with the including the Liffey Estuary Upper, Liffey Estuary Lower and Dublin Bay. The closest downgradient water course is the Poddle Stream which is culverted and therefore there is no identified hydraulic connection and no potential risk to water quality associated with groundwater migration from the Site.

Any potential impact to surface water quality is associated with discharges to surface water drainage during the Construction and Operational Phases and will be locally with the Poddle Stream where surface water drainage outfalls to the Poddle Stream. There is no identified potential impact to the downstream receiving Liffey Estuary Upper and Liffey Estuary Lower transitional waterbodies and the Dublin Bay coastal waterbody associated with the Proposed Development.

The identified potential impacts to water quality are considered in the absence of any mitigation measures that will prevent and limit any potential impact to water quality. The embedded design and avoidance measures (Refer to Section 5.4) will prevent and limit any potential impact on water quality within the receiving river basin district associated with the Proposed Development.

5.4 Design Avoidance and Mitigation

The design avoidance measures and standard good practice construction methods that will prevent or limit any potential for impacts to the water environment together with additional specific measures required to address identified potential risks are outlined below.

Construction Phase

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

- Construction Industry Research and Information Association (CIRIA), 2001. Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (C532);
- CIRIA, 2015. Environmental good practice on site guide (C741);
- BPGCS005, Oil Storage Guidelines;
- Environmental Protection Agency (EPA), 2004. IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities;
- EPA, 2013 Amendment to IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities.
- CIRIA 697, The SUDS Manual, 2007;

- UK Environment Agency, 2016. Pollution prevention for businesses. Guidance;
- 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
- The National Roads Authority (2014) (now Transport Infrastructure Ireland) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.

The CEMP (Enviroguide, 2022) which is prepared in accordance with industry best practice standards including CIRIA - C532 will be implemented by the appointed contractor and outlines measures for the control, management and protection of water quality and associated receptors. The measures will address the main activities of potential impact which include:

- Control and management of water and surface runoff;
- Control and management of soil and groundwater including potential contamination during excavation and dewatering;
- Control and management of potentially contaminated soil encountered during excavation;
- Management and control of imported soil and aggregates from off-site sources;
- Fuel and Chemical handling, transport and storage; and
- Accidental release of contaminants.

There will be no uncontrolled discharges to ground (groundwater) or surface water. Discharges from the Proposed Development will be in accordance with relevant statutory approvals from Irish Water for discharges to sewer and Dublin City Council for discharges to surface water.

Where any as yet unidentified potentially contaminated soils, water or other materials are encountered these will be assessed by an appropriately qualified competent person engaged by the appointed contractor in accordance with current EPA guidelines for the management of contaminated land (EPA, 2013) and regulatory standards.

As specified in the drainage design (AECOM, 2022b) 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.

All below (below ground) drainage infrastructure will be constructed in accordance with current IW requirements to ensure that there are no potential impacts to groundwater quality.

Surface water from the Proposed Development Site will be managed, treated and attenuated at the Site in accordance with the principles of SUDS and GDSDS.

Discharges from the Site will only be in accordance with relevant statutory approvals once received from Irish Water for discharges to sewer and DCC for discharges to surface water.

Operational Phase

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.

5.5 Protected and Designated Sites (Natura 2000 sites)

The Natura 2000 sites that are hydraulically connected with the Site are associated with Dublin Bay and the closest are North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA.

It is considered that in the absence of any mitigation or avoidance measures that in a worst-case scenario there would be a potential localised impact on water quality associated with surface water discharges from the Proposed Development Site within the Poddle Stream. There is no identified impact to receiving surface water and Dublin Bay associated with migration of groundwater from the Site. Taking account of the baseline condition of the receiving water courses and associated catchments, it is considered that there will be no significant impact downstream on water quality where the Poddle Stream discharges to the Liffey Estuary Upper and further downstream at the Liffey Estuary Lower and then to the Dublin Bay coastal waterbody. In applying the precautionary principle and considering the unmitigated worst-case scenario and the existing baseline conditions there is no identified potential impact to Natura 2000 in combination with other plans or projects or individually associated with the Proposed Development.

Foul water from the Site will under agreement consent from Irish Water, discharge via the Ringsend WWTP to Dublin Bay. The WWTP is operated under relevant statutory approvals. It is noted that the most recent available 2020 AER for the Ringsend WWTP identifies a non-compliant status for final effluent with an exceedance of Emission Limit Values (ELVs) (Irish Water, 2021). These conditions associated with the Ringsend WWTP are considered as baseline to the Proposed Development. In addition, the upgrades to Ringsend WWTP which have commenced will result in an increased capacity from 1.6 million PE to 2.4 million PE and will result in an overall reduction in the final effluent discharge loading to the receiving waters. Furthermore, the capacity to accept the foul discharges from the Proposed Development has been confirmed by Irish Water (COF Ref: CDS21000854) on the 1st October 2021 (AECOM, 2022a) and the proposed connections and diversion (Diversion ref.: DIV21217) have been agreed with and confirmed by Irish Water in correspondence dated 31st March 2022 and dated the 8th July 2022. Therefore, it is considered there will be no impact on water quality associated with the foul discharges from the Proposed Development and no identified risk of impact either individually or in combination with other plans and projects on baseline conditions at any Natura 2000.

Overall, it is considered that in the worst-case scenario in the absence of mitigation or design avoidance that there would be no deterioration in water quality or impact on the receiving environment associated with the Proposed Development that would result in a significant effect on any Natura 2000 sites either in combination with other plans and projects or individually.

5.6 Water Framework Directive

The findings of the risk-based assessment identified that in the absence of any mitigation or avoidance measures in a worst-case scenario there could be a potential impact on the water quality within receiving water bodies immediately downgradient of the Site.

There is potential for impact to the Poddle Stream associated with surface water discharges from the Site in the absence of design avoidance and mitigation measures and there is no identified potential impact to the downstream receiving Liffey Estuary Upper, Liffey Estuary Lower and Dublin Bay.

In a worst-case scenario there may be a potential impact on groundwater beneath the Site within the Dublin GWB during construction works in the absence of design avoidance and mitigation measures. These embedded design avoidance and mitigation measure will prevent and limit any potential impacts on the receiving water quality.

Foul water from the Proposed Development will discharge to the Dublin Bay via Ringsend WWTP. Based on the fact that Irish Water have identified that there is capacity within the network to accept foul water from the Proposed Development and that the most recent 2020 AER (Irish Water 2021) identifies that 'primary discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status in the Liffey Estuary'. Furthermore, the Ringsend WWTP upgrades have commenced and therefore discharges to Dublin Bay will be improved. Accordingly, there is no identified potential impact to water quality associated with foul discharges from the Proposed Development.

Based on the design of the Proposed Development, embedded avoidance measures and identified mitigation measures that will prevent or limit impact and deterioration of water bodies the identified potential impact on WFD status of water bodies will be prevented. The WFD status of the Poddle Stream is 'Poor' and it is considered that the proposed development will not negatively impact on the Poddle Stream water quality or WFD status. The 'Good' status of the Dublin GWB and 'Good' Status of the Liffey Estuary Upper, Liffey Estuary Lower and Dublin Bay will not be impacted by the Proposed Development. The Camac River as identified in Section 5.2.3 located hydraulically upgradient of the Site and therefore there is no identified pathway from the Site to the Camac River and no identified potential risk to the WFD status associated with the Proposed Development.

The Proposed Development will not cause a deterioration in status of water bodies hydraulically connected with the Proposed Development Site including the Poddle Stream, Liffey Estuary Upper, Liffey Estuary Lower and Dublin Bay and Dublin GWB taking account of design avoidance and mitigation measures. The Proposed Development will not jeopardise objectives to achieve good surface water status or good ecological potential and the attainment of good surface water chemical status. The Proposed Development will not permanently exclude or compromise the achievement of the objectives of the WFD in other bodies of water within the same river basin district as the Site.

6 CONCLUSIONS

Enviroguide undertook a hydrogeological assessment of the Proposed Development at the Donore Project, Donore Avenue, Dublin 8

Based on the data made available to Enviroguide pertaining to the existing hydrogeological and hydrological conditions at the Site and the design for the Proposed Development, the following can be concluded:

- Groundwater flow within the bedrock aquifer beneath the Site is towards the Poddle Stream and Liffey Estuary, however there is no identified hydraulic connection with the Poddle Stream which is culverted as it passes the Site.
- Surface water from the Proposed Development Site will be managed, treated and attenuated at the Site in accordance with the principles of SUDS and GDSDS prior to discharge to the mains drainage which outfalls to the Poddle Stream. Foul water from the Proposed Development Site will be discharged to Dublin Bay following treatment at Ringsend WWTP and IW confirmed capacity to accept the foul discharges from the Proposed Development.
- The embedded design avoidance and mitigation measures will prevent the potential impacts on water quality during the construction works and post construction (Operational Phase). It is noted that there are no identified impacts to surface water in the downstream Poddle Stream, Liffey Estuary and Dublin Bay. There are no identified potential impacts to offsite groundwater associated with the Proposed Development.
- The Proposed Development will not cause a deterioration to the WFD status of the water bodies hydraulically connected with the Proposed Development Site and within the same river basin district including the river waterbodies, transitional waterbodies, coastal waterbodies and groundwater bodies taking account of design avoidance and mitigation measures including the Poddle Stream, Liffey Estuary, Dublin Bay and Dublin GWB. The Camac River is not hydraulically connected to the Site and therefore there is no identified impact associated with the Proposed Development of the WFD status of the Camac River. The Proposed Development will not jeopardise objectives to achieve good surface water status or good ecological potential and the attainment of good surface water chemical status. The Proposed Development will not exclude or compromise the achievement of the objectives of the WFD in other bodies of water within the same river basin district.
- The Proposed Development will not cause any impact to Natura 2000 sites with a potential hydraulic connection to the Proposed Development Site. In the worst-case scenario in the absence of mitigation or design avoidance measures there would be no deterioration in water quality or impact on the receiving environment associated with the Proposed Development that would result in a significant effect on any Natura 2000 sites either in combination with other plans or projects or individually.

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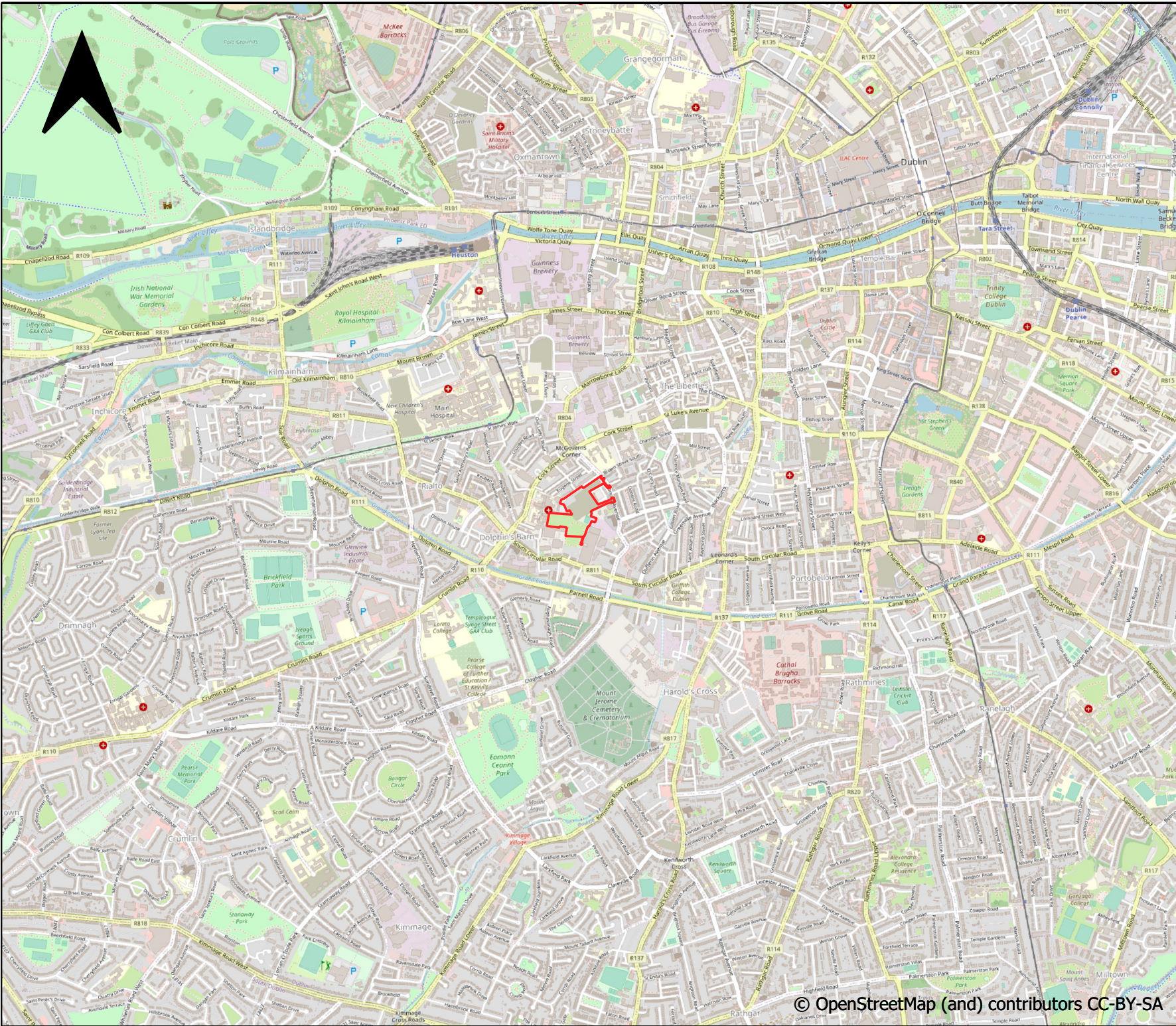
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Appendix A



Legend:

Site boundary

Project:


Proposed Development at St Teresa's Gardens, Donore Avenue, Dublin 8

Client:

The Land Development Agency

Title:

Site Location



3D Core C, Block 71, The Plaza
Park West, Dublin 12 D12F9TN

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Drawn By: FJ

Checked: CC

Date: 05/08/2022

Projection:
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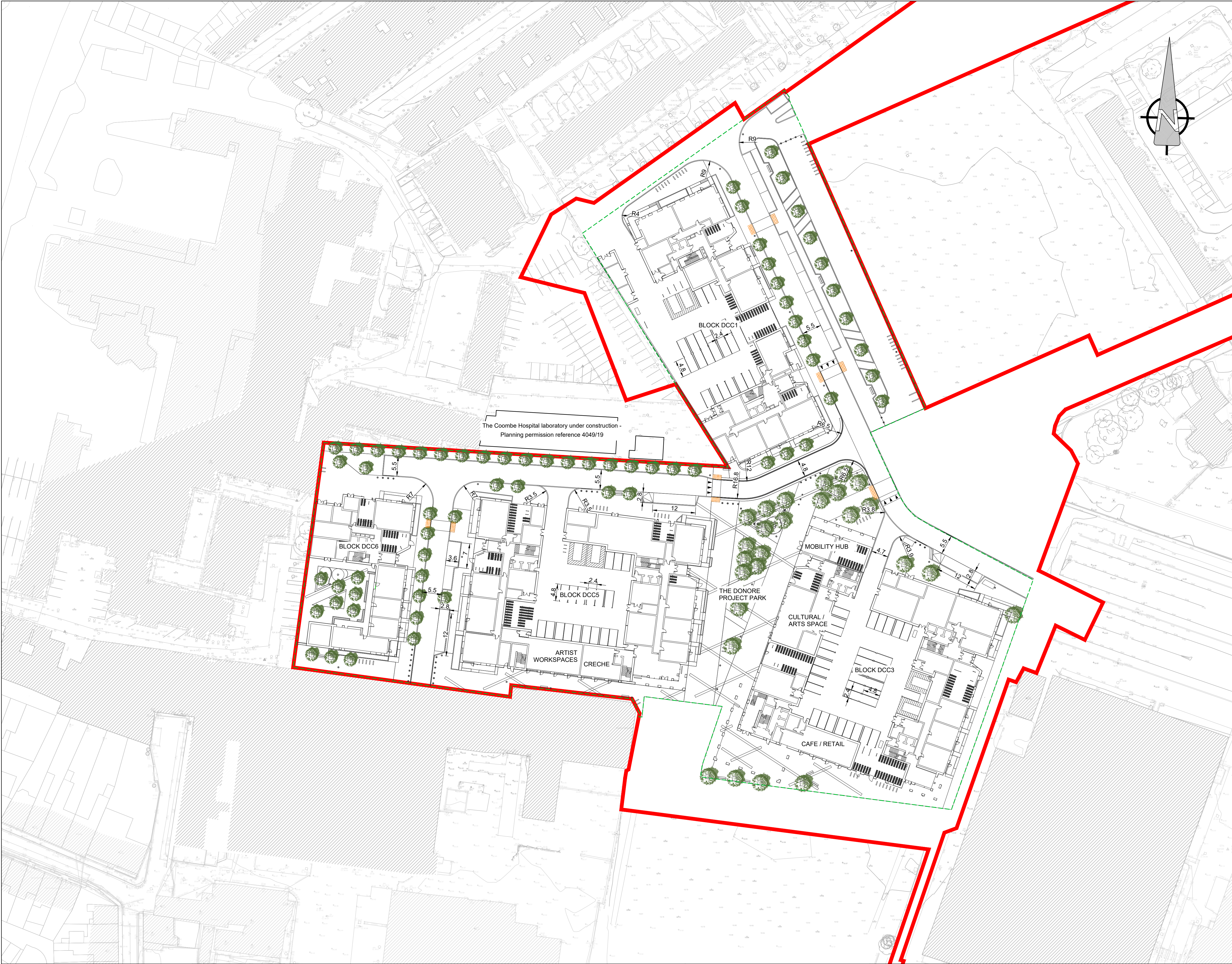
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Notes:

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ISO A1 594mm x 841mm
Project Management Initials: Drawn by: KM Checked: MI Approved: LS
Last saved by: KARL MULLIGAN/2022-10-12 Last Plotted: 2022-11-16
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PROJECT

DONORE PROJECT, DONORE AVENUE, DUBLIN 8

CLIENT

THE LAND DEVELOPMENT AGENCY (LDA)

CONSULTANT

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NOTES

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LEGEND:

SITE BOUNDARY
NET DEVELOPABLE AREA BOUNDARY.....



ISSUE/REVISION

0	18.11.2022	ISSUED FOR PLANNING
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60648061

SHEET TITLE

PROPOSED GENERAL ARRANGEMENT

SHEET NUMBER

STG-AEC-S1b-00-00-DR-C-0000001

A PROPOSED GENERAL ARRANGEMENT

0001 Scale: 1:500

ORDNANCE SURVEY IRELAND LICENCE NO CYAL50217544
©ORDNANCE SURVEY IRELAND / GOVERNMENT OF IRELAND

LEGEND:

PROPOSED SURFACE WATER..... SW

PROPOSED FOUL WATER..... FW

EXISTING FOUL WATER..... EX_FW

EXISTING COMBINED SEWER..... EXST_CS

EXISTING SURFACE WATER..... EX_SW

EXISTING FOUL WATER TO BE DECOMMISSIONED..... EX_FW

EXISTING SURFACE WATER TO BE DECOMMISSIONED..... EX_SW

DRAINAGE LINE REMOVED BY DCC.....

EXISTING SURFACE WATER OVERSIZED PIPE.....

EXISTING GULLY.....

PROPOSED GULLY.....

PROPOSED ATTENUATION TANK.....

PROPOSED SLOT DRAIN AND RECESSED COVERS.....

PROPOSED CLASS 2 PETROL INTERCEPTOR.....

PROPOSED LAND DRAIN.....

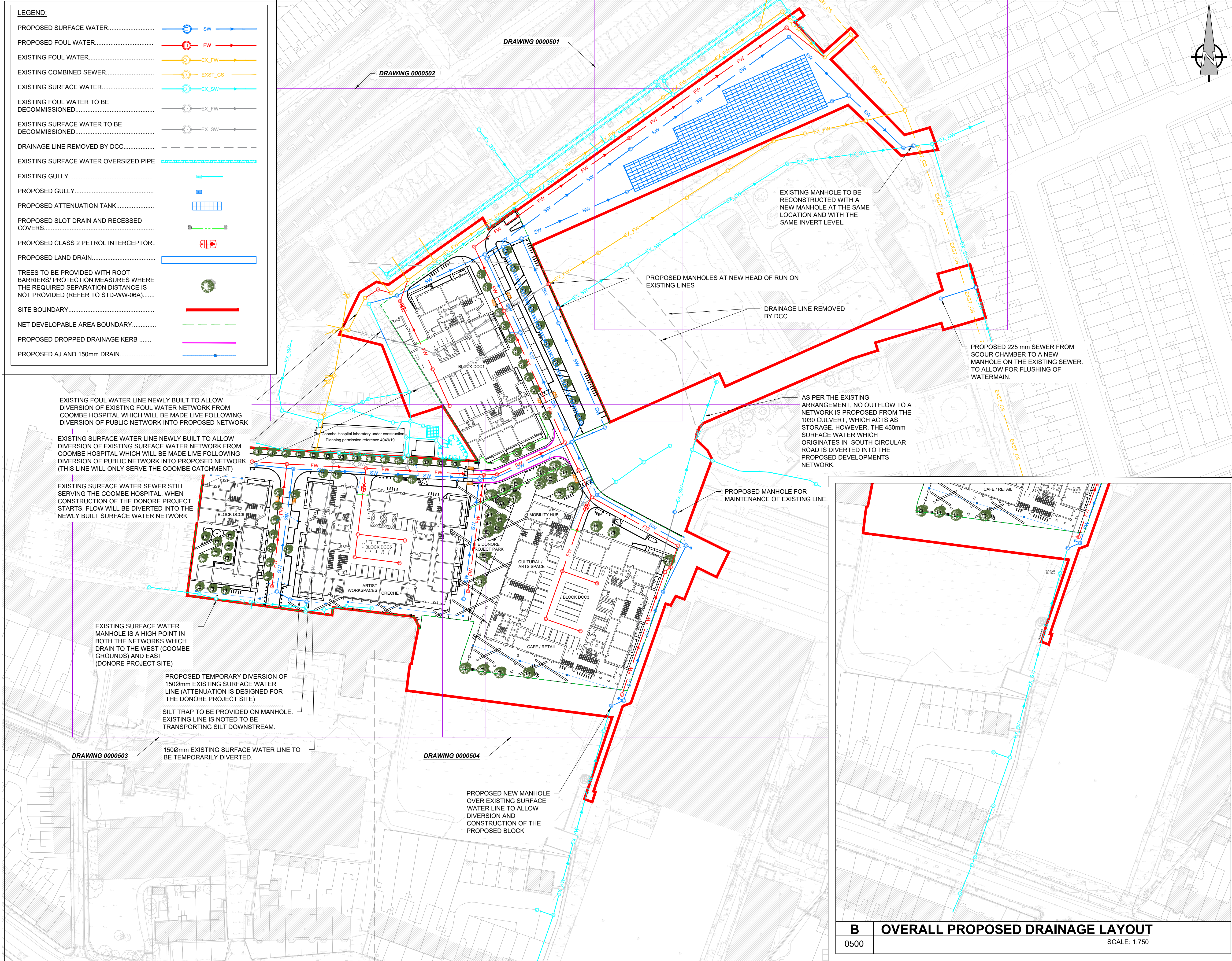
TREES TO BE PROVIDED WITH ROOT BARRIERS/ PROTECTION MEASURES WHERE THE REQUIRED SEPARATION DISTANCE IS NOT PROVIDED (REFER TO STD-WW-06A).....

SITE BOUNDARY.....

NET DEVELOPABLE AREA BOUNDARY.....

PROPOSED DROPPED DRAINAGE KERB.....

PROPOSED AJ AND 150mm DRAIN.....



PROJECT

DONORE PROJECT, DONORE AVENUE, DUBLIN 8

CLIENT

THE LAND DEVELOPMENT AGENCY (LDA)

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4. DIMENSIONS OF ALL BOUNDARIES AND ADJOINING ROADS TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF WORKS.
5. DO NOT SCALE. ALL MEASUREMENTS AND COORDINATES TO BE CHECKED ON SITE PRIOR TO COMMENCING ANY WORKS.
6. THE LOCATION & DEPTH OF SERVICES TO BE CHECKED ON SITE PRIOR TO COMMENCING ANY WORKS.
7. MANHOLE COVERS IN PUBLICLY ACCESSIBLE AREAS SHALL BE HEAVY DUTY CAST IRON OR HEAVY DUTY CAST IRON, CLASS D400, DOUBLE SEALED AND LOCKABLE TYPE COMPLYING WITH BS EN 124:2015.
8. GULLY GRATINGS & FRAMES SHALL COMPLY WITH BS EN 124:2015.
9. EXISTING INVERT LEVELS TO BE VERIFIED ON SITE BEFORE COMMENCING CONSTRUCTION.
10. SURFACE WATER & FOUL PIPES LESS THAN 1.2m BELOW THE ROAD SURFACE OR LESS THAN 0.9m IN NON-TRAFFICKED FOOTPATHS AND LANDSCAPE AREAS (WITH AN ABSOLUTE MINIMUM DEPTH OF COVER ABOVE THE EXTERNAL CROWN OF THE PIPE Ø 750mm) SHALL BE PROTECTED FROM DAMAGE BY PROVIDING MINIMUM 150mm THICK CONCRETE C16/20 HAUNCH IN ACCORDANCE WITH IS EN 12620.
11. ATTENUATION PROPOSALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.
12. CCTV SURVEY TO BE CONDUCTED PRIOR TO COMMENCEMENT OF ANY WORKS TO DETERMINE THE CONDITION AND VERIFY LEVELS OF THE EXISTING FOUL AND SURFACE WATER PIPES/MANHOLES TO BE REPORTED AND CORRECTED.
13. ALL PROPOSED SURFACE WATER MANHOLES AND GULLY CHAMBERS ARE TO BE BLOCKWORK, IN ACCORDANCE WITH DCC REQUIREMENTS.
14. ALL SURFACE WATER DRAINAGE DETAILS TO BE IN ACCORDANCE WITH THE GREATER DUBLIN STRATEGIC DRAINAGE STUDY AND THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR THE DRAINAGE WORKS.
15. ALL FOUL WATER DETAILS TO BE IN ACCORDANCE WITH THE IRISH WATER INFRASTRUCTURE STANDARD DETAILS AND CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE.
16. ALL PROPOSED FOUL SEWER LAYOUT SHALL BE BUILT IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS STD-WW-02 & STD-WW-03.
17. THIS DESIGN DRAWING HAS BEEN DEVELOPED USING THE FOLLOWING TOPOGRAPHICAL SURVEYS: LDA SURVEY (MSL 39995 REV 1 21.05.2021) AND HINES' SURVEY (MSL 35430 REV 2 24.06.2020).



ISSUE/REVISION

0	18.11.2022	ISSUED FOR PLANNING
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60648061

SHEET TITLE

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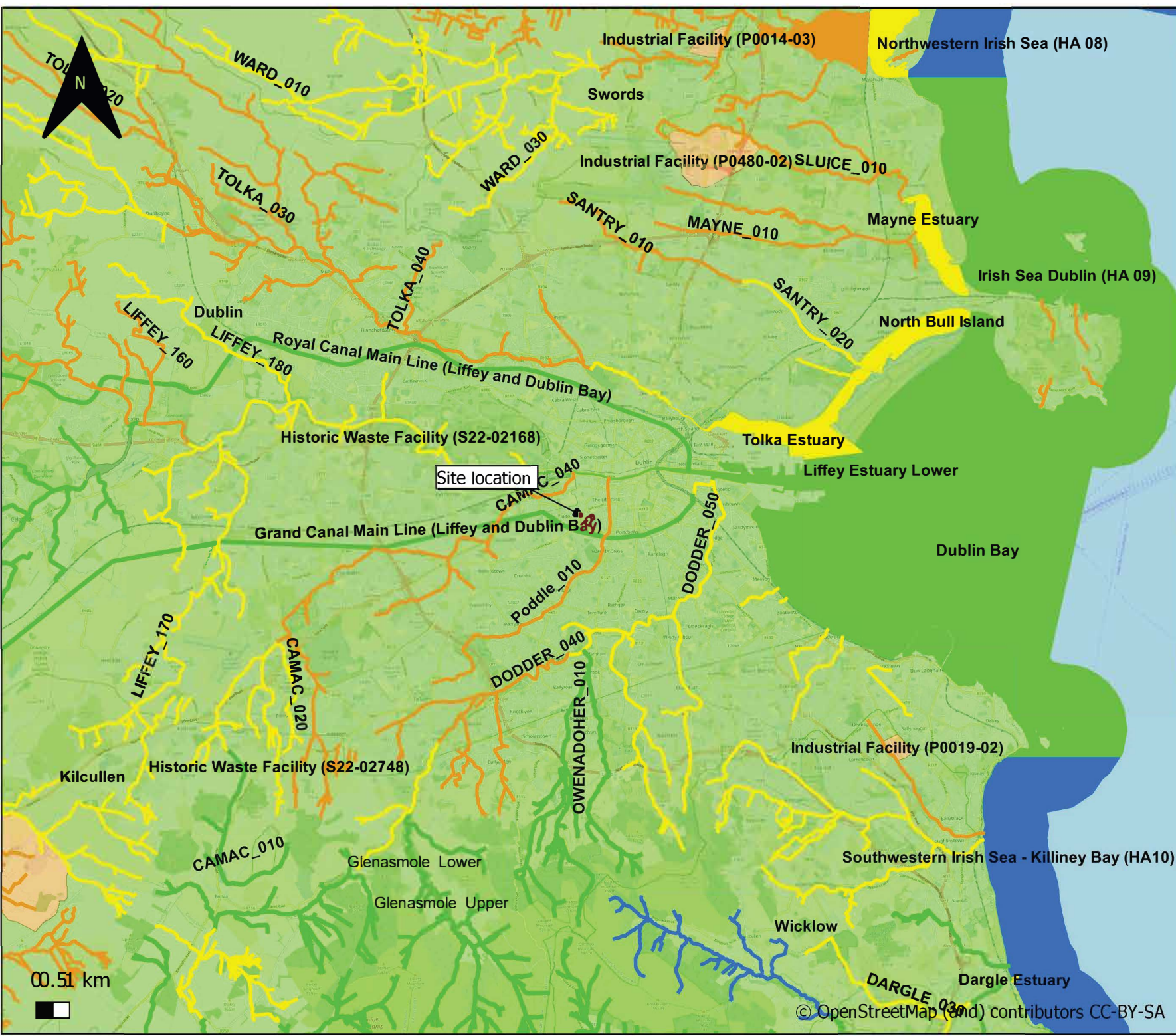
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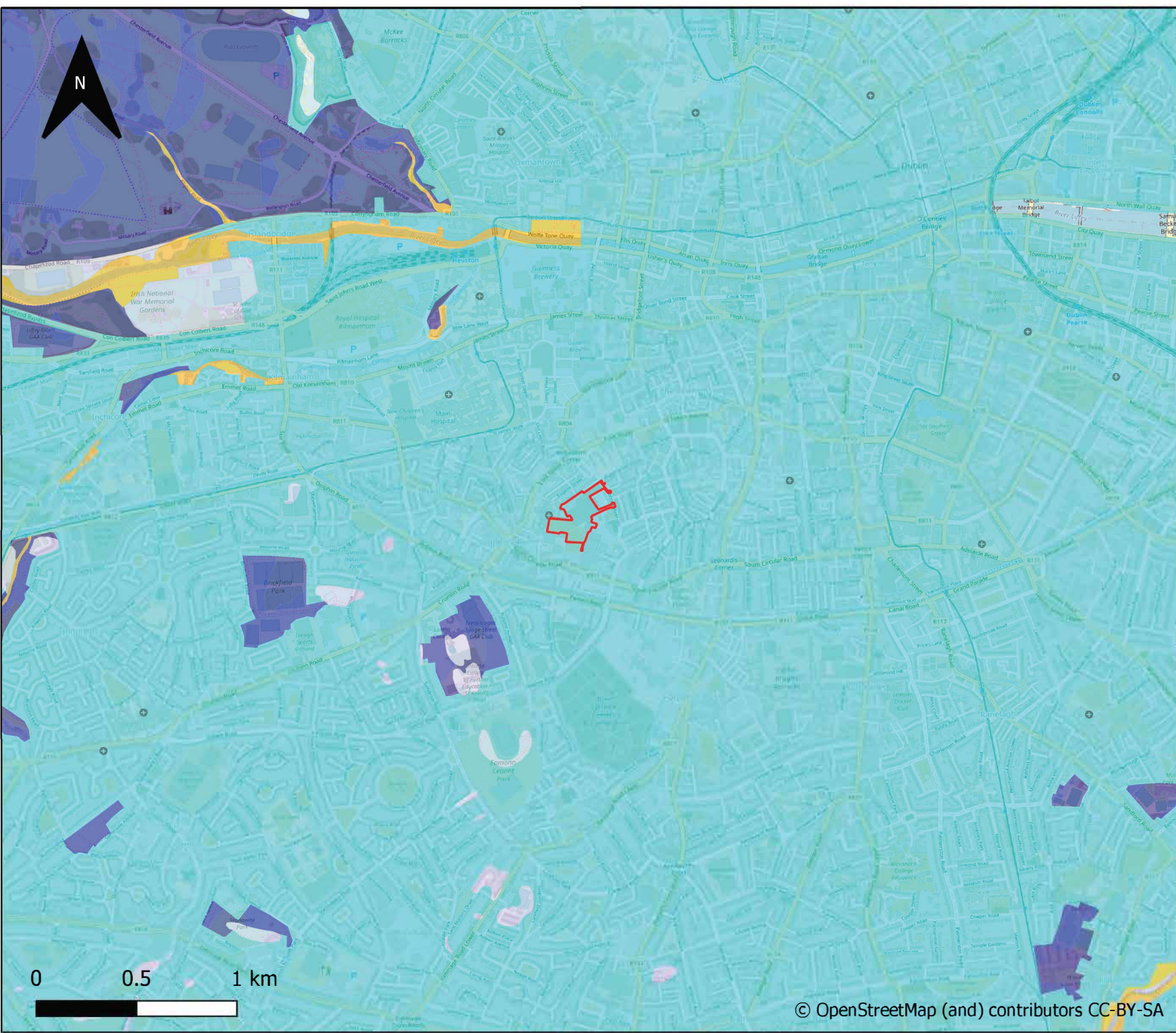
STG-AEC-S1B-00-00-DR-C-0000500

A OVERALL PROPOSED DRAINAGE LAYOUT
0500
SCALE: 1:750

B OVERALL PROPOSED DRAINAGE LAYOUT
0500
SCALE: 1:750

SEE: INSET B





Legend:

 Site boundary

Teagasc Soils

 BminDW - Deep well drained mineral (Mainly basic)

 BminPD - Mineral poorly drained (Mainly basic)

 BminSW - Shallow well drained mineral (Mainly basic)

 AlluvMIN - Alluvial (mineral)

 Made - Made ground

Project:

Donore Project, Donore Avenue, Dublin 8

Client:

The Land Development Agency

Title:

Soils



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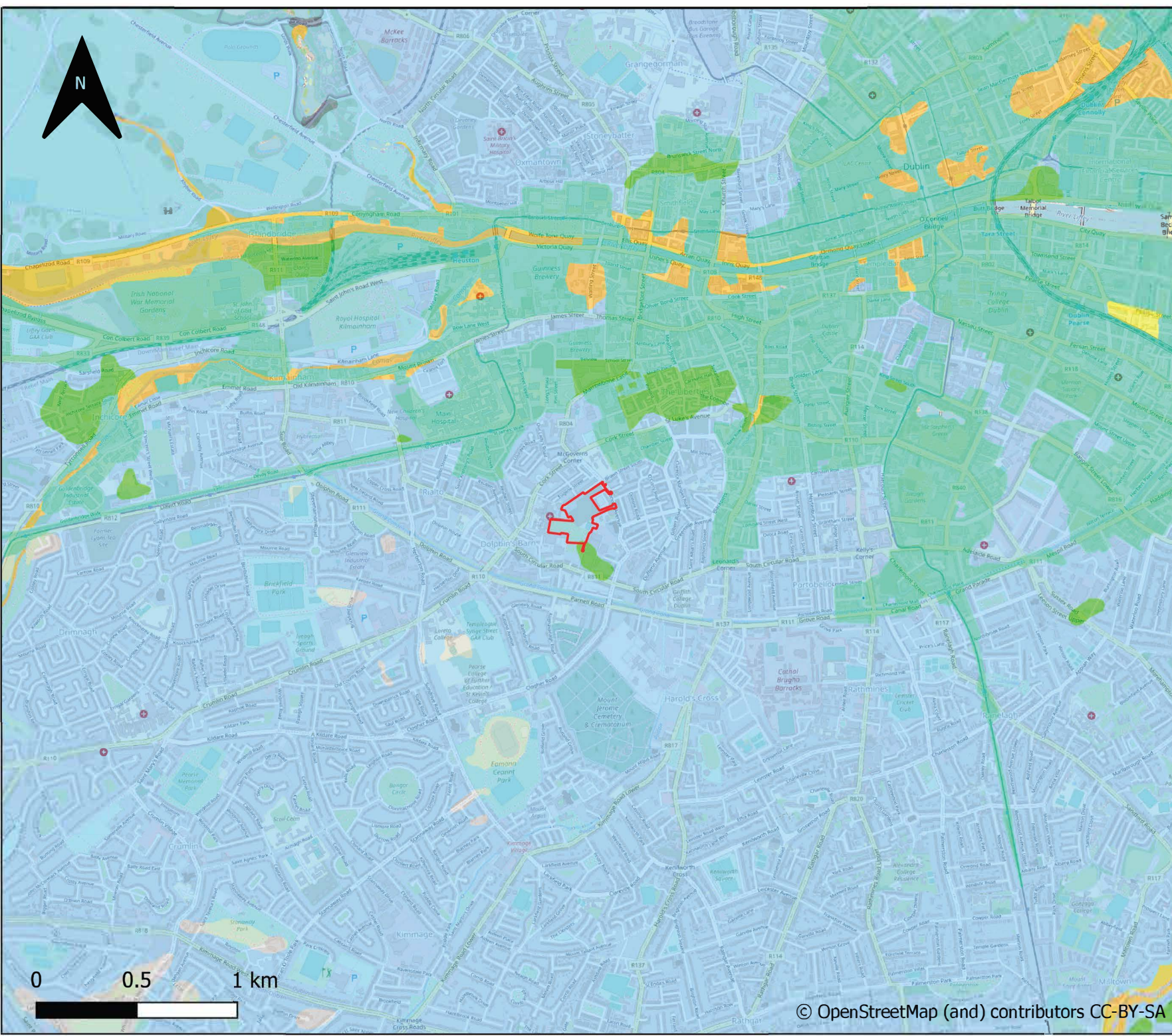
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Notes:

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Legend:

- Site boundary
- Quaternary Sediments**
 - A, Alluvium
 - Fill, Made ground
 - GLs, Gravels derived from Limestones
 - Mbs, Marine beach sands
 - Rck, Bedrock outcrop or subcrop
 - TLs, Till derived from limestones
 - Urban

Project:

Donore Project, Donore Avenue,
Dublin 8

Client:

The Land Development Agency

Title:

Quaternary Sediments



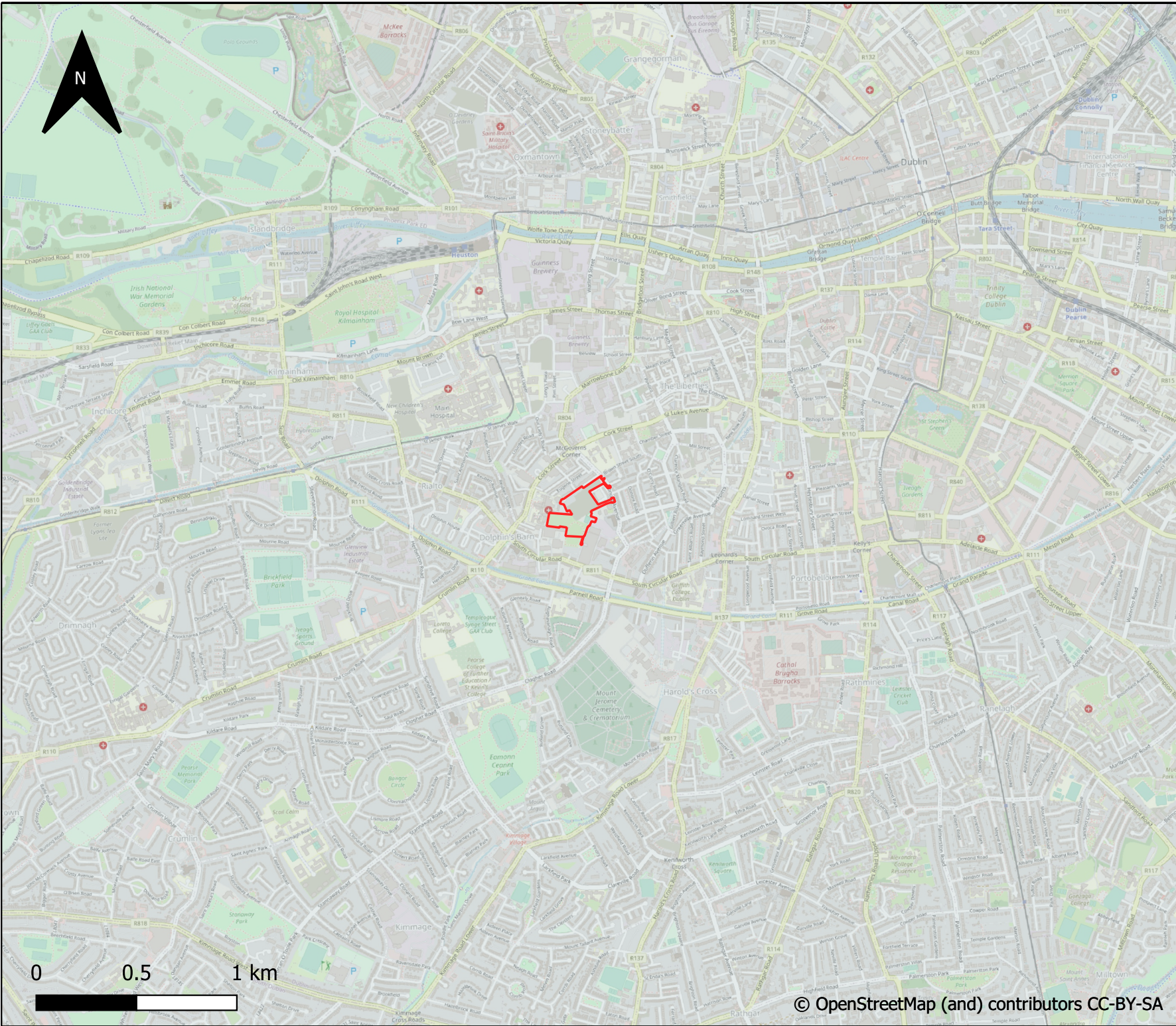
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Legend:

-  Site boundary
- Bedrock**
-  Lucan Formation

Project:

Proposed Development at St Teresa's Gardens, Donore Avenue, Dublin 8

Client:

The Land Development Agency

Title:

Bedrock Geology



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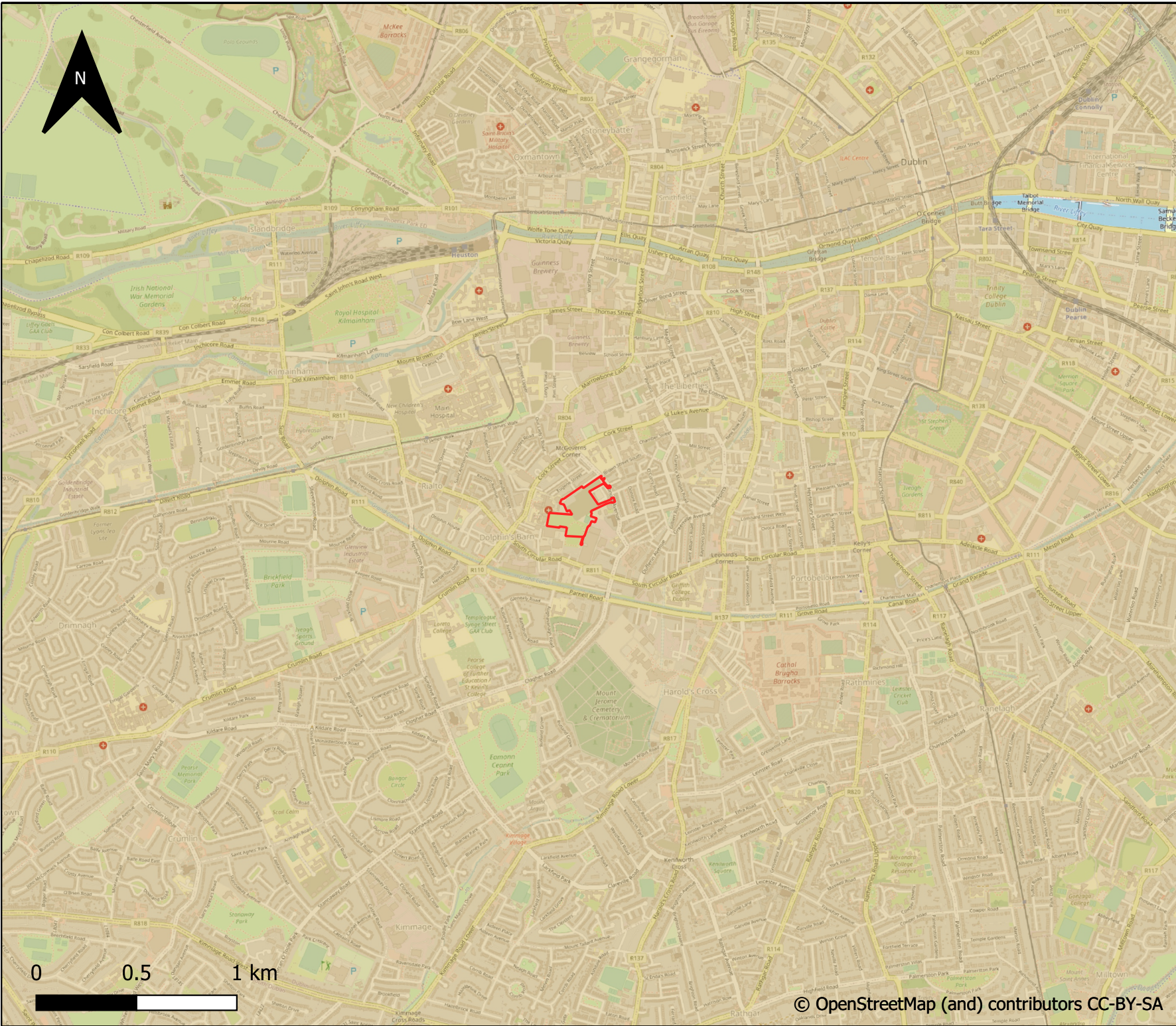
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Scale @ A4: 1:25000

Notes:

Site boundaries shown are for illustration purposes only and do not represent legal or exact boundaries



Legend:

Site boundary

Bedrock Aquifer

LI - Locally Important Aquifer
- Bedrock which is Moderately Productive only in Local Zones

Project:

Proposed Development at St Teresa's Gardens, Donore Avenue, Dublin 8

Client:

The Land Development Agency

Title:

Groundwater Aquifers



3D Core C, Block 71, The Plaza
Park West, Dublin 12 D12F9TN

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Drawn By: FJ

Checked: CC

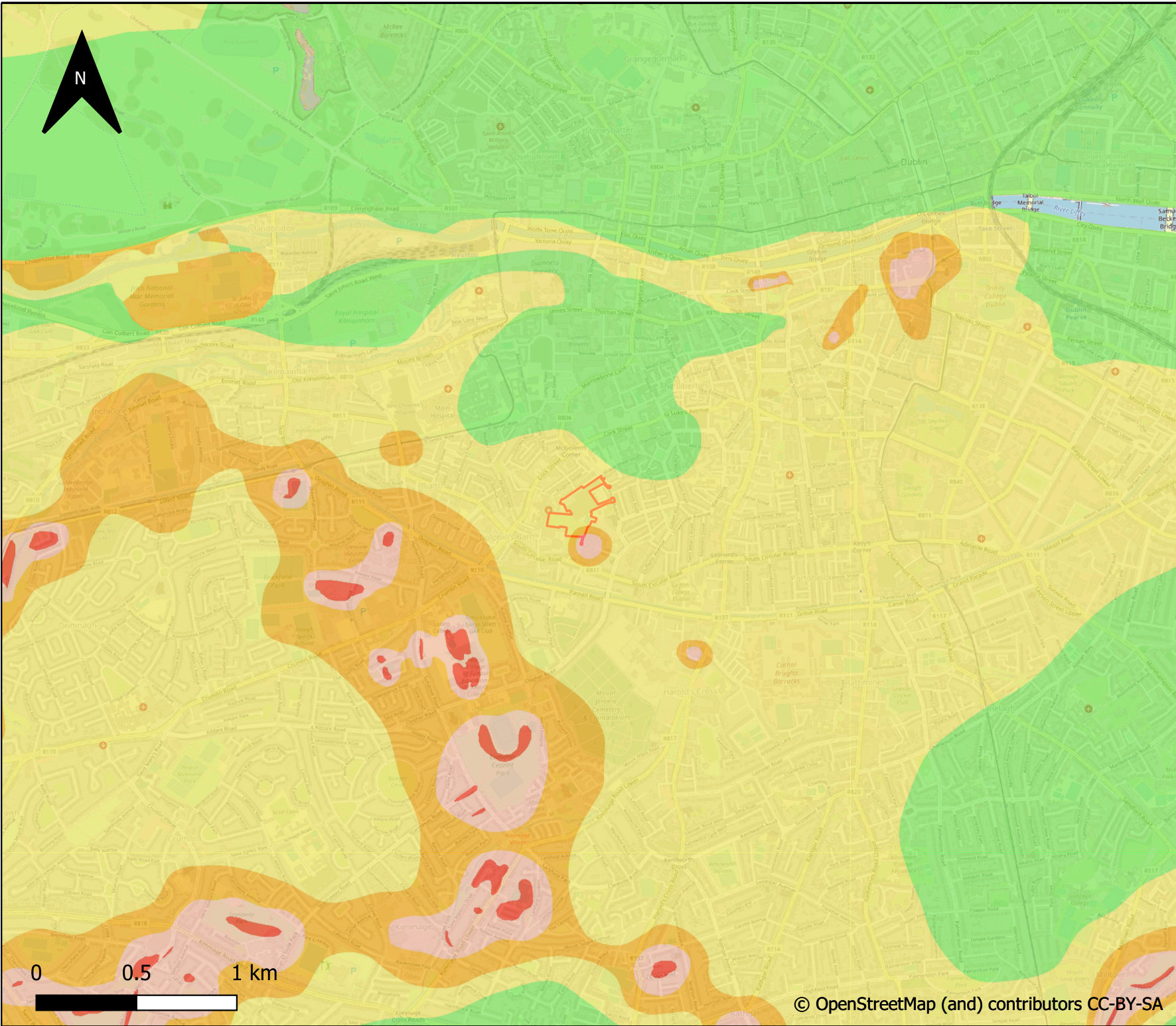
Date: 05/08/2022

Projection:
IRENET95 / Irish Transverse Mercator

Scale @ A4: 1:25000

Notes:
Site boundaries shown are for illustration purposes only and do not represent legal or exact boundaries

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Legend:

Site boundary

National Groundwater Vulnerability Ireland

Rock at or near surface or Karst

Extreme

High

Moderate

Low

Water

Project:

Proposed Development at St Teresa's Gardens, Donore Avenue, Dublin 8

Client:

The Land Development Agency

Title:

Groundwater Aquifers

**Enviroguide**
CONSULTING

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Drawn By: FJ

Checked: CC

Date: 05/08/2022

Projection:
IRENET95 / Irish
Transverse Mercator

Scale @ A4: 1:25000

Notes:

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Legend:

- Site boundary
- 15km Site buffer
- SAC - Special Areas of Conservation
- SPA - Special Protection Area
- NHA - Natural Heritage Area
- pNHA - Proposed Natural Heritage Area

Project:

Donore Project, Donore Avenue, Dublin 8

Client:

The Land Development Agency

Title:

Designated and Protected Areas



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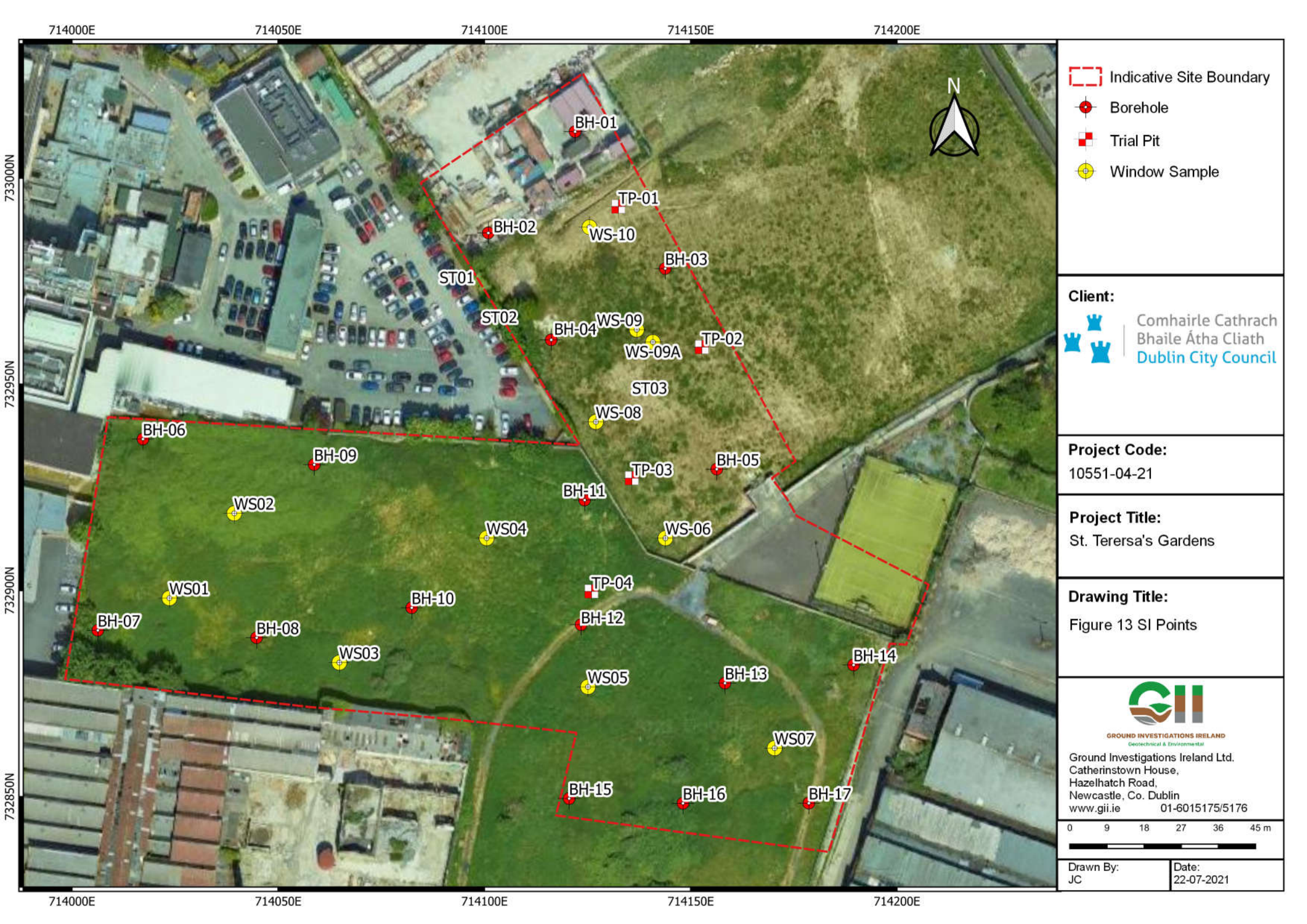
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Checked:	
Date: 12/08/2022	
	Scale @ A4: 1:150000

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- Indicative Site Boundary
- Borehole
- Trial Pit
- Window Sample

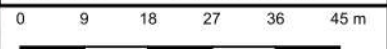
Client:
 Comhairle Cathrach
Bhaile Átha Cliath
Dublin City Council

Project Code:
10551-04-21

Project Title:
St. Teresa's Gardens

Drawing Title:
Figure 13 SI Points


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Drawn By: JC	Date: 22-07-2021
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