LARGE-SCALE RESIDENTIAL DEVELOPMENT ON LANDS AT BOHERBOY, SAGGART, CO. DUBLIN

HYDROLOGICAL AND HYDROGEOLOGICAL RISK ASSESSMENT REPORT

Evara Developments Ltd. and Kelland Homes Ltd.

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Hydrological and Hydrogeological Risk Assessment

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1 EXECUTIVE SUMMARY

A risk-based hydrological and hydrogeological impact assessment was undertaken for the Proposed Development to evaluate potential effects on groundwater, surface water, and Natura 2000 sites. The assessment concludes that, with mitigation measures in place, there will be no significant impact on the Kilcullen Groundwater Body (GWB), Dublin GWB, Camac_020 (Corbally Stream, Coldwater Stream, Cooldown Stream), Camac_030, Camac_040, or downstream transitional and coastal waterbodies, including the Liffey Estuary Upper, Liffey Estuary Lower, and Dublin Bay. Furthermore, due to distance downstream, significant dilution, and tidal attenuation, there will be no adverse effect on any Natura 2000 sites, either individually or in combination with other plans or projects.

The Proposed Development incorporates robust design and mitigation measures, including perimeter drainage, groundwater interception systems, Sustainable Drainage Systems (SuDS), and implementation of a robust Construction Environmental Management Plan (CEMP). These measures will ensure no significant risk to water quality or WFD status during both construction and operational phases. The drainage network will maintain hydrological connectivity, manage approximately 26.07m^3/day of shallow groundwater, and support the ecological viability of the translocated wetland. Overall, with these measures in place, the Proposed Development will preserve the hydrogeological regime, minimise flood risk, and ensure sustained baseflow to the translocated wetland.

2 INTRODUCTION

DNV was appointed by Kelland Homes Ltd. and Aderrig 4 Residential Ltd. (hereafter referred to as 'the Applicant') to complete a hydrological and hydrogeological risk assessment for the proposed large-scale residential development (LRD) on lands at Boherboy, Saggart, Co. Dublin (hereafter referred to as the 'Proposed Development' and 'site').

2.1 Project Background

A pre-planning meeting was held between the applicant's design team and South Dublin County Council (SDCC) on 14th August 2024. It was noted by SDCC that there were areas of marsh habitat on site that required resurvey during the appropriate season, and that a detailed analysis of the site's underlying geology, soils and hydrogeology were needed to understand the hydrological conditions that had allowed for the development of this habitat on site.

A second pre-planning meeting was held between the applicant's design team and SDCC on 20th May 2025. Clarification was sought on the site's ecological assessment and the viability of the proposed translocation of marsh habitat. It was noted that the marsh translocation proposal must be supported by clear ecological justification and design evidence demonstrating long-term habitat sustainability

2.2 Project Objectives

The primary objective of the project is to address the concerns raised by the SDCC Heritage Officer, as outlined in the Stage 2 Opinion Report (Ref: LRDOP002/24) issued in September 2024 and reiterated in the LRD Opinion Report following the Section 32D meeting held on 20 May 2025. Specifically, the Heritage Officer noted the need for:

> *"A resurvey of the habitats on the site is recommended, although it is noted that the season for good habitat surveys is almost finished for 2024. Nonetheless, a survey of the marsh habitat which was not recorded in the original and subsequent site visits is essential, not just to record its presence but to determine its emerging value as a wetland habitat and as a nature-based solution that could be incorporated in a recommended redesign of this development proposal.*
>
> *A detailed analysis of the underlying geology and soils, aquifer type and sensitivities is needed, including a detailed hydrogeological assessment, to fully ascertain the subsurface factors governing water volume, water emergence patterns, and water flow/seepage off this sloping site. The source and volume of the water supporting the development of a marsh habitat at the break of slope should particularly be determined.*
>
> *This detailed analysis will be needed to assist with designing a more appropriate model for water management on the proposed development site, with the primary aim of avoiding flood risk either on the proposed site itself or in any residential and development areas downslope from the site."*

A method statement has been prepared by Gannon & Associates Landscape Architecture (Gannon & Associates Landscape Architecture, 2025. Marsh Translocation Report; submitted with the planning application under separate cover), for the proposed translocation of the vegetation on site within the area of marshy ground to the northern section of the site.

Accordingly, the purpose of this project was to establish the baseline hydrological and hydrogeological conditions at the site and to assess the potential for adverse impacts on environmental receptors associated with the site and the proposed development. The specific objectives were to:

- Establish the hydrological and hydrogeological regime and develop a Conceptual Site Model (CSM) for the site.
- Identify the source and quantify the volume of water supporting the existing marsh habitat located at the break of slope.
- Assess the proposed drainage design intended to intercept and convey shallow groundwater beneath the site to the receiving watercourses, namely, the Corbally Stream, the Coldwater Stream, and the Cooldown Stream, as well as to the proposed translocated wetland, to ensure continuity of the shallow groundwater flow regime across the site and to support the establishment and long-term viability of the translocated wetland habitat.
- Identify any potential adverse effects on receiving water environmental receptors, both on-site and in downgradient areas.
- Assess whether the proposed development could negatively impact any designated and protected Natura 2000 sites that are hydraulically connected to the site.
- Evaluate whether the proposed development could affect the water quality status of receiving water bodies, as classified by the Environmental Protection Agency (EPA), in accordance with the Water Framework Directive (WFD).

2.3 Project Scope

The scope of the hydrological and hydrogeological assessment included the following tasks:

- A desk-based study was undertaken including a review of relevant hydrological and hydrogeological information from publicly available sources and design information pertaining to the Proposed Development provided by the Applicant.
- A site walkover inspection and survey were undertaken on the 28th of January 2025 to identify and assess the site condition, the site setting, and the receiving environment, including local hydrological and hydrogeological features and potential receptors.
- Intrusive site investigations were undertaken by Priority Geotechnical Ltd. (PGL, 2025) between the 23rd and 25th of June 2025 which included borehole drilling and installation of five (5 No.) groundwater monitoring wells (BH1, BH2, BH3, BH4 and BH5).
- Topographical survey of the five (5 No.) newly installed groundwater monitoring wells (BH1, BH2, BH3, BH4 and BH5) relative to Ordnance Datum.
- Groundwater and surface water monitoring, sampling and laboratory analysis at the five (5 No.) newly installed groundwater monitoring wells (BH1, BH2, BH3, BH4 and BH5) and two (2 No.) surface water locations (SW3 and SW4) on the 2nd of July 2025 to establish baseline conditions.
- Hydrogeological testing was conducted at two (2 No.) of the newly installed groundwater monitoring wells (BH2, BH3 and BH4) on the 2nd of July 2025 to assess the permeability of the aquifer beneath the site.
- Develop a hydrogeological Conceptual Site Model (CSM) for the Proposed Development and Site identifying potential Source-Pathway-Receptor linkages.
- Identify and assess any potential adverse effects associated with the Proposed Development on sensitive receptors associated with the receiving water environment.

Detailed methodologies for each element of the assessment are provided in relevant sections of the report where applicable.

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

2.4 Professional Competency

This report was prepared by Gareth Carroll BA BAI MIEnvSc CEnv, a Principal Consultant of DNV with over 13 years' experience in undertaking environmental assessments for a range of project types and geological and hydrogeological site settings. The report was reviewed by Nuria Manzanas BSc, MSc, a Principal Consultant of DNV with over 11 years' experience in preparing environmental and hydrogeological risk assessments. The report was approved by Patrick Higgins BSc, MSc, MIEnvSc CEnv who is a Technical Director with DNV, with over 20 years' experience and is professionally competent and accredited to undertake hydrogeological risk assessments in accordance with EPA guidelines.

3 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

3.1 Site Location and Description

The site is located to the north of Boherboy Road, approximately 2 km south-west of Tallaght Town Centre, 1 km east of Saggart, 700 m south-west of Citywest Shopping Centre, and 1.6 km south of the N7.

The site comprises approximately 18.5 hectares (Ha) of primarily undeveloped agricultural lands. The lands comprise of two agricultural grassland fields which are separated by a hedgerow and stream. There are three (3 No.) overhead power lines crossing the site (10kV-38kV). The Corbally stream runs along much of the eastern and southern boundary of the site. The Coldwater stream flows along the western boundary, and the Cooldown stream is noted along the central field boundary on the site. The site also comprises a small area of disused grassland, located to the east of the Corbally Stream. Hedgerows and treelines surround the lands. Cattle graze on the agricultural fields, with open cow sheds in the south of the site, adjacent to the entrance.

The land is bound by the Boherboy Road (L2008) to the south, agricultural fields and a single dwelling to the west, Carrigmore residential estate to the north and Corbally residential estate and Carrigmore Park to the east.

The Site location is presented in Figure 2-1 and the current layout of the site is presented in Figure 2-2.

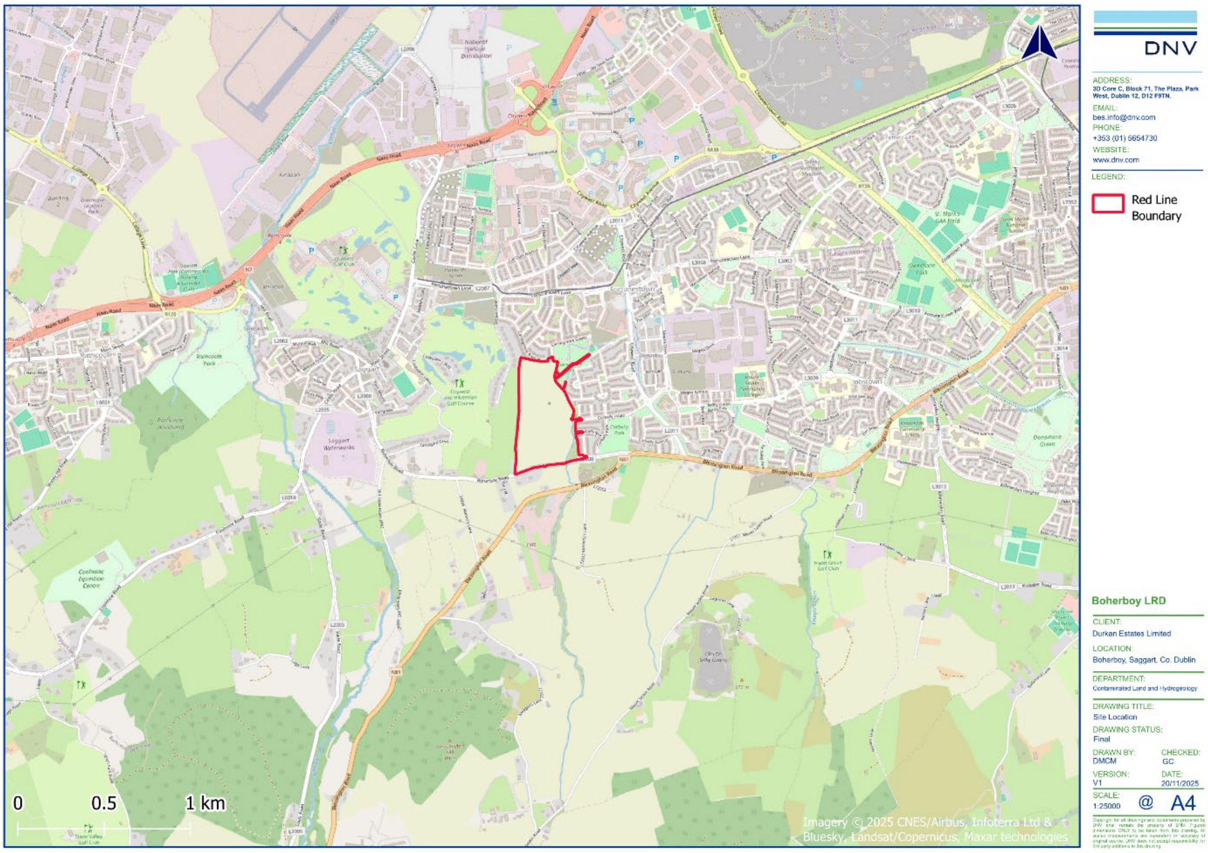

Figure 3-1. Site Location

Figure 3-2. Existing Site Layout

3.2 Topography

As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025; submitted with the planning application under separate cover), a topographical survey was carried out on the site and indicates that the lands slopes sharply downwards from the south end of the site towards the north. The existing ground level gradients range from 1/7 to 1/30 generally. There is an approximate drop in level of 38m from the highest portion (SW) of the site to the lowest point (NW).

The existing ground topography forms a natural catchment with approximately 75% of the site draining towards the north-west and the remainder draining towards the north-east of the lands. All catchments drain to existing natural watercourses either side of the site.

The existing topography is presented in Figure 3-3.

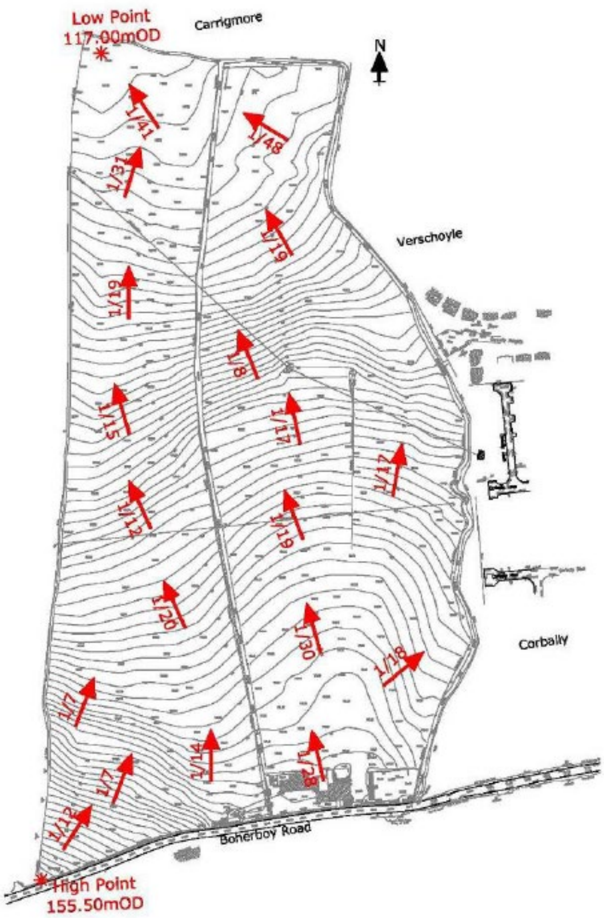

Figure 3-3. Existing Topography (Extract from Roger Mullarkey & Associates, 2025. Drainage and Water Infrastructure Engineering Report)

3.3 Proposed Development

Evara Developments Ltd. and Kelland Homes Ltd. intend to apply for permission for a Large-scale Residential Development (LRD) at a site located at Boherboy, Saggart, County Dublin. To the immediate north of the site is the Carrigmore residential estate, to the west are agricultural lands and a single dwelling, to the east is the Corbally residential estate and Carrigmore Park while to the south is the Boherboy Road.

The development will consist of 611 no. dwellings, comprised of 306 no. 2, 3 & 4 bed, 2 & 3 storey, detached, semi-detached & terraced houses, 133 no. 1, 2 & 3 bed duplex units in 12 no. 2-3 storey blocks, and 172 no. 1, 2 & 3 bed apartments in 5 no. buildings ranging in height from 4-5 & 5 storeys. The proposed development also includes a 2-storey crèche (c.630m²).

Access to the development will by via one no. new vehicular access point from the Boherboy Road, along with vehicular, pedestrian and cyclist connections to adjoining developments at Corbally Heath and Corbally Glade to the east and Carrigmore Green to the north, and pedestrian/cyclist access into Carrigmore Park to the east.

The proposed development provides for (i) all associated site development works above and below ground, including surface water attenuation & an underground foul sewerage pumping station at the northern end of the site, (ii) public open spaces (c. 2.19Ha), (iii) communal open spaces (c. 4,337sq.m), (iv) hard & soft landscaping and boundary treatments, (v) surface car parking, (vi) bicycle parking, (vii) bin & bicycle storage, (viii) public lighting, and (ix), plant (M&E), utility services & ESB sub-stations, all on an overall application site area of c.18.7Hha. In accordance with the South Dublin County Development Plan (2022-2028), an area of c.1.03Ha within the site is reserved as a future school site

The Proposed Development site layout is presented in the figures and details prepared by McCrossan O'Rourke Manning Architects (MCORM) and submitted with the planning application under separate cover.

3.4 Construction Phase

The construction phase of the Proposed Development will include:

- Foundation design will be finalised at detailed design stage. However, it is anticipated that foundation design will consist of traditional strip footings on the underlying firm to stiff cohesive deposits, or the medium dense granular deposits at depths ranging from 1.0 meters below ground level (mbGL) to 2.0mbGL. There may also be a requirement for piling.
- The stripping of existing topsoil at the site.
- The excavation of approximately 184,422m^3 of soil and subsoil for the construction of building foundations, surface water and foul water drainage infrastructure.
- Based on the findings of site investigations carried out across the site (GII, 2014 and DNV 2025c), it is anticipated that there will be no requirement for the excavation of bedrock during the construction phase of the Proposed Development.
- Where possible, it is intended to reuse suitable excavated soil and subsoil for landscaping and engineering use (total fill requirement of approximately 249,228m^3). However, it is anticipated that approximately 103,689m^3 of surplus materials will require removal offsite in accordance with all statutory legislation.
- Temporary stockpiling of excavated material pending re-use onsite.
- It is anticipated that local dewatering will likely be required during the construction of building foundations and utility infrastructure based on recorded groundwater levels with a potential temporary localised change in groundwater levels.
- The importation of approximately 164,654m^3 of aggregate fill materials will also be required for the construction of the Proposed Development (e.g., granular material beneath road pavement, under floor slabs and for drainage and utility bedding / surrounds etc.).
- The construction of 5No.crossings of the Corbally Stream connecting the Proposed Development with the adjoining Corbally and Carrigmore housing estates and the public Carrigmore Park.
- Construction of new foul and mains water connections in accordance with UE Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03), UE's Code of Practice for Water Infrastructure (IW-CDS-5020-03), Building Regulations 2010 and Technical Guidance Documents, Section H.
- Construction of new surface water and groundwater drainage designed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS) and the Greater Dublin Sustainable Drainage System (GDSDS) and the requirements of SDCC.

3.5 Operational Phase

3.5.1 Surface Water Drainage

As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025), surface water from the Proposed Development will be managed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS), the Greater Dublin Strategic Drainage Study (GDSDS), Greater Dublin Regional Code of Practice and South Dublin County Council to treat and attenuate water prior to discharging to the receiving Corbally Stream, Coldwater Stream, and Cooldown Stream.

The surface water drainage is divided into 9No. separate catchment areas (refer to Figure 3-4), each with its own SuDS interception, treatment, attenuation and storage. There is a potential c.1Ha future school site reserved on the lands that does not form part of this application but has been allowed for in the drainage calculations.

Each of the surface water outfall locations are to include a wing-wall outfall detail, and a non-return valve is to be included at each outfall location to prevent backflow in the event of a swamped outfall condition.

The surface water drainage for the Proposed Development has been designed to cater for surface water runoff from all hard surfaces including roadways, carparks, and roofs, and will adequately accommodate the 2-year, 30 year and 100 year return events over multiple time periods ranging between 15 minutes to 7 day durations. An allowance of an additional 20% for climate change has been applied as has an allowance for 10% urban creep to the rear gardens of the houses.

The following attenuation and SuDS measures will be incorporated into the Proposed Development:

- Rain Garden planters to the rear down pipes of the houses
- Permeable paving to all private parking areas draining roads and front roofs of the houses
- Filter Swales adjacent to roadways where feasible
- Tree pits where practically feasible
- Use of the existing centrally located watercourse and hedgerow as a conveyance swale
- Use of 9No.open detention basins and 1No. below ground system

- Bio-Retention areas draining roads/paths and roofs
- Silt-trap/catchpit manholes
- Hydrobrakes limiting flow to the total Qbar greenfield rate
- Petrol interceptors upstream of all outfall points
- Stone lined voided arch retention storage devices

In addition, land drains will be installed across the site to intercept and convey shallow groundwater towards the receiving Corbally Stream, Coldwater Stream, and Cooldown Stream and the proposed translocated wetland (refer to Roger Mullarkey & Associates, 2025 Drainage Layout submitted as part of the planning application under separate cover) to ensure that the shallow groundwater flow regime is maintained across the site and to support the establishment and long-term viability of the translocated wetland habitat (further details provided in the method statement prepared by Gannon & Associates Landscape Architecture (Gannon & Associates Landscape Architecture, 2025. Marsh Translocation Report; submitted with the planning application under separate cover).

The proposed surface water and groundwater catchment summary is presented in Figure 3-4.

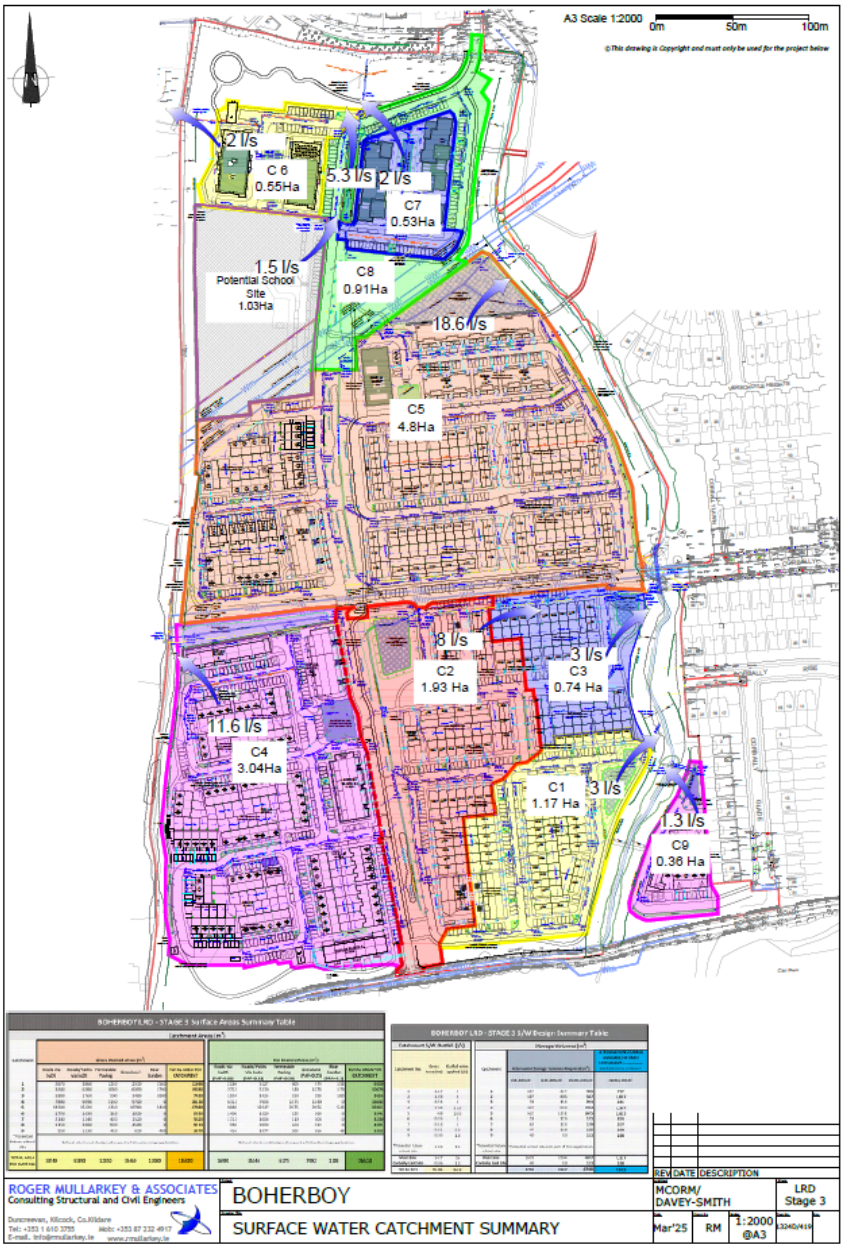

Figure 3-4. Surface Water and Groundwater Catchment Summary (Roger Mullarkey & Associates, 2025)

3.5.2 Foul Drainage

As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025), foul water from the Proposed Development will be discharged as follows:

- Approximately 75% of the foul water drainage system outfalls by gravity flow into the existing Uisce Éireann (UE) infrastructure located to the east of the site at Verschoyle Green.
- Due to the sloping topography of the subject lands, it is not feasible to drain the apartments on the northern c.25% of the site or potential future school site by gravity. Therefore, a foul water pumping station is proposed
- as part of this application to drain the above blocks from lower NE corner of the site into the gravity sewer to be constructed connecting into Verschoyle Green.
- Foul drainage for the 10No. “east” Corbally site is to connect to the existing foul drainage in Corbally Rise.

The wastewater drainage system's pipework is designed for a design flow of 9.45l/s for residential, 3.66l/s for commercial (Creche and Possible School Site) following UE’s Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03) and standard details.

The proposed foul water drainage layout is presented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025) submitted with the LRD planning application under separate cover.

The UE Confirmation of Feasibility (CoF) letter dated the 21st of January 2025 (UE COF Reference: CDS24005491) states that the proposed foul water connection is feasible subject to upgrades as follows:

- *“Approximately 135m network extension, via private lands, is required from the existing 225m gravity sewer on Verschoyle Green Road to the Development site. Please be advised that at a connection application stage you have to provide evidence of consent of the Third Party Landowners.*
- *Proposed wastewater rising main crossing the existing water pipes must be in accordance with Uisce Éireann Code of Practice and Standard Details (separation distances, crossing under the mains). The details must be approved by Uisce Éireann Diversion Team.*
- *Approximately 154m of 225mm sewer upgrade to a 450mm pipe is required. The sewer section is downstream of the Development site*
- *The Developer will be required to fund the above network extension and upgrade works. The fee will be calculated at a connection application stage.”*

The Applicant will fund all works in agreement and to the satisfaction of UE.

Construction of new foul drainage connections and the proposed foul pumping station will be in accordance with UE’s Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03).

Foul water from the Proposed development will be treated in the Ringsend Wastewater Treatment Plant (WWTP) (Discharge Licence No. D0034-02) before ultimately discharging to the Liffey Estuary Lower transitional waterbody (EU Code: IE_EA_090_0300).

3.5.3 Water Supply

As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025), there are five (5No.) existing trunk watermains crossing the site as follows:

- A 1.2m Ø (1982 Concrete), a 27inch Ø (1938 Steel) and a 24inch (AC 1975) lie parallel to each other in the northern third of the site
- A 1.2m Ø (1983 Concrete) and 24inch Ø (1952 Cast Iron) lie parallel approximately in the middle of the site.

These trunk watermains are in the control of Uisce Éireann. The set-back requirements from these mains are in accordance with the Uisce Éireann Code of Practice for Water Infrastructure 2020 document and extensive discussions were held with Uisce Éireann relating to development in proximity to same.

There are three (3No.) existing watermains (4inch uPVC/400mmDI/600mmDI) in Boherboy Road to the south of the site.

As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025), water supply to the Proposed Development will be from a new water connection to the 400mmDI watermain in Boherboy Road. It is noted that water supply for the 10No. “east” Corbally site will be from the existing main in Corbally Rise.

The UE Confirmation of Feasibility (CoF) letter dated the 21st of January 2025 (UE COF Reference: CDS24005491) states that the proposed water supply connection is feasible without infrastructure upgrade from UE.

Construction of new water supply connection will be in accordance with UE’s Code of Practice for Water Infrastructure (IW-CDS-5020-03).

4 ENVIRONMENTAL SITE SETTING

The desk study involved collecting all the relevant data for the site and surrounding area including published information and previous site investigation reports provided by the Applicant. The desk study included the review of the following sources of information:

- Ordnance Survey Ireland Online mapping (OSI, 2025).
- Geological Survey of Ireland Online mapping (GSI, 2025).
- Environmental Protection Agency Online mapping (EPA, 2025).
- National Parks & Wildlife Services, Protected Sites Webmapping (NPWS, 2025).
- Ground Investigations Ireland Ltd. (GII), 2014. Ground Investigation Report (GII, 2014).

The study area, for the purposes of assessing the baseline conditions for the HRA, extends beyond the site boundaries and includes potential receptors with which there may be a pathway to/from the Proposed Development and receptors that may be indirectly affected by the Proposed Development. The extent of the wider study area was based on the IGI, 2013 Guidelines which recommend a minimum distance of 2.0km from the site.

The study area for the HRA is defined to ensure a comprehensive assessment of baseline conditions. This area extends beyond the immediate boundaries of the site of the Proposed Development to include a broader region. The site refers specifically to the land where the Proposed Development will take place. In contrast, the study area encompasses a wider region, extending at least 2.0 km from the site, as recommended by the Institute of Geologists of Ireland (IGI) 2013 Guidelines. This broader area is necessary to identify and evaluate all potential receptors that could be affected by the Proposed Development, either directly or indirectly. The distinction between the application site and the study area is crucial. The site of the Proposed Development is the focal point of the Proposed Development, while the study area includes additional regions that might experience secondary effects. For instance, potential receptors within the study area include surrounding waterbodies and protected sites that might undergo changes in water quality and composition that could be altered by construction activities, and underlying geological features that might be affected.

The justification for this wider study area lies in the need to capture all potential effects comprehensively. While the primary focus is on the application site, the broader study area ensures that any indirect or secondary effects on hydrology and hydrogeology are also considered. This approach provides a detailed and accurate picture of how the Proposed Development might affect these aspects of the environment, helping stakeholders make informed decisions and ensuring that all potential environmental effects are thoroughly assessed.

4.1 Soil and Geology

The soils beneath the site are mapped by Teagasc (Teagasc, 2025) as deep well drained mineral (mainly acidic), Acid Brown Earths, Brown Podzolics (IFS Soil Code: AminDW) derived from mainly non-calcareous parent materials described as till derived chiefly from Lower Palaeozoic rocks (sandstone and shale till – TLPSsS). The underlying soils are presented in Figure 3-1.

The subsoil or quaternary sediments beneath the majority of the site are mapped by the GSI (GSI, 2025) as till derived from limestones (TLs). While the subsoil beneath a small portion within the southern boundary of the site is mapped by the GSI (GSI, 2025) as till derived from Lower Palaeozoic sandstones and shales (TLPSsS). The underlying subsoil or quaternary sediments are presented in Figure 3-2.

The bedrock beneath the majority of the site is mapped by the GSI (GSI, 2024) as the Pollaphuca Formation (code SLPLPH) described as coarse greywacke & shale. The bedrock beneath the most northern portion of the site is classified as the Lucan Formation (code CDLUCN) which is made up of dark limestone and shale (‘calp). The underlying bedrock geology is presented in Figure 4-3.

While no bedrock outcrops are mapped within the site boundary, a cluster of bedrock outcrops is located approximately 1.08km south of the site (GSI, 2025).

There are no karst features mapped by the GSI (GSI, 2025) at the Site or within a 2km radius of the site.

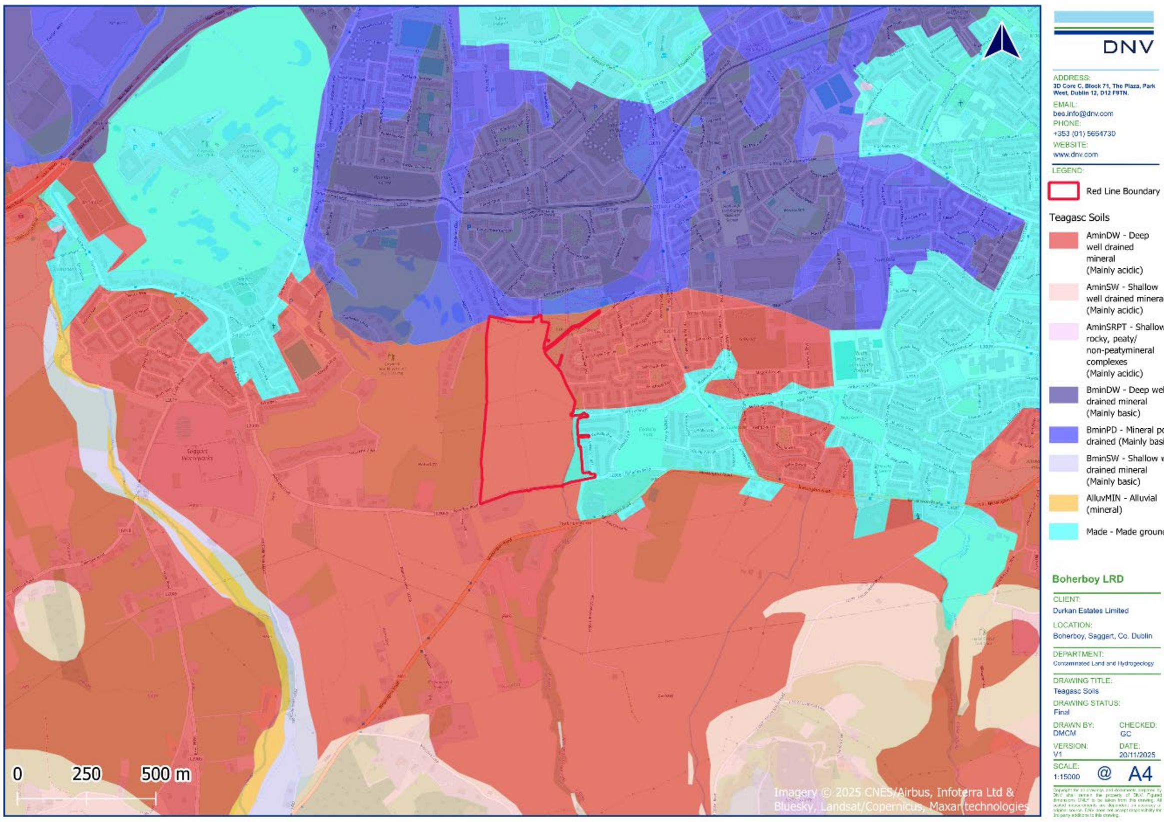

Figure 4-1. Teagasc Soils

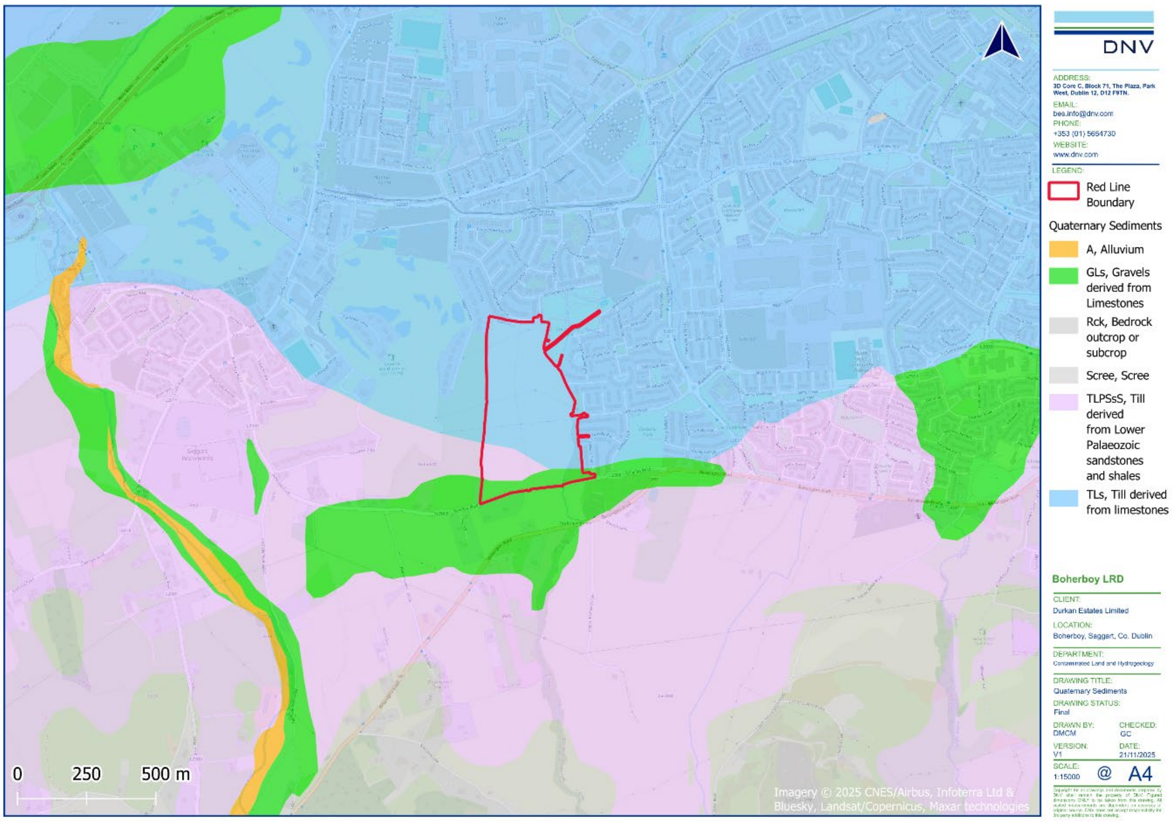

Figure 4-2. Subsoil or Quaternary Sediments

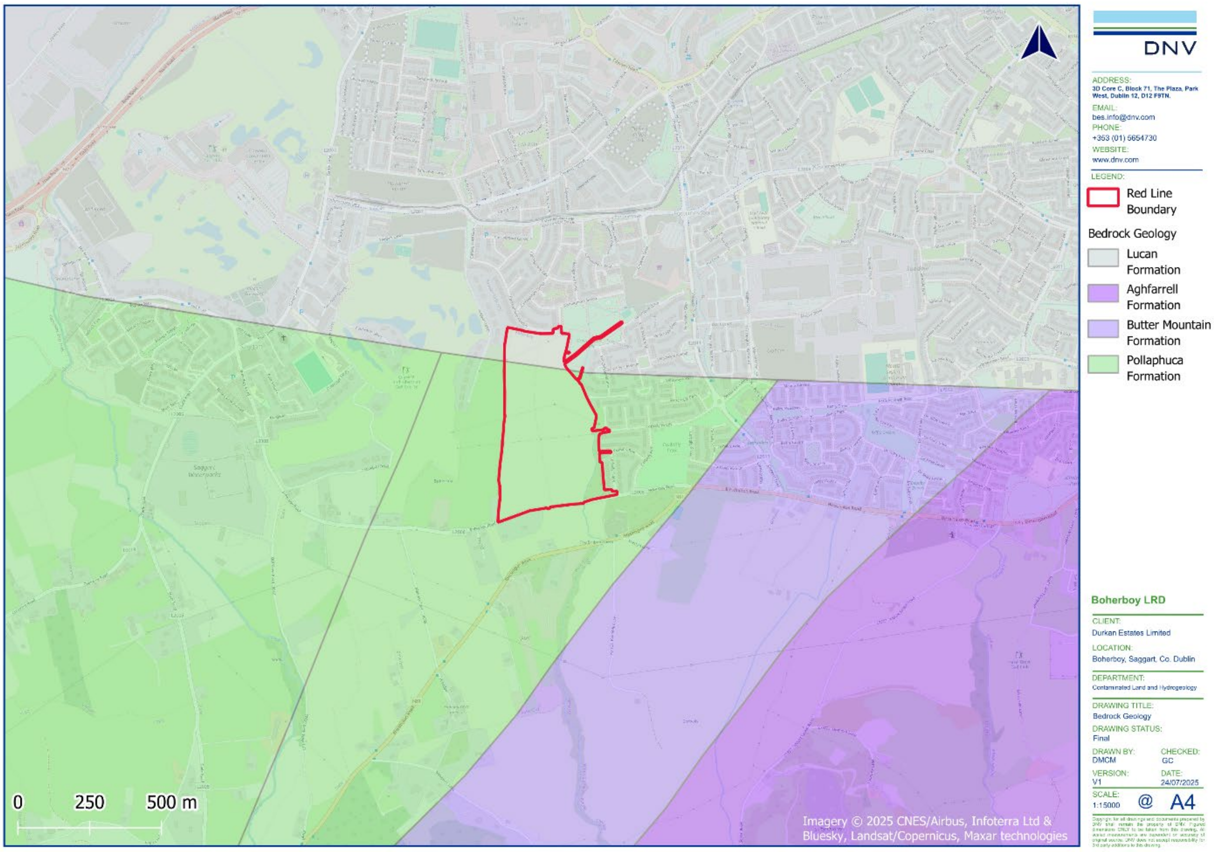

Figure 4-3. Bedrock Geology

4.2 Regional Hydrogeology

4.2.1 Groundwater Body

The EPA (EPA, 2025) maps the groundwater body (GWB) beneath majority of the site as the Kilcullen GWB (EU Code: IE_EA_G_003). The Kilcullen GWB covers some 642km^2 and occupies an area across Co. Dublin, Co. Wicklow and Co. Kildare (GSI, 2025). The bedrock aquifer beneath the most northern area of the site is mapped by the EPA (EPA, 2025) as the Dublin GWB (EU Code: IE_EA_G_008). The Dublin GWB covers some 837km^2 and occupies an area across Co. Dublin, Co. Kildare and Co. Wexford (GSI, 2025).

<u>**Kilcullen Groundwater Body**</u>

The Kilcullen GWB Report (GSI, 2025) identifies that the dominant recharge process in this area will be diffuse recharge from water percolating through the overlying tills and into the aquifer. High rates of potential recharge are expected in the hilly areas where there are very thin subsoils and high rainfall. A large portion of this potential recharge will be rejected because the rocks in this area are considered to be poor aquifers with low storativity to accept all the water and therefore, the runoff component to streams will be higher, which can be seen in the very high drainage density in the area.

Groundwater flow is anticipated to principally occur in the top few metres (approximately in the upper 3m of the rocks), mostly within the weathered zone moving laterally towards discharge points such as rivers and springs. However, deeper groundwater flow is possible in some instances within areas of a greater degree of structural deformation which provides a fracture network often encountered (between 10 metres below ground level (mbGL) and 40mbGL). Flow is only anticipated in isolated fractures expected below 30m (GSI, 2025). As discussed in Section 4.3, previous site investigation results indicate that shallow groundwater, where encountered, was recorded at depths ranging between 2.0mbGL and 3.0mbGL as slow seepages and typically within the granular deposits (GII, 2014).

Typical groundwater flow paths are anticipated to be in the order of a couple of hundred metres, with discharge occurring to the closest surface water feature (i.e., overlying streams and rivers as baseflow). Groundwater flow is considered to recharge and discharge on a local scale. Groundwater discharges to the numerous small streams crossing the aquifer, to springs and seeps. Regional groundwater flow paths are not considered to develop, as the rocks do not have sufficient transmissivity to transport water over long distances.

Dublin Groundwater Body

The Dublin GWB Report (GSI, 2025) identifies two (2 No.) different recharge processes, one within Dublin City and the other one recharge in rural areas within this GWB. Recharge is prevented within Dublin City as it is essentially a cement cap on the limestone. The only open areas where recharge may occur are open grassed areas (i.e., parks, squares and gardens). In addition, some recharge occurs from leaking sewers, mains and storm drains. Elsewhere diffuse recharge will occur via rainfall percolating through the subsoil and via outcrops. The proportion of the effective rainfall that recharges the aquifer is determined by the thickness and permeability of the soil and subsoil, and the slope. A high proportion of the recharge will then discharge rapidly to surface watercourses via the upper layers of the aquifer given the low permeability of the aquifers within this GWB, therefore, reducing further the available groundwater resource in the aquifer.

This GWB will discharge directly to the Irish Sea along the coast. Although, there will also be discharge to the overlying gravel aquifers in places and to the overlying rivers, if they are in hydraulic continuity with the aquifer.

Groundwater flow occurs along fractures, joints and major faults. Deeper groundwater circulation is possible given the presence of a number of warm springs within this GWB. The general groundwater flow direction is towards the coast and also towards the River Liffey and Dublin City. This aquifer is not expected to maintain regional groundwater flow paths. The majority of groundwater flow will be a rapid flow within the upper weathered zone near the surface (i.e., likely to be approximately 10mbGL, comprising a weathered zone (i.e., few metres thickness) and a connected fractured zone below the weathered zone). However, flow in conduits is commonly recorded at depths of 30mbGL to 50mbGL. Groundwater circulation from recharge to discharge points will more commonly take place over a distance of less than a one kilometre.

Locally, groundwater flow within the site and vicinity of the site is likely to be toward the Corbally Stream (also known as Brownsbarn Stream), located along the eastern and northern site boundaries and also the Cooldown Stream and Coldwater Stream located along the central field boundary on the site and along the western boundary of the site respectively.

4.2.2 Aquifer Classification

The bedrock aquifer within the Pollaphuca Formation (Code: SLPLPH) beneath the site is classified by the GSI (GSI, 2025) as a Poor Aquifer which is generally unproductive except for local zones (PI). The bedrock aquifer within the northern portion of the site within the Lucan Formation (code CDLUCN) is classified as a 'Locally Important Aquifer (LI), which is moderately productive only in local zones' (GSI, 2025).

As documented by the GSI (GSI, 2017 A Description of Irish Aquifer Categories), poor aquifers are capable of supplying 'moderate' to 'low' yields (<100m3/day) and groundwater flows occurs predominantly through a limited and poorly connected network of fractures, fissures and joints. While locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or 'good' yields (100-400m3/day). Groundwater flow occurs predominantly through fractures, fissures and joints (GSI, 2017).

There are no gravel aquifers mapped by the GSI (GSI, 2025) at the site or within a 2km radius of the site (GSI, 2025).

The bedrock aquifer beneath the Site is presented in Figure 3-4.

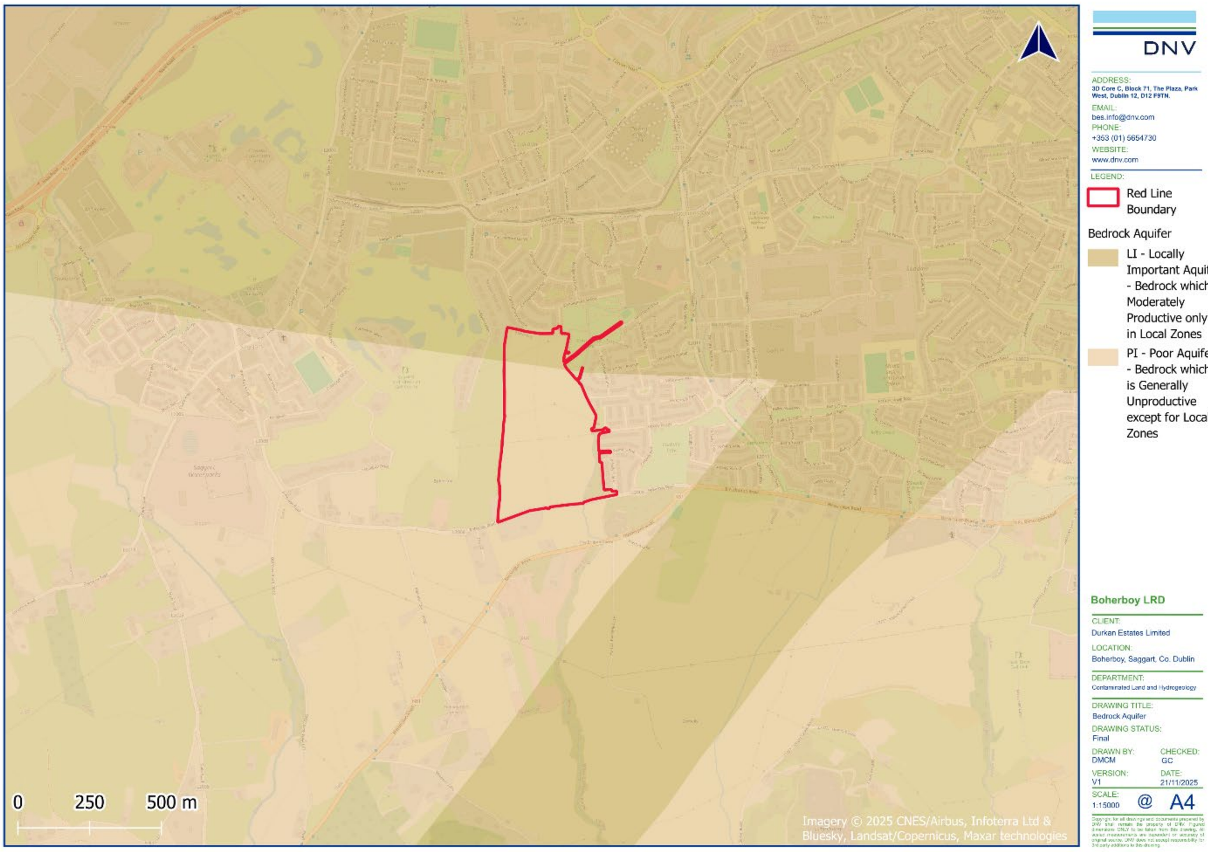

Figure 4-4. Bedrock Aquifer

4.2.3 Recharge

The GSI groundwater recharge map provides an estimate of the average amount of rainwater that percolates down through the subsoils to the water table over a year. The map accounts for rainfall that percolates diffusely through soils and subsoils it does not consider water that enters aquifers at points (e.g., at sinkholes) or along linear features (e.g., along sinking streams/rivers). Groundwater recharge amounts are estimated by considering soil drainage, subsoil permeability, thickness and type, the ability of the aquifer to accept the recharge, and rainfall.

The GSI (GSI, 2025) have calculated a capped recharge of 100mm/year for the aquifer beneath the southern portion of the site and 41mm/year beneath the northern portion of the site based on an effective rainfall (ER) value of 547mm/year and a recharge coefficient of 60% and 8% respectively.

4.2.4 Groundwater Vulnerability

The vulnerability categories, and methods for determination, are presented in the Groundwater Protection Schemes publication (DEHLG/EPA/GSI, 1999) and summarised in Table 4-1. The publications state that *'as all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area'.*

Table 4-1. Vulnerability Mapping Criteria

Subsoil Thickness	*Hydrogeological Requirements*				
	Diffuse Recharge			*Point recharge*	*Unsaturated Zone*
	Subsoil Permeability & Type			*(Swallow holes, losing streams)*	*(sand & gravel aquifers only)*
	High permeability (sand & gravel)	*Moderate permeability (sandy subsoil)*	*Low permeability (clayey subsoil, clay, peat)*		
0-3m	*Extreme*	*Extreme*	*Extreme*	*Extreme (30m radius)*	*Extreme*
3-5m	*High*	*High*	*High*	*N/A*	*High*
5-10m	*High*	*High*	*Moderate*	*N/A*	*High*
>10m	*High*	*Moderate*	*Low*	*N/A*	*High*
Notes: (i) N/A = not applicable (ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method.					

The GSI has assigned a ‘Moderate’ permeability rating and a groundwater vulnerability rating of ‘Moderate’ (M) for the bedrock aquifer beneath the southern part of the site (GSI, 2025). While a ‘Low’ permeability rating and ‘Low’ (L) groundwater vulnerability has been assigned to the bedrock aquifer beneath the northern part of the site.

The anticipated depth to bedrock across the site based on the assigned permeability and vulnerability ratings is greater than 10mbGL. As discussed in Section 4.3, previous site investigation results indicate that there were cohesive sediments of low permeability (sandy gravelly clay) up to 3mbGL and some lenses of granular deposits present to the south of the site. Bedrock was not encountered during previous site investigations.

The groundwater vulnerability rating map is provided in Figure 4-5.

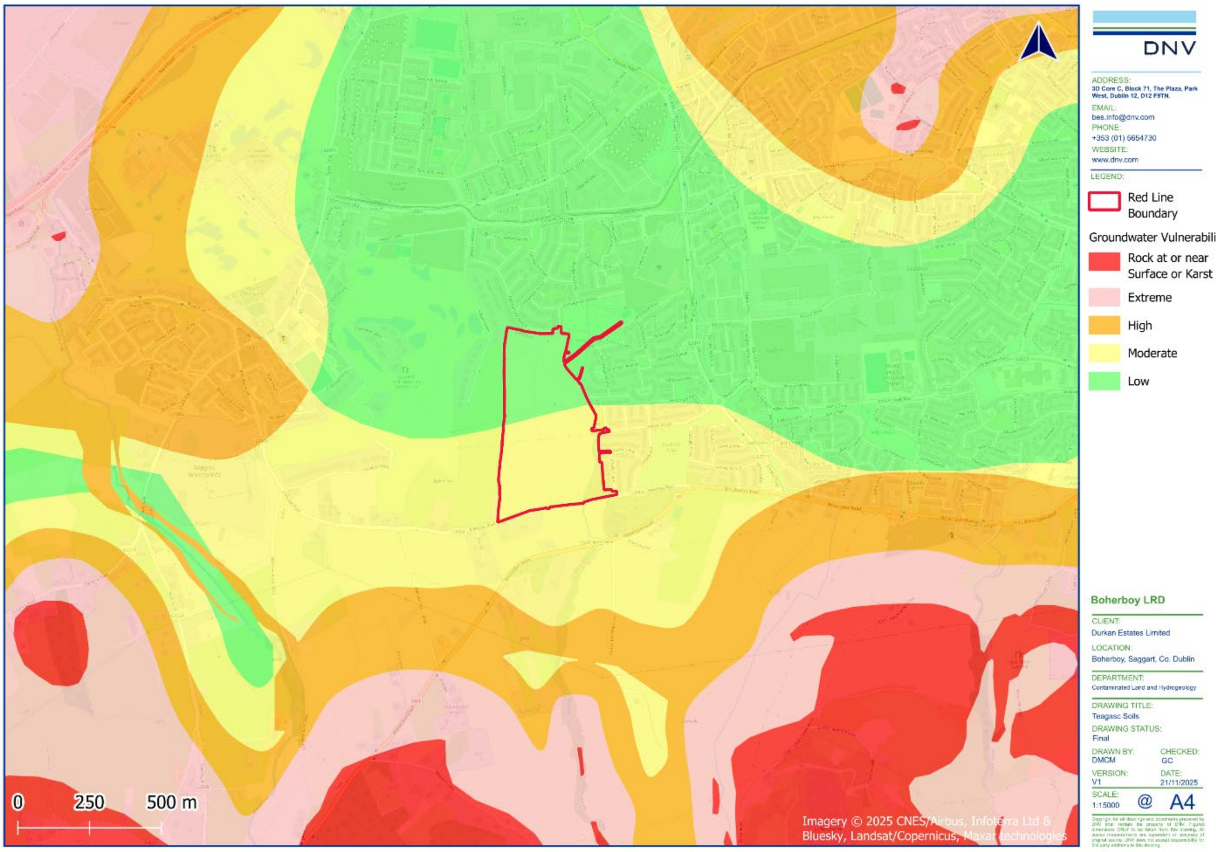

Figure 4-5. Groundwater Vulnerability

4.3 Previous Site Investigations

A site investigation was carried out at the site by GII between the 9th and 12th of December 2013 (GII, 2014; appended to the Roger Mullarkey & Associates, 2025 Drainage and Water Infrastructure Engineering Report submitted with the planning application under separate cover).

The scope of the site investigation works consisted of the following:

- Eight (8No.) trial pits excavated to a maximum depth of 3.5mbGL).
- Six (6No.) slit trenches excavated to a maximum depth of 2.5mbGL.
- Nine (9No.) dynamic probes to a maximum depth of 3.3mbGL.
- Four (4No.) soakaway tests to BRE Digest 365.
- Geotechnical and Environmental Laboratory testing.

The site investigation locations are presented in Figure 4-6.

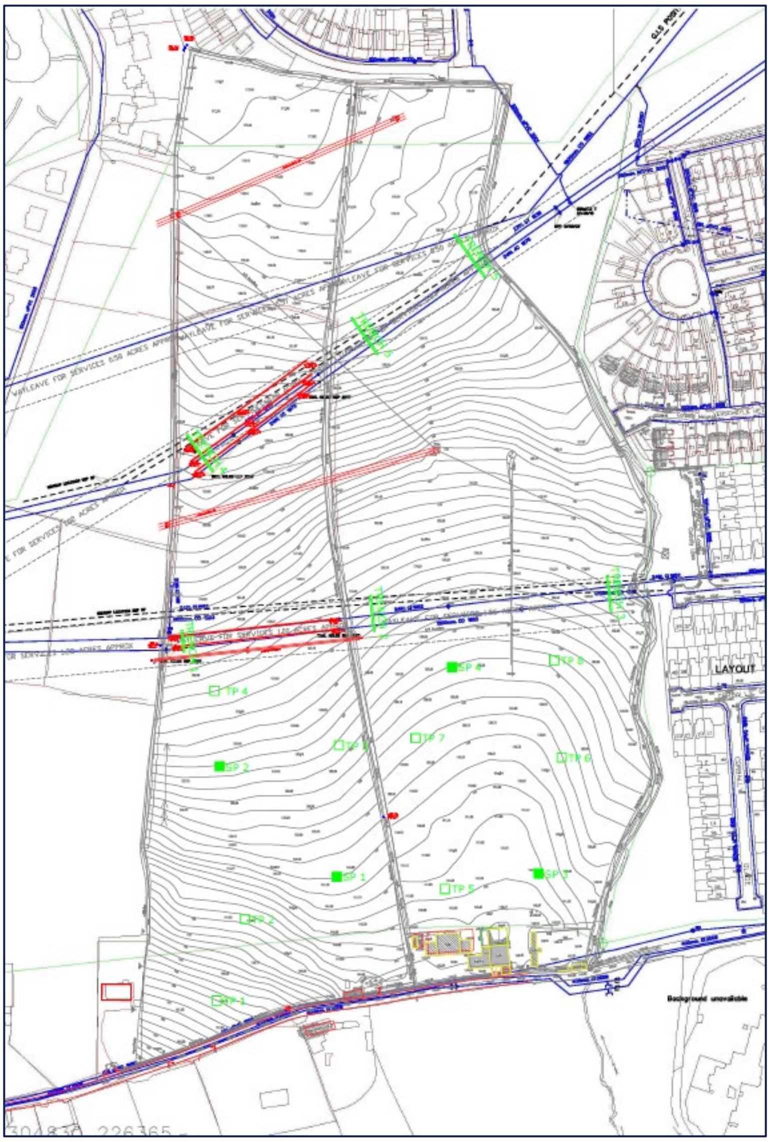

Figure 4-6. Site Investigation Locations (Extract from GII, 2014)

4.3.1 Ground Conditions

The ground conditions encountered at the site are summarised as follows:

- **Topsoil** – encountered to a maximum depth of 0.3mbGL mainly in all site investigation locations.
- **Cohesive Deposits** – encountered beneath the topsoil and described mainly as brown, grey-brown or occasionally as black, slightly sandy, slightly gravelly, CLAY, slightly gravelly, sandy, CLAY/SILT, laminated

sandy, SILT and sandy, gravelly, slightly organic CLAY. These deposits generally ranged from soft or soft to firm at shallow depths increasing to stiff or stiff to very still at the base of the majority of the trial pits. Occasional cobbles and rare boulder content were also noted during the excavation of the trial pits.

- **Granular Deposits** – generally described as brown or dark grey, gravelly, fine to coarse, SAND and clayey, sandy, subangular to subrounded fine to coarse GRAVEL. These deposits were encountered in the south of the site either in lenses within the cohesive deposits or as a layer beneath the cohesive deposits at the base of the trial pits. Occasional cobbles and rare boulder content were also noted.
- Bedrock was not encountered during site investigation works.

The geotechnical classification of the soil samples demonstrated that the primary constituent is CLAY for the cohesive deposits of low and intermediate plasticity with variable content of silt, sand and gravel. The granular deposits (glacial till) were well-graded with a high content of fine material.

4.3.2 Groundwater Levels

Groundwater strikes were recorded at depths ranging between 2.0mbGL and 3.0mbGL as slow seepages (GII, 2014).

The site investigation locations were backfilled upon completion and did not remain open for sufficiently long periods of time to establish the hydrogeological regime. It was noted that groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors (GII, 2014).

4.3.3 Hydrogeological Testing

A total of four soakaway tests (denoted as 4No.) were conducted in accordance with the procedures outlined in BRE Digest 365. These tests were carried out to assess the infiltration capacity of the underlying soil and determine its suitability for soakaway design. Each test involved excavating a trial pit, filling it with water, and monitoring the rate at which the water drained away.

The results of the soakaway testing indicated a soil infiltration rate of 1.38×10^{-5}m/s in the vicinity of test location SP1 located in the centre of the southern portion of the stie (refer to Figure 4-6). The remaining three (3No.) soakaway tests failed indicating the presence of low permeability subsoils.

4.3.4 Laboratory Analytical Results

As documented in the site investigation report (GII, 2014) , a total of four (4No.) soil samples collected were analysed for a suite of parameters suitable to determine the suitability of soils for disposal to a landfill. Soil analytical data for soil samples collected across the site are provided in the in the site investigation report (GII, 2014) appended the Roger Mullarkey & Associates, 2025 Drainage and Water Infrastructure Engineering Report submitted with the planning application under separate cover.

Based on the soil and soil leachate analysis results, all four (4No.) samples meet the meet the waste acceptance criteria (WAC) for inert landfills as stipulated in the European Landfill Directive (Council Directive 1999/31/EC of 26 April 1999). It is noted that the samples were not classified as hazardous or non-hazardous in accordance with EPA guidance 'Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous' (EPA, 2018).

Based on a review of the results, there is no evidence of anthropogenic contamination in sampled soils:

- The reported concentration of benzene, toluene, ethylbenzene, m/p-xylene and o-xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), mineral oil, Polychlorinated Biphenyl (PCBs) were less than the Limit of Detection (LOD).

4.4 Hydrology

The Proposed Development site lies within the Liffey and Dublin Bay Catchment (Hydrometric Area 09) and River Liffey sub-catchment (WFD name: Liffey_SC_090, ID 09_15) (EPA, 2025). The site has been mapped by the EPA (EPA, 2025) to be within the Camac_020 WFD River Sub Basin (IE_EA_09C020250).

The surface water features within the site recorded on the EPA database (EPA, 2025) are as follows:

- The Corbally Stream (also known as the Brownsbarn Stream) (WFD Name: Camac_020; River Waterbody Code: IE_EA_09C020250) is a tributary of the Camac River. It flows along the eastern and northern boundaries of the site in a northerly direction before joining the Camac River approximately 2.1km north of the site. From there, the Camac River continues northeast and discharges into the Liffey Estuary Upper transitional waterbody (WFD Name: Liffey; Transitional Waterbody Code: IE_EA_090_0400) approximately 11.7km northeast of the site. It then flows into the Liffey Estuary Lower (WFD Name: Liffey; Transitional Waterbody Code: IE_EA_090_0300) approximately 13.7km northeast of the site, and ultimately discharges into the Dublin Bay coastal waterbody (Coastal Waterbody Code: IE_EA_090_0000).

- The Coldwater Stream (WFD Name: Camac_020; River Waterbody Code: IE_EA_09C020250) originates along the western boundary of the site, flowing northward before discharging into the Corbally Stream at the site's northern boundary.
- The Cooldown Stream (WFD Name: Camac_020; River Waterbody Code: IE_EA_09C020250) originates within the site and flows in a south-to-north direction, ultimately discharging into the Corbally Stream at the site's northern boundary. It is typically a dry ditch that bisects the site and is believed to be man-made. The stream is inactive under normal conditions and only becomes active during periods of heavy rainfall. Several French drains within the site discharge into the Cooldown Stream, though runoff and infiltration from these drains occur only in the northern third of the stream. The remainder of the channel generally remains dry.

Other surface water features within the vicinity of the site are as follows:

- The Baldonnel_Little (WFD Name: Camac_020; River Waterbody Code: IE_EA_09C020250), located approximately 0.38km west of the site, flows in a northerly direction before conveying to the Camac River approximately 1.3km north of the site.
- The Camac River (WFD Name: Camac_020; River Waterbody Code: IE_EA_09C020250), located approximately 1.37km east and 2.1km north of the site, flows in a northeastern direction before discharging into the Liffey Estuary Upper (WFD Name: Liffey; Transitional Waterbody Code: IE_EA_090_0400) approximately 11.7km northeast of the site, then into the Liffey Estuary Lower (WFD Name: Liffey; Transitional Waterbody Code: IE_EA_090_0300) approximately 13.7km northeast of the site and finally discharging into the Dublin Bay (Coastal Waterbody Code: IE_EA_090_0000) approximately 18.0km east of the site.
- The Baldonnel_Upper (WFD Name: Camac_020; River Waterbody Code: IE_EA_09C020250), located approximately 0.37km east of the site, flows in a northerly direction before conveying to the Camac River approximately 1.30km north of the site.
- The Kingswood Stream (WFD Name: Camac_030; River Waterbody Code: IE_EA_09C020310), located approximately 1.0km east of the site, flows in a northerly direction before conveying to the Camac River approximately 2.8km north of the site.
- The Fortunestown Stream (WFD Name: Camac_030; River Waterbody Code: IE_EA_09C020310), located approximately 0.99km east of the site, discharges into the Kingswood Stream approximately 1km east of the site.

The local surface waterbodies within a 2km radius of the site are presented in Figure 4-7.

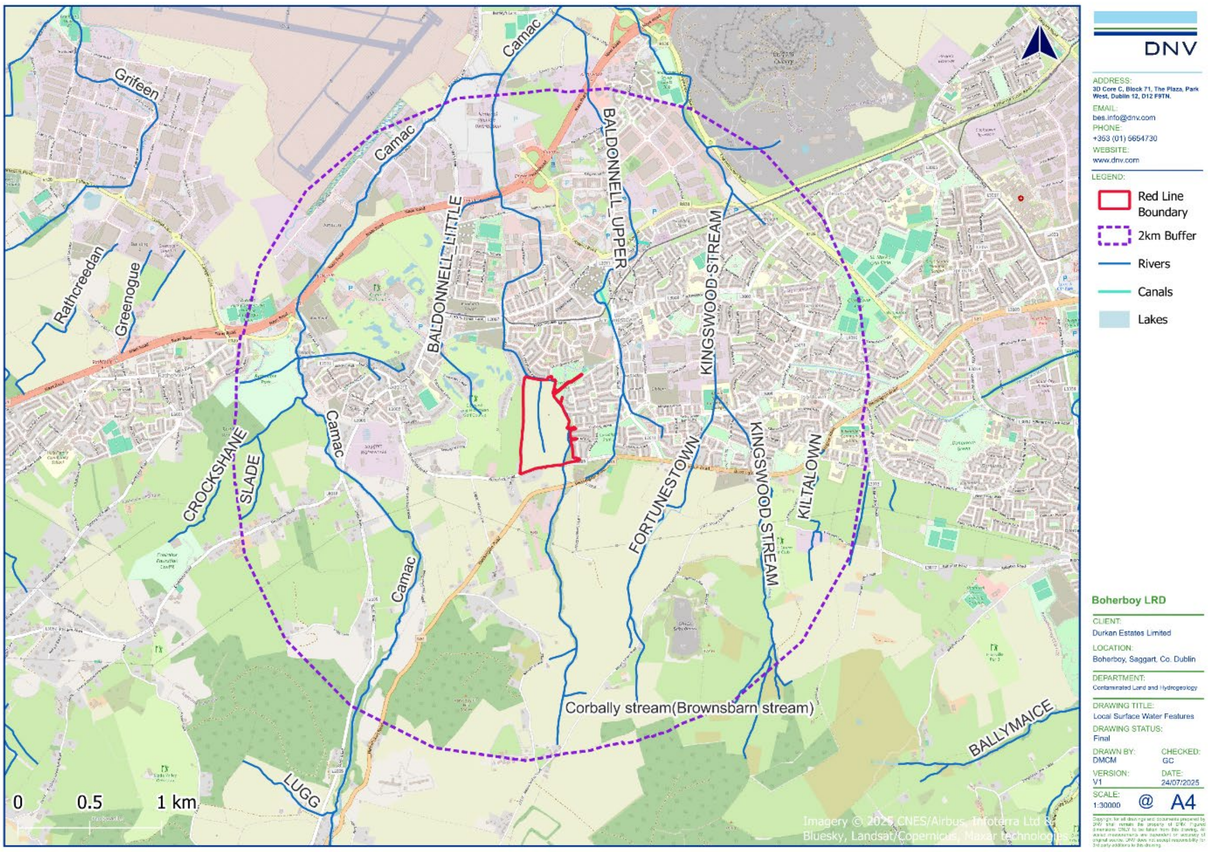

Figure 4-7. Local Surface Water Features

4.5 Flooding

The site-specific flood risk assessment (SSFRA) report (Kilgallen & Partners Consulting Engineers, 2025; submitted with the planning application under separate cover) assessed the potential flood risk associated with fluvial, groundwater and pluvial flooding for the site and Proposed Development.

The initial assessment concluded that the site is not at risk from pluvial or groundwater flooding. However, indicators suggested a potential risk from fluvial flooding, prompting a detailed assessment. This confirmed that the northern boundary of the site lies within Flood Risk Zones A and B. To mitigate this, the proposed development incorporates a compensatory storage basin in the northwest corner of the site. While the development will displace floodplain storage in some areas, it lowers ground levels in others, resulting in a net increase in floodplain storage and a slight reduction in flood risk to surrounding areas. Stream crossings have been designed in accordance with OPW requirements, with soffit levels at least 500mm above the 1% Annual Exceedance Probability (AEP) flood level. Two vehicular crossings meet road level constraints and have received OPW Section 50 consent. The proposed floor levels exceed the recommended minimum by 1.90m, and road levels are 1.65m above the required threshold. Additionally, open space adjacent to the Corbally stream has been elevated to maintain a minimum 750mm freeboard above the 1% AEP water level. The development has passed the Development Management Justification Test and is deemed appropriate from a flood risk perspective, with no increased risk to surrounding areas (Kilgallen & Partners Consulting Engineers, 2025).

4.6 Groundwater Use and Source Protection

A search of the GSI groundwater well database (GSI, 2025) was conducted to identify registered wells and groundwater sources in the surrounding area. There are no groundwater sources recorded at the site or within a 2km radius of the site (refer to Figure 4-8).

The site of the Proposed Development is located within an area serviced by mains water supply. As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025), there are five (5No.) existing trunk watermains crossing the site as follows:

- A 1.2m dia. (1982 Concrete), a 27inch Ø (1938 Steel) and a 24inch (AC 1975) lie parallel to each other in the northern third of the site

- A 1.2m dia. (1983 Concrete) and 24inch Ø (1952 Cast Iron) lie parallel approximately in the middle of the site.

There are also three (3No.) existing watermains (4inch uPVC/400mmDI/600mmDI) in Boherboy Road to the south of the site.

It is noted that water supply to the Proposed Development will be from a new water connection to the 400mmDI watermain in Boherboy Road. Additionally, water supply for the 10No. "east" Corbally site will be from the existing main in Corbally Rise.

There are no Groundwater Source Protection Areas (SPAs) mapped by the GSI (GSI, 2025) within a 2km radius of the site. The closest Groundwater SPAs is the Kilteel GWS located 5.2km southwest of the site.

There are no surface water drinking water source sites under Article 7 of the Water Framework Directive (EPA, 2025) within 2km of the site. The closest surface water drinking source is the River Dodder (WFD Name: DODDER_020) located approximately 4.3km southeast of the site (EPA, 2025).

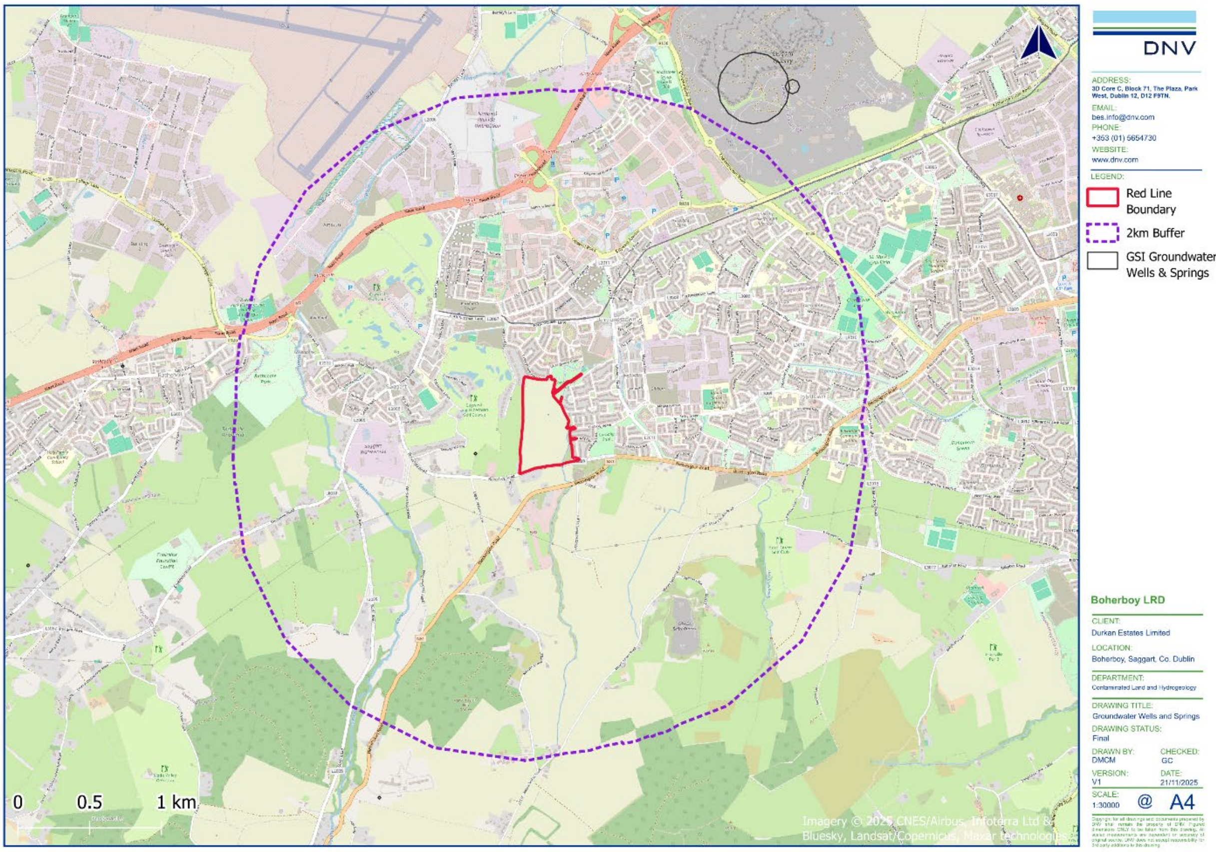

Figure 4-8. Groundwater Wells and Springs

4.7 EPA Water Quality Data

4.7.1 EPA Surface Water Quality – Q Values

The EPA Q-Value assessment is a system of water quality rating based on the biological quality of the water body and abundance for specific invertebrate species. A summary of the Q values for the operational and historical EPA monitoring locations along the Camac River (EPA, 2025) is presented in Table 4-2.

Table 4-2. Relevant EPA Monitoring Stations and Q-Values

River I.D. & Locations	Sample Locations	Monitoring Station	Q-Value & Year
Camac River (2.92km upstream)	CAMAC - Br 0.5km d/s Brittas pond (NNE of Glenaranean)	RS09C020050	3-4 1986

River I.D. & Locations	Sample Locations	Monitoring Station	Q-Value & Year
Camac River (1.28 km downstream)	CAMAC - Br 0.5km d/s Brittas pond (NNE of Glenaranean	RS09C020050	3-4 1986
Camac River (1.63km downstream)	Br 1 km SW (u/s) of Saggart	RS09C020100	3-4 2022
Camac River (1.96km downstream)	CAMAC - Br 1 km NW of Saggart (u/s STW)	RS09C020150	4-5 1991
Camac River (2.5km downstream)	Br SE of Baldonnell Ho	RS09C020250	4 2022
Camac River (4.75km downstream)	CAMAC - End of Cherrywood Aveenue	RS09C020270	3 1988
Camac River (5.4km downstream)	CAMAC - Orchard Lane Just d/s Clondalkin Br	RS09C020300	3 1987

4.7.2 EPA Surface Water Quality – Published Regional Surface Water Quality

The EPA surface water quality monitoring database (EPA, 2025) was consulted. A summary of the most recent published EPA water quality monitoring data (EPA, 2025) for waterbodies which have a potential hydraulic connection to the site is presented in Table 4-3.

Table 4-3. EPA Surface Water Quality

River I.D. (Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2023)
Camac_020 River	Ammonia-Total (as N)	Annual	High	Upwards	0.024 mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	1.704 mg/l
	Ortho-Phosphate (as P)- unspecified	Annual	High	Downwards	0.023 mg/l
Camac_030 River	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.099 mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	1.499 mg/l
	Ortho-Phosphate (as P)- unspecified	Annual	Moderate	Upwards	0.044 mg/l
Camac_040	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.161 mg/l
	Total Oxidised Nitrogen (as N)	Annual	Moderate	Downwards	1.853 mg/l
	Ortho-Phosphate (as P)- unspecified	Annual	Moderate	Downwards	0.039 mg/l
Liffey Estuary Upper	Chlorphyll	Summer	High	Downwards	1.950 mg/m^3
		Winter	High	Downwards	0.730 mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	Good	Downwards	0.740 mg/l
		Winter	Poor	Upwards	2.947 mg/l
	Ortho-Phosphate (as P) - unspecified	Summer	Good	Downwards	31.500 mg/l
		Winter	High	Downwards	25.500 mg/l
Liffey Estuary Lower	Chlorphyll	Winter	High	Downwards	0.445 mg/m^3
		Summer	High	Downwards	2.300 mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Winter	Good	Downwards	0.433 mg/l
		Summer	High	Downwards	0.182 mg/l
	Ortho-Phosphate (as P) - unspecified	Winter	Good	Upwards	38.500 mg/l
		Summer	Good	Downwards	32.500 mg/l
Dublin Bay	Chlorphyll	Summer	High	Upwards	1.700 mg/m^3
		Winter	High	Upwards	0.330 mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	Downwards	0.030 mg/l
		Winter	High	Downwards	0.120 mg/l
	ortho-Phosphate (as P) - unspecified	Summer	High	Upwards	7.850 mg/l
		Winter	High	Upwards	17.000 mg/l

4.7.3 EPA Groundwater Quality - Published Regional Groundwater Quality

The EPA groundwater monitoring data (EPA, 2025) was reviewed and there are no groundwater quality monitoring stations within a 2km radius of the site or that are hydraulically connected to the site. However, there are recorded groundwater quality data for the groundwater body beneath the site. The groundwater quality data is presented in Table 4-4.

Table 4-4. EPA Groundwater Quality

Groundwater Body	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2021) (mg/l)
Kilcullen GWB	Ammonia-Total(As N)	Annual	Good	Upwards	0.021 mg/l
	Chloride	Annual	Good	Downwards	15.772 mg/l
	Conductivity@25°C	Annual	Good	Upwards	670.500 us/cm
	Nitrate (as NO3)	Annual	Good	Upwards	19.275 mg/l
	ortho-Phosphate (as P) - unspecified	Annual	Good	Downwards	0.022 mg/l
Dublin GWB	Ammonia-Total (as N) - Ryewater RW2-Deep	Annual	Good	Upwards	0.028 mg/l
	Ammonia-Total (as N) - Ryewater RW3-Deep	Annual	Failing to achieve good status	Upwards	0.151 mg/l
	Ammonia-Total (as N) - Ryewater RW1-Transition	Annual	Failing to achieve good status	Upwards	0.138 mg/l
	Ammonia-Total (as N) - Ryewater RW3-Shallow	Annual	Failing to achieve good status	Upwards	0.118 mg/l
	Ammonia-Total (as N) - Ryewater RW3-Subsoil	Annual	Good	Upwards	0.038 mg/l
	Ammonia-Total (as N) - Ryewater RW2-Shallow	Annual	Good	Upwards	0.024 mg/l
	Ammonia-Total (as N) - Ryewater RW1-Deep	Annual	Failing to achieve good status	Upwards	0.454 mg/l
	Ammonia-Total (as N) - Ryewater RW1-Shallow	Annual	Good	Upwards	0.039 mg/l
	Ammonia-Total (as N) - Ryewater SW1	Annual	Failing to achieve good status	Downwards	0.109 mg/l
	Ammonia-Total (as N) - Ryewater RW2-Transition	Annual	Failing to achieve good status	Upwards	0.175 mg/l
	Ammonia-Total (as N) - Ryewater RW3-Transition	Annual	Failing to achieve good status	Downwards	0.234 mg/l
	Chloride - Ryewater RW2-Deep	Annual	Good	Upwards	22.160 mg/l
	Chloride - Ryewater RW3-Deep	Annual	Failing to achieve good status	Upwards	25.836 mg/l
	Chloride - Ryewater RW1-Transition	Annual	Failing to achieve good status	Upwards	88.694 mg/l
	Chloride - Ryewater RW3-Shallow	Annual	Good	Downwards	21.539 mg/l
	Chloride - Ryewater RW3-Subsoil	Annual	Failing to achieve good status	Downwards	38.428 mg/l

Groundwater Body	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2021) (mg/l)
	Chloride - Ryewater RW2-Shallow	Annual	Failing to achieve good status	Upwards	35.933 mg/l
	Chloride - Ryewater RW1-Deep	Annual	Good	Upwards	18.600 mg/l
	Chloride - Ryewater RW1-Shallow	Annual	Failing to achieve good status	Downwards	49.708 mg/l
	Chloride - Ryewater SW1	Annual	Failing to achieve good status	Downwards	25.580 mg/l
	Chloride - Ryewater RW2-Transition	Annual	Failing to achieve good status	None	110.743 mg/l
	Chloride - Ryewater RW3-Transition	Annual	Good	Downwards	18.603 mg/l
	Conductivity @25°C - Ryewater RW2-Deep	Annual	Good	Upwards	571.567 mg/l
	Conductivity @25°C - Ryewater RW3-Deep	Annual	Good	Upwards	595.389 mg/l
	Conductivity @25°C - Ryewater RW1-Transition	Annual	Failing to achieve good status	Upwards	1024.778 mg/l
	Conductivity @25°C - Ryewater RW3-Shallow	Annual	Good	Upwards	735.250 mg/l
	Conductivity @25°C - Ryewater RW3-Subsoil	Annual	Good	Upwards	762.056 mg/l
	Conductivity @25°C - Ryewater RW2-Shallow	Annual	Good	Upwards	680.267 mg/l
	Conductivity @25°C - Ryewater RW1-Deep	Annual	Good	Upwards	611.278 mg/l
	Conductivity @25°C - Ryewater RW1-Shallow	Annual	Good	Upwards	725.028 mg/l
	Conductivity @25°C - Ryewater SW1	Annual	Good	Downwards	654.933 mg/l
	Conductivity @25°C - Ryewater RW2-Transition	Annual	Failing to achieve good status	Upwards	1020.233 mg/l
	Conductivity @25°C - Ryewater RW3-Transition	Annual	Good	Upwards	653.5 mg/l
	Nitrate (as NO_3) - Ryewater RW2-Deep	Annual	Good	Downwards	1.089 mg/l
	Nitrate (as NO_3) - Ryewater RW3-Deep	Annual	Good	Downwards	1.452 mg/l
	Nitrate (as NO_3) - Ryewater RW1-Transition	Annual	Good	Upwards	9.662 mg/l
	Nitrate (as NO_3) - Ryewater RW3-Shallow	Annual	Good	Upwards	0.861 mg/l
	Nitrate (as NO_3) - Ryewater RW3-Subsoil	Annual	Good	Downwards	1.255 mg/l
	Nitrate (as NO_3) - Ryewater RW2-Shallow	Annual	Good	Upwards	0.923 mg/l
	Nitrate (as NO_3) - Ryewater RW1-Deep	Annual	Good	Upwards	1.091 mg/l

Groundwater Body	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2021) (mg/l)
	Nitrate (as NO_3) - Ryewater RW1-Shallow	Annual	Good	Downwards	2.051 mg/l
	Nitrate (as NO_3) - Ryewater SW1	Annual	Good	Downwards	7.599 mg/l
	Nitrate (as NO_3) - Ryewater RW2-Transition	Annual	Good	Downwards	1.115 mg/l
	Nitrate (as NO_3) - Ryewater RW3-Transition	Annual	Good	Downwards	1.013 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW2-Deep	Annual	Good	Upwards	0.010 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW3-Deep	Annual	Good	None	0.010 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW1-Transition	Annual	Good	Downwards	0.019 mg/l
	ortho-Phosphate (as P) – unspecified – Ryewater RW3-Shallow	Annual	Good	Downwards	0.012 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW3-Subsoil	Annual	Good	None	0.010 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW2-Shallow	Annual	Good	None	0.010 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW1-Deep	Annual	Failing to achieve good status	Upwards	0.044 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW1-Shallow	Annual	Good	Upwards	0.010 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater SW1	Annual	Failing to achieve good status	None	0.103 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW2-Transition	Annual	Good	Upwards	0.012 mg/l
	ortho-Phosphate (as P) – unspecified - Ryewater RW3-Transition	Annual	Good	Downwards	0.020 mg/l

4.7.4 Receiving Water Quality – Ringsend WWTP (Wastewater Treatment Plant)

Foul water from the site will discharge via the Ringsend WWTP to the Liffey Estuary Lower transitional waterbody. The WWTP is operated under relevant statuary approvals. The most recent available Annual Environmental Report (AER) for the Ringsend WWTP is 2023 (UE, 2024). The AER identified that the final effluent was non-compliant with the Emission Limit Values (ELV) specified in the discharge license (D0034-01). The parameters falling to meet there ELV's included biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total phosphorus (as P), total nitrogen and E. coli. It was reported that the non-compliances for all parameters were as a result of overloading with the exception of total phosphorus which was due to no phosphorus removal treatment onsite.

While exceedances in the ELV's is noted, the following is also noted under the significance of results section of the AER:

- *'The primary discharge from the wastewater treatment plant does have an observable negative impact on the water quality in the near field of the discharge and in the Liffey and Tolka Estuaries.*
- *The primary discharge from the WWTP does not have an observable negative impact on the Water Framework Directive status in the Liffey Estuary.*
- *Other potential causes of deterioration in water quality relevant to this area are upstream riverine pollutants, combined sewer overflows, exfiltration from sewers and misconnections to surface water sewers in the large urban agglomeration'*

4.8 Water Framework Directive (WFD)

The WFD status for river, lake, groundwater, transitional and/or coastal water bodies that have a potential hydraulic connection to the site as recorded by the EPA (EPA, 2025) in accordance with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003) are provided in Table 4-5 and shown in Figure 4-9.

Table 4-5. Water Framework Directive Status

Waterbody Name	Waterbody EU Code	Location from Site	Distance from Site (km)	WFD Status (2019-2024)	WFD Risk	Hydraulic Connection to the Site
Surface Water Bodies						
Camac_020	IE_EA_09C020250	Closest location along the west/east/ and north boundaries and traversing the middle of the site	Onsite	Good	At Risk	Yes, via groundwater and surface water drainage from the Proposed Development
Camac_030	IE_EA_09C020310	East	1.1km	Poor	At Risk	Yes, downstream of adjacent surface water bodies (via the Camac_020 River).
Camac_040	IE_EA_09C020500	Northeast	6.48km	Poor	At Risk	Yes, downstream of adjacent surface water bodies (via the Camac_020 and Camac_030 River).
Transitional Water Bodies						
Liffey Estuary Upper	IE_EA_090_0400	Northeast	11.76km	Moderate	Under Review	Yes, downstream of adjacent surface water bodies (via the Camac_020, Camac_030 and Camac_040 Rivers).
Liffey Estuary Lower	IE_EA_090_0300	Northeast	14.16km	Moderate	At Risk	Yes, downstream of adjacent surface water bodies (via the Liffey Estuary Upper).
Tolka Estuary	IE_EA_090_0200	Northeast	18.19km	Poor	At Risk	Weak Potential Hydraulic connection via Liffey Estuary Lower (upstream of the Liffey Estuary Lower)
Coastal Water Bodies						
Dublin Bay	IE_EA_090_0000	Northeast	15.81km	Good	Not at risk	Yes, downstream of adjacent surface water bodies.
Groundwater Bodies						

Waterbody Name	Waterbody EU Code	Location from Site	Distance from Site (km)	WFD Status (2019-2024)	WFD Risk	Hydraulic Connection to the Site
Kilcullen	IE_EA_G_003	Underlying	0.0	Good	At risk	Yes, underlying the majority of the site
Dublin	IE_EA_G_008	Underlying	0.0	Good	Review	Yes, underlying the most northern part of the site

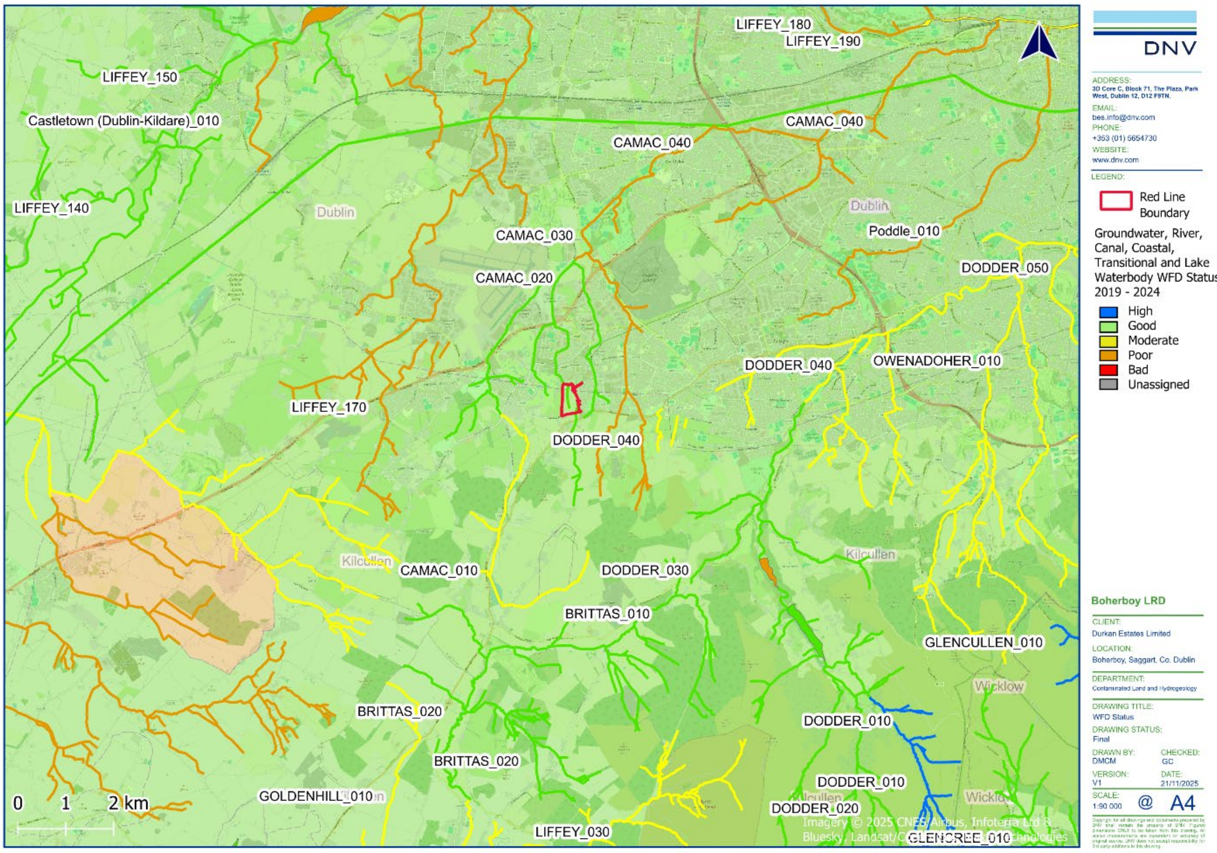

Figure 4-9. Water Framework Directive Status

4.8.1 Designated and Protected Sites

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 sites).

National Heritage Areas (NHAs) are designations under the Wildlife Acts to protect habitats, species, or geology of national importance. The boundaries of many of the NHAs in Ireland overlap with SAC and/or SPA Sites. Although many NHA designations are not yet fully in force under this legislation (referred to as 'proposed NHAs' or pNHAs), they are offered protection in the meantime under planning policy which normally requires that planning authorities give recognition to their ecological value.

There are six (6No.) Natura 2000 sites that are identified with a potential hydraulic connection to the site and Proposed Development. There are also two (2No.) pNHAs identified with a potential hydraulic connection to the site and Proposed Development. The Natura 2000 sites and other protected and designated sites or areas with a potential hydraulic connection to the site are summarised in Table 4-6 and Figure 4-10. It is noted that the Kilcullen GWB and Dublin GWB beneath the site is considered to have short groundwater flow paths (be in the order of a couple of hundred metres), with groundwater discharging to the closest surface water feature (i.e., the Corbally Stream, the Cooldown Stream and the Coldwater Stream). Therefore, there is no perceived direct pathway from groundwater beneath the site to the identified downgradient Natura 2000 sites and other protected and designated sites.

Table 4-6. Designated and Protected Sites

Designated Site	Site Code	Distance from Site (km)	Direction	Potential Risk
Special Area of Conservation (SAC)				
North Dublin Bay SAC	000206	18.75	Northeast	Yes, hydrological connection via Corbally Stream and downstream waterbodies. There is also a connection via discharge from Ringsend WWTP.
South Dublin Bay SAC	000210	15.66	East	
Rockabill to Dalkey Island SAC	003000	22.59	Northeast	
Special Protection Area (SPA)				
North-West Irish Sea SPA	004236	20.32	Northeast	Yes, hydrological connection via River Dodder and downstream waterbodies. There is also a connection via discharge from Ringsend WWTP.
North Bull Island SPA	004006	19.70	Northeast	
South Dublin Bay and River Tolka Estuary SPA	004024	15.32	East	
Proposed Natural Heritage Area (pNHA)				
Grand Canal pNHA	002104	5.55	North	No identified hydraulic connection. The Camac River is culverted below the Grand Canal.
South Dublin Bay pNHA	000210	15.66	East	Yes, hydrological connection via River Dodder and downstream waterbodies. There is also a connection via discharge from Ringsend WWTP.
North Dublin Bay pNHA	000206	18.75	Northeast	
Note: '*' = Distance is measured as closest point to the Site				

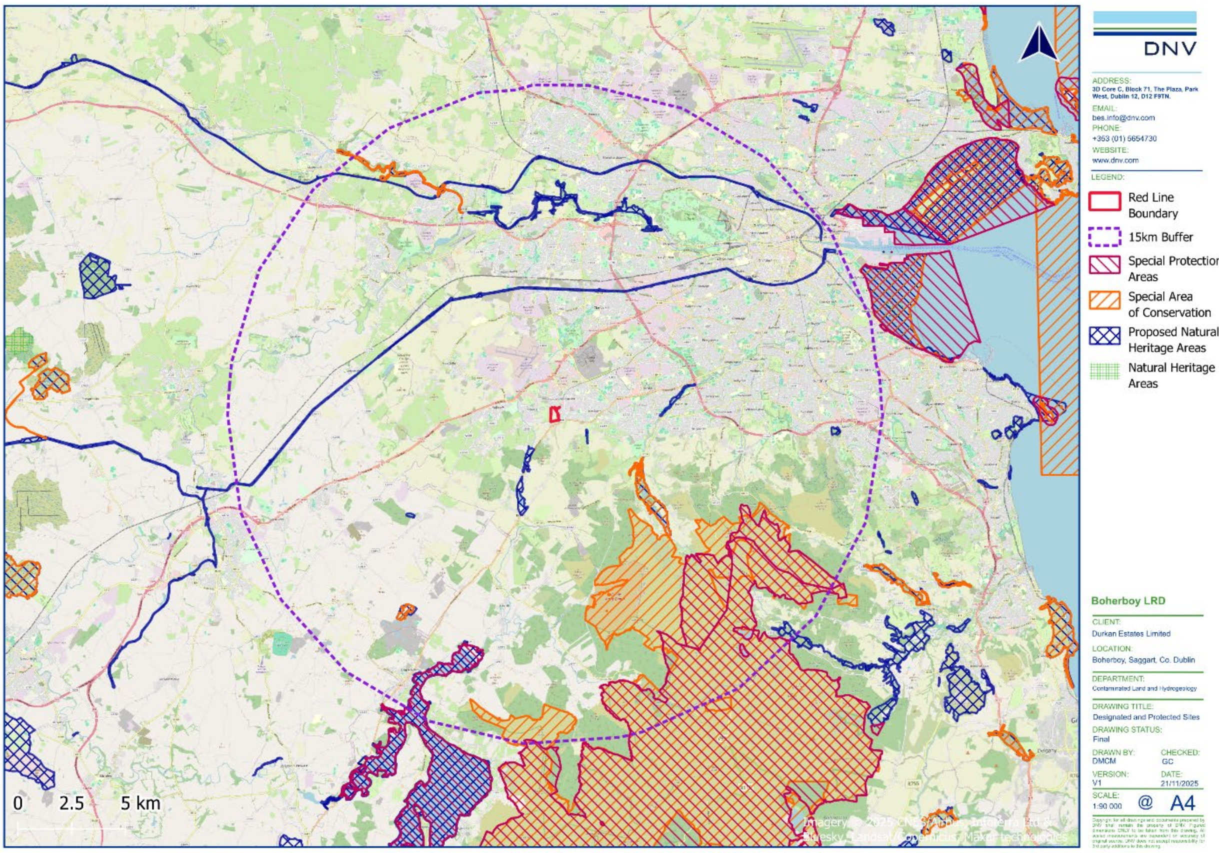

Figure 4-10. Protected and Designated Areas

4.8.2 Drinking Water

The river drinking water protected areas (DWPA) are represented by the full extent of the Water Framework Directive (WFD) river waterbodies from which there is a known qualifying abstraction of water for human consumption as defined under Article 7 of the WFD.

There are no surface water drinking water sources, under Article 7 of the Water Framework Directive, identified by the EPA (EPA, 2025) within a 2km radius or hydraulically downstream of the site (refer to section 4.6). However, the groundwater bodies beneath the site, the Kilcullen GWB (IE_EA_G_003) and the Dublin GWB (IE_EA_G_008) are classified under Article 7 Abstraction for Drinking Water.

4.8.3 Shellfish Areas

Although the Shellfish Waters Directive (SWD) has been repealed, areas used for the production of shellfish that were designated under the SWD, are protected under the WFD as 'areas designated for the protection of economically significant aquatic species'.

The requirement from a WFD perspective is to ensure that water quality does not impact on the quality of shellfish produced for human consumption. In Ireland, 64 areas have been designated as shellfish waters (S.I. No. 268 of 2006, S.I. No. 55 of 2009, S.I. 464 of 2009).

The closest designated Shellfish Area location is Malahide (IE_EA_020_0000) located approximately 26.7km northeast of the site.

4.8.4 Nutrient Sensitive Areas

EU member states are required under the Urban Wastewater Treatment Directive (91/271/EEC) to identify nutrient-sensitive areas. These have been defined as "natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken".

The closest designated nutrient-sensitive area (estuaries and lakes) is the Liffey Estuary (IE_EA_090_0300-Urban Wastewater Treatment Directive Sensitive Area) located approximately 10.5km northeast of the site at its closest point. In addition, the closest nutrient-sensitive area (rivers) is the Liffey (Urban Wastewater Treatment Directive Sensitive Area) located approximately 9.4km northeast of the site at its closest point.

4.8.5 Bathing Waters

Bathing waters are designated under Regulation 5 of Directive 2006/7/EC. Designated Bathing Waters exist under S.I. No. 79/2008 and S.I. No. 351/2011 Bathing Water Quality (Amendment) Regulations 2011. EC Bathing Water Profiles - Best Practice and Guidance 2009.

The closest designated Bathing Water location is the Sandymount Strand (IEEABWC090_0000_0300) located approximately 15.6km northeast of the site.

5 SITE INVESTIGATION METHODOLOGY

5.1 Intrusive Site Investigation

An air rotary drill rig was mobilised to the site by PGL for the drilling and installation of five (5 No.) groundwater monitoring wells (BH1, BH2, BH3, BH4 and BH5) between the 23rd and 25th of June 2025.

The boreholes were advanced to a maximum depths ranging from 6.0mbGL to 9.0mbGL under the supervision of DNV to enable characterisation of the subsurface geological and hydrogeological conditions.

The rationale for selecting the location of the groundwater monitoring wells is outlined Table 5-1.

Table 5-1. Groundwater Well Locations and Rationale

Well ID	Location	Rationale
BH1	Upgradient of the Proposed Development	Determine groundwater flow direction, assess the potential for a hydraulic connection between groundwater beneath the site and the existing marsh habitat and assess the permeability of the aquifer beneath the site.
BH2	Centre of the site and Proposed Development	Determine groundwater flow direction and assess the potential for a hydraulic connection between groundwater beneath the site and the existing marsh habitat.
BH3	Downgradient of the Proposed Development	Determine groundwater flow direction, assess the potential for a hydraulic connection between groundwater beneath the site and the existing marsh habitat and assess the permeability of the aquifer beneath the site.
BH4	Upgradient of the Proposed Development	Determine groundwater flow direction, assess the potential for a hydraulic connection between groundwater beneath the site and the existing marsh habitat and assess the permeability of the aquifer beneath the site.
BH5	Downgradient of the Proposed Development	Determine groundwater flow direction and assess the potential for a hydraulic connection between groundwater beneath the site and the existing marsh habitat.

The groundwater monitoring wells were constructed with 50mm PVC blank casing and slotted casing and were finished with heavy-duty upright covers. The monitoring well installation was designed by DNV. Each groundwater monitoring well was logged by PGL in accordance with best practice procedures and visual and olfactory observations were also recorded. The borehole logs for these wells with records of the installation details (i.e., screened depth, total depth, etc.) and any other relevant installation details are provided in Appendix A.

The groundwater monitoring wells were developed by DNV following construction to ensure a good hydraulic connection with the aquifer and to remove excess suspended sediments.

The locations of the five (5 No.) groundwater monitoring wells were surveyed by DNV relative to Ordnance Datum and ITM (Irish Transverse Mercator). The top of the well outer casing (i.e., heavy-duty upright cover) was surveyed to provide a fixed reference point for groundwater level monitoring.

The locations of the newly installed groundwater monitoring wells are presented in Figure 5-1.

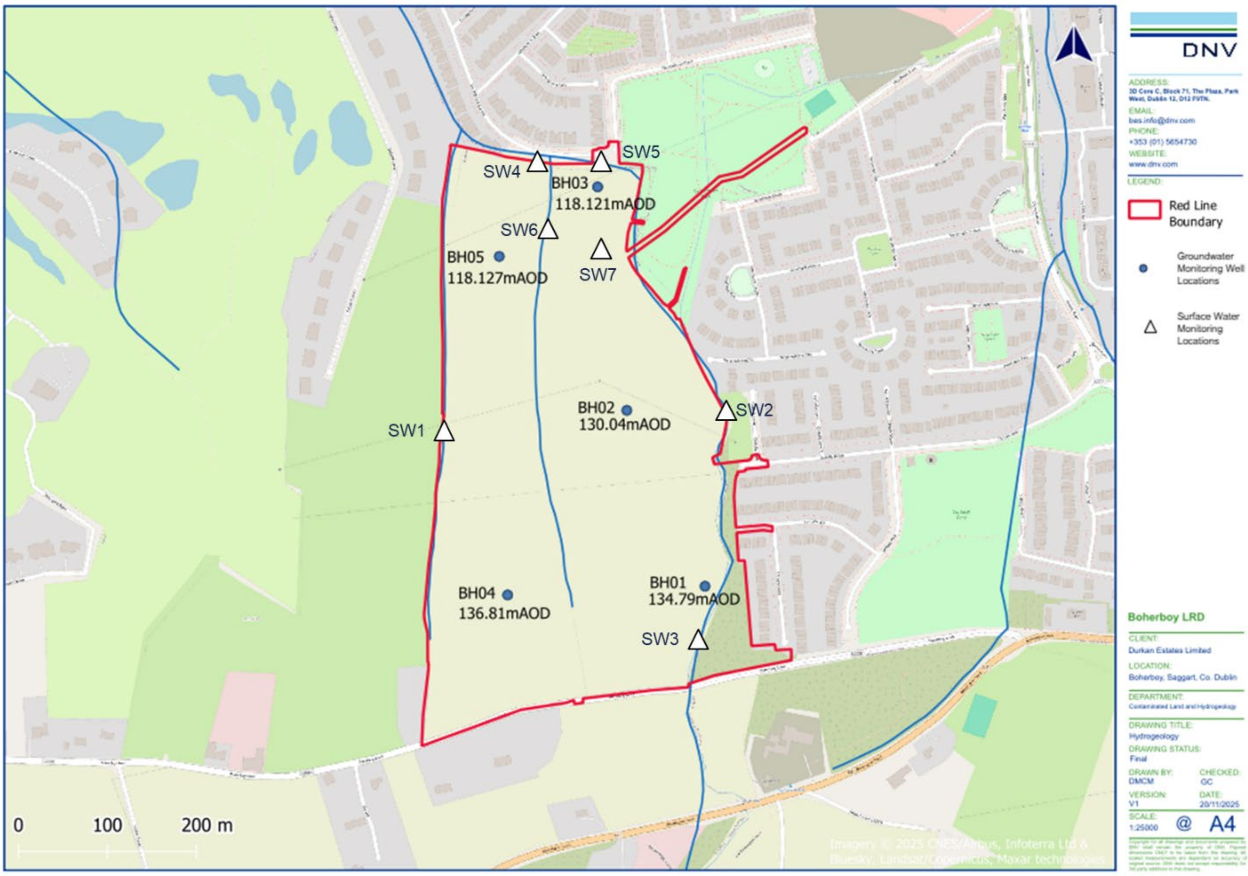

Figure 5-1. Site Investigation Locations

5.1.1 Groundwater Monitoring Well Installation Details

The construction details for the five (5 No.) groundwater monitoring wells installed at the site are included in the borehole logs presented in Appendix A and summarised in Table 5-2.

The total depth of the monitoring wells ranged from 6.0mbGL at BH5 in the north of the site to 9.0mbGL at BH4 in the south of the site. All wells were screened in shallow groundwater observed within the overburden subsoils.

Table 5-2. Groundwater Well Installation Details

Well I.D.	Screen Depth (mbGL)	Total Depth (mbGL)	Coordinates (x,y)	Topographical Level Surveyed (mOD) – Ground Level	Lithology Encountered
BH1	4.5-7.5	7.5	704913.596, 726246.021	138.698	Overburden
BH2	3.0-7.0	7.5	704825.768, 726445.038	132.287	Overburden
BH3	3.5-7.5	7.5	704792.85, 726697.831	118.975	Overburden
BH4	4.0-7.5	9.0	704691.856, 726236.155	139.317	Overburden
BH5	3.0-6.0	6.0	704682.381, 726619.19	119.305	Overburden

5.2 Environmental Monitoring

5.2.1 Groundwater

Groundwater monitoring was conducted by DNV at the five (5 No.) newly installed groundwater wells (BH1 through BH5) on the 2nd of July 2025.

The groundwater monitoring locations are presented in Figure 5-1.

Each well was purged (i.e., three well volumes of groundwater), prior to sample collection in accordance with standard best practice methods using dedicated equipment (i.e., dedicated tubing and foot valves), in order to ensure that the collection of samples was representative of the screened formation. During purging and sample collection, water quality field measurements were recorded, using a calibrated multi parameter meter for pH, electrical conductivity (EC), temperature, and total dissolved solids (TDS), as well as notes on the physical appearance of the purged water.

After purging, the groundwater samples were decanted into labelled containers supplied by the laboratory. All samples were collected in accordance with best practice procedures (ISO 5667-11:2009) using dedicated sampling equipment to avoid cross-contamination. The sample containers were kept cool and in darkness and were sent to a UKAS and ISO 17025 accredited laboratory (Element Materials Technology Ltd.) for analysis. In order to maintain sample integrity, a Chain of Custody (COC) record was completed to track sample possession from time of collection to time of analysis.

The groundwater laboratory analytical reports are included in Appendix B.

5.2.2 Surface Water

Surface water monitoring was conducted by DNV on the 2nd of July 2025 at two (2 No.) locations within the Corbally Stream adjoining the eastern and northern boundaries of the site.

The surface water sample locations are presented in Figure 5-1 and summarised in Table 5-3.

Table 5-3. Surface Water Monitoring Locations and Rationale

Waterbody I.D.	Sample I.D.	Sample Location
Corbally Stream	SW3	Surface water monitoring location located upstream of the site.
	SW4	Surface water monitoring location located downstream of the site.

The surface water samples were collected using a decontaminated telescopic rod and dedicated sampling receptacle. During sample collection, water quality field measurements were recorded, using a calibrated multi parameter meter for pH, electrical conductivity (EC), temperature, and total dissolved solids (TDS), as well as notes on the physical appearance of sampled water.

All surface water samples were collected in accordance with best practice procedures (ISO 5667-11:2009) and sent to UKAS and ISO 17025 accredited laboratory (Element Materials Technology Ltd.) for analysis. A COC was also prepared for the surface water samples.

The surface water laboratory analytical reports are included in Appendix B.

5.2.3 Laboratory Analysis

Groundwater and surface water samples were analysed in the laboratory for the following parameters:

- Total and Dissolved Metals (Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Lead, Magnesium, Mercury, Nickel, Potassium, Selenium, Sodium, Vanadium and Zinc).
- Nitrate.
- Nitrite.
- Chloride.
- Sulphate.
- Ortho Phosphate.
- Ammoniacal Nitrogen
- Biochemical Oxygen Demand (BOD).
- Total Dissolved Solids (TDS).
- Total Alkalinity.

The results are discussed in Section 6.4.

5.3 Hydrogeological Testing

Hydrogeological testing (i.e., slug tests) were conducted by DNV on the 2nd of July 2025 to assess hydraulic conductivity of the aquifer in the immediate vicinity of selected newly installed groundwater monitoring wells (BH1, BH3 and BH4). The groundwater wells were screened within the overburden lithology (refer to Section 5.1.1). The slug tests conducted were variable head tests (i.e., rising / falling head tests) which were carried out in accordance with best practice standards (i.e., BS 5930:2015+A1:2020 Code of Practice for Ground Investigations).

Manually measured water levels at the wells were recorded by DNV prior to the commencement of the slug tests. All measurements were taken relative to reference point (i.e., the top of the well casing with results recorded as metres below top of casing (mbTOC)). In addition, data loggers were used to record water pressure changes detected by a pressure transducer submerged in all monitoring wells. A barometric data logger was also used to measure changes in ambient air pressure and to allow compensation of the slug test data. Level loggers were set to record at one-minute intervals.

The Hvorslev method (Hvorslev 1951) was used to analyse the slug test data as follows:

$$K = \frac{A}{F(t_2 - t_1)} \ln\left(\frac{H_1}{H_2}\right)$$

Where:

- K = hydraulic conductivity (m/min).
- A = cross-sectional area of borehole casing or standpipe where water level is changing (m^2).
- t_1 = Initial time at H_1.
- t_2 = Time at some point during the test at H_2.
- H_1 = Initial displacement at time t_1.
- H_2 = Displacement at time t_2.
- F = intake factor.

5.4 Estimating Groundwater Flow

The Proposed Development will include the installation of a series of land drains across the site to intercept and convey shallow groundwater towards the receiving Corbally Stream, Coldwater Stream, and Cooldown Stream and the proposed translocated wetland (refer to Roger Mullarkey & Associates, 2025 Drainage Layout submitted as part of the planning application under separate cover). The land drains will ensure that the shallow groundwater flow regime is maintained across the site and to support the establishment and long-term viability of the translocated wetland habitat.

To support the design and assess the viability of the land drains, Darcy's Law was used to estimate the volume of shallow groundwater intercepted and conveyed by the proposed land drains. This method assumes that groundwater flow is steady-state, predominantly horizontal, and occurs through a homogeneous and isotropic medium. The calculation of groundwater flow using Darcy's Law requires site-specific data on hydraulic conductivity, hydraulic gradient, and the cross-sectional area through which flow occurs.

Darcy's Law is expressed as:

- $Q = K \cdot A \cdot i$

Where:

- Q is the groundwater discharge (m^3/day),
- K is the hydraulic conductivity of the soil (m/day),
- A is the cross-sectional area perpendicular to flow (m^2),
- i is the hydraulic gradient (dimensionless).

Hydraulic conductivity values will be derived using the methodology outlined in Section 5.3. The hydraulic gradient will be calculated from groundwater level measurements across the site. The cross-sectional area will be estimated based on the length and depth of the land drains. For linear drains, this is calculated as:

- $A = L \cdot D$

Where:

- L is the length of the drain intercepting flow (m),

- D is the effective saturated thickness of the soil contributing to flow (m).

The site will be divided into zones based on the proposed drain layout. Representative values of K, i, and A will be assigned to each zone. Darcy's Law will then be applied to each zone to calculate the groundwater flow:

- $Q_{zone} = K_{zone} \cdot A_{zone} \cdot i_{zone}$

The total volume of groundwater intercepted by the drainage system will be estimated by summing the flow contributions from all zones:

- $Q_{total} = \sum Q_{zone}$

6 SITE INVESTIGATION AND MONITORING RESULTS

6.1 Soil and Geology

The soil and geology as well as ground conditions encountered during the site investigation are detailed in the borehole logs (refer to Appendix A) and summarised as follows:

- CLAY with varying boulder content was encountered from ground level to depths ranging from 3.0mbGL at site investigation location BH04 and BH05 to 4.5mbGL at site investigation locations BH01 and BH03.
- PEAT was encountered from ground level to a maximum depth of 3.2mbGL at site investigation location BH02 in the central portion of the site.
- Clayey sandy GRAVEL / sandy GRAVEL was encountered below the CLAY / PEAT units to the final extent of investigation and maximum depth of 7.5mbGL at site investigation locations BH1, BH03 and BH05.
- CLAY / sandy CLAY was encountered at site investigation locations BH02 and BH04 from 6.0mbGL to the final extent of investigation and maximum depth of 9.0mbGL.

There was no visual or olfactory evidence of anthropogenic contamination observed.

Groundwater strikes were recorded between 2.0mbGL at BH05 in the north of the site, to 4.0mbGL at BH01 in the south of the site.

6.2 Groundwater and Surface Water Levels

Gauging of groundwater levels in the newly installed monitoring wells (MW1 through MW5) was completed on the 30th of June 2025 and the 2nd of July 2025 using a Hydrotechnik water level meter. All measurements were taken relative to the top of the well casing and therefore the results are reported as metres below top of casing (mbTOC). Recorded levels were converted to Ordnance Datum (mOD). The invert levels of the stream / drainage channels across the site and at the marshland located in the northeast portion of the site were also surveyed relative to Ordnance Datum (mOD).

The recorded groundwater and surface water levels are presented in Table 6-1 and Table 6-2 respectively.

Table 6-1. Measured Groundwater Levels and Elevations

Monitoring Location ID	Monitoring Well Screened Strata	Measured Water Level (mbTOC)		Groundwater Elevation (mOD)	
		30/06/2025	02/07/2025	30/06/2025	02/07/2025
BH1	Overburden	4.22	4.24	134.79	134.77
BH2	Overburden	2.24	2.27	130.488	130.458
BH3	Overburden	1.14	1.16	118.221	118.201
BH4	Overburden	2.9	2.97	136.81	136.74
BH5	Overburden	1.51	-	118.127	-

Table 6-2. Measured Surface Water Elevations

Monitoring Location ID	Waterbody Name	Waterbody Location	Surface Water Elevation (mOD)
			02/07/2025
SW7	Existing Marshland	Located in the northeast corner of the site.	120.376
SW2	Corbally Stream (Brownsbarn Stream)	Located along the eastern boundary of the site.	126.425
SW3			138.180
SW5		Located along the northern boundary of the site.	117.995
SW4			117.78
SW6	Cooldown Stream	Located through the centre of the site.	117.995
SW1	Coldwater Stream	Located along western boundary of the site.	127.161

The groundwater hydraulic gradient across the site was calculated using measured groundwater levels compensated to meters ordnance datum (mOD) from monitoring boreholes. In the southern portion of the site, the elevation difference between BH4 and BH2 is 6.77m over a horizontal distance of 249m, yielding a hydraulic gradient of 0.027m/m. In the northern portion, the elevation difference between BH2 and BH5 is 11.91m over a horizontal distance of 225m, resulting in a steeper hydraulic gradient of 0.053m/m. These gradients were calculated perpendicular to the inferred direction of groundwater flow and are considered representative of shallow groundwater movement across the site.

Maximum recorded groundwater levels range from 136.81 mOD at BH4 in the southern portion of the site to 118.127 mOD and 118.201 mOD at BH5 and BH3, respectively, in the northern portion.

Based on groundwater elevation data collected from monitoring wells across the site, shallow groundwater flow is interpreted to occur predominantly toward the northwest and northeast, toward the Corbally Stream (also known as Brownsbarn Stream), which borders the eastern and northern boundaries of the site. The inferred groundwater flow direction is presented in Figure 6-1.

The Cooldown Stream, and Coldwater Stream are also considered likely hydraulically connected to the underlying groundwater. This interpretation is based on measured groundwater elevations in close proximity to these streams, suggesting they may be at least partially groundwater-fed. During wetter periods (e.g., winter), rising groundwater levels may enhance this hydraulic connection, increasing baseflow contributions to the streams.

Similarly, the marshland area (invert level: 120.376 mOD) is also considered potentially hydraulically connected to the underlying groundwater. Local groundwater elevations in this area range from approximately 121 mOD to 123 mOD, indicating that the standing water observed in the marshland is likely attributable to both groundwater discharge and surface water runoff.

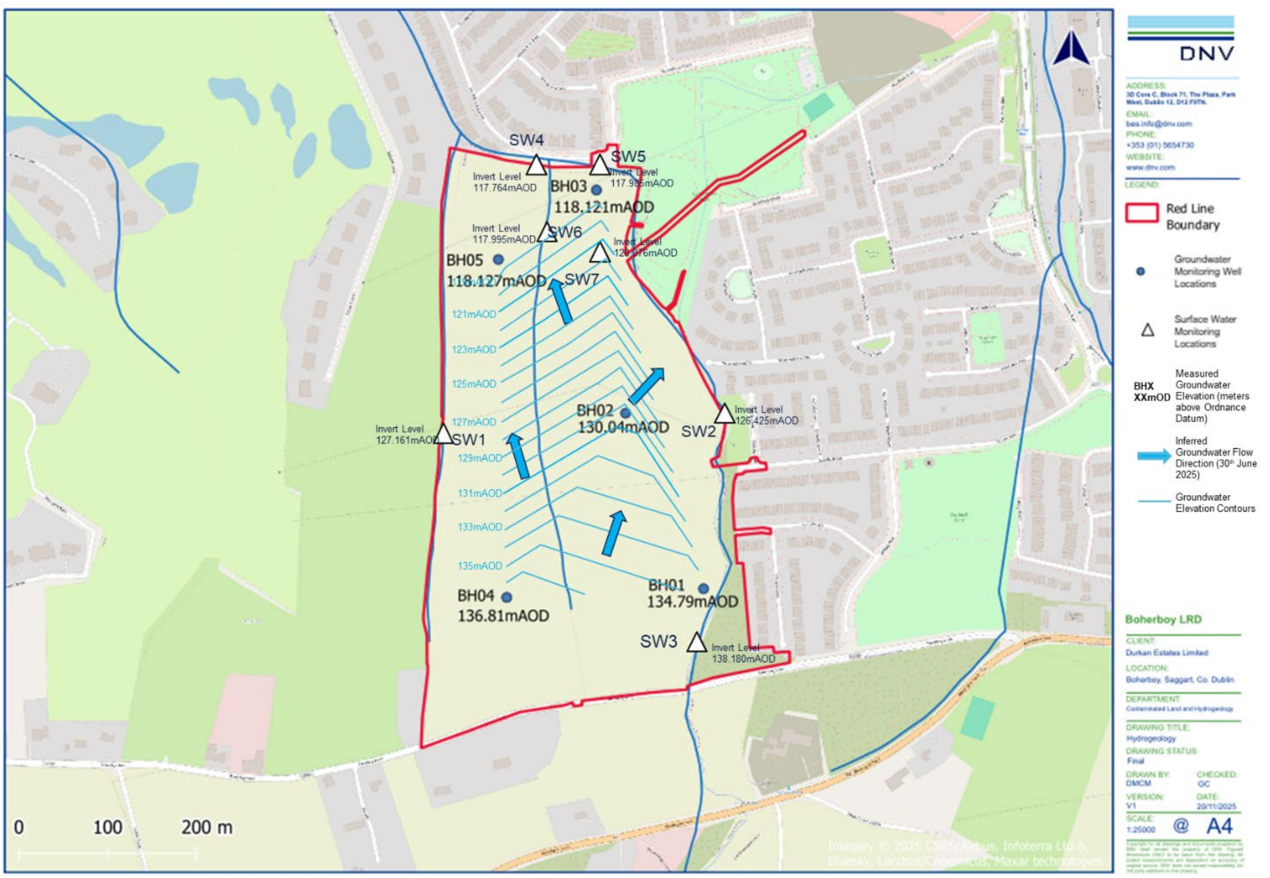

Figure 6-1. Inferred Groundwater Flow Direction (30/06/2025)

6.3 Hydraulic Conductivity

The hydraulic conductivity was determined through permeability testing conducted during the site investigation. The calculated hydraulic conductivity ranged from 1.168m/d at BH3 in the north of the site to 0.147m/d in the south of the site at BH4, which is characteristic of low-permeability strata such as the clay encountered at the site. The test data and associated calculations are provided in Appendix C, with a summary of the calculated hydraulic conductivity presented in Table 6-3.

Table 6-3. Hydraulic Conductivity

Date of Test	Well No.	Screened Strata	Groundwater Elevation (mOD)	Hydraulic Conductivity (m/d)
02/07/2025	BH3	Overburden	118.201	1.168
	BH4	Overburden	136.810	0.147

As discussed In Section 4.3, the results of the soakaway testing undertaken by GII between the 9th and 12th of December 2013 (GII, 2014; appended to the Roger Mullarkey & Associates, 2025 Drainage and Water Infrastructure Engineering Report submitted with the planning application under separate cover) indicated a soil infiltration rate of 1.38 x 10-5m/s in the vicinity of test location SP1 located in the centre of the southern portion of the stie (refer to Figure 4-6). The remaining three (3No.) soakaway tests failed indicating the presence of low permeability subsoils.

These findings are consistent with the results of the permeability testing undertaken by DNV indicating that the presence of low-permeability clay will significantly limit infiltration and recharge potential at the site.

6.4 Environmental Assessment

6.4.1 Groundwater Assessment Criteria

The analytical results for groundwater were assessed using published water quality regulation values to establish baseline conditions. The groundwater analytical results were assessed against the limit values specified in the following:

- S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 and as amended (GW GTVs).
- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 and as amended (SW EQS).

Assessment against the European Union (Drinking Water) Regulations 2014, as amended (S.I. No. 122 of 2014 – DW PVs), was not undertaken, as there are no identified groundwater receptors at the Site that would be impacted via a drinking water pathway.

6.4.2 Groundwater Results

The groundwater laboratory analytical reports for samples collected at the five newly installed groundwater monitoring wells (BH1, BH2, BH3, BH4 and BH5) are included in Appendix B and the summarised analytical results and exceedances with respect to the relevant water quality assessment criteria are presented in Appendix D.

The results are discussed below.

- The reported concentrations of the dissolved metals analysed (Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Lead, Magnesium, Mercury, Nickel, Potassium, Selenium, Sodium, Vanadium and Zinc) at all monitoring locations were reported as below the applicable GW GTV and SW EQS at all monitoring locations.
- The reported concentrations of nitrate and nitrite at all monitoring locations were below the applicable GW GTV of 37.5mg/l ad 0.375mg/l respectively. There are no limits for the SW EQS.
- Sulphate and chloride concentrations at all monitoring locations were reported below the applicable GW GTV. There is no applicable SW EQS for sulphate and chloride.
- BOD Concentrations at all monitoring locations were reported below the applicable SW EQS. There is no applicable GW GTV for BOD.
- The reported concentration of orthophosphate (0.19mg/l) and ammoniacal nitrogen (1.51mg/L) at location BH02, in the central portion of the site, exceeded the applicable GW GTV of 0.035mg/l and 0.175mg/l respectively. The reported concentrations also exceed the applicable SW EQS of 0.035mg/l and/or 0.065mg/l respectively at locations BH2, BH3 (ammoniacal nitrogen only), BH4 (ammoniacal nitrogen only) and BH5 (ammoniacal nitrogen only).

The results are considered representative of baseline conditions at the site. The elevated concentrations of orthophosphate and ammoniacal nitrogen are likely attributable to agricultural land use at the site, specifically grazing of cattle.

6.4.3 Surface Water Assessment Criteria

The surface water analytical results were assessed against the limit values specified in the following:

- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 and as amended (SW EQS).

6.4.4 Surface Water Results

The surface water laboratory analytical reports are included in Appendix B and the summarised analytical results and exceedances with respect to the relevant water quality assessment criteria are presented in Appendix D.

The results are discussed below.

- The reported concentrations of the dissolved metals analysed (Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Lead, Magnesium, Mercury, Nickel, Potassium, Selenium, Sodium, Vanadium and Zinc) at both surface water locations (SW3 and SW4) were reported as below the applicable SW EQS.

- BOD Concentrations at both monitoring locations were reported below the applicable SW EQS.
- The reported concentration of orthophosphate at both monitoring locations were reported below the applicable SW EQS.
- The reported concentration of ammoniacal nitrogen (0.09mg/L) at downstream location SW4 marginally exceeded the applicable SW EQS of 0.065mg/l. The reported concentration of ammoniacal nitrogen at upstream location SW3 was below the laboratory limit of detection and hence the applicable SW EQS.

The results are considered representative of baseline conditions at the site. The elevated concentration of ammoniacal nitrogen at downstream location BH3 is considered likely attributable to agricultural land use at the site (i.e., grazing of cattle).

6.5 Hydrochemical Analysis and Groundwater Sources

The surface water samples (SW3 and SW4) and the groundwater samples (BH1 through BH5) were analysed for a suite of major ions. The hydrochemical data for major ions were produced graphically for each sample using the Piper diagram which is a graphical representation of the chemistry of a water sample or samples. The trilinear piper diagram can show the percentage composition of different ions, which shows the classification of water samples from various lithological environments and/or different conditions (i.e., saline intrusion, brackish water, etc).

The objective of the Piper Diagram was to analyse the major ions composition of the samples and determine the extent of any potential hydraulic connectivity between the groundwater beneath the site and receiving surface water receptor. The hydrochemistry plots generated are provided in Figure 6-2.

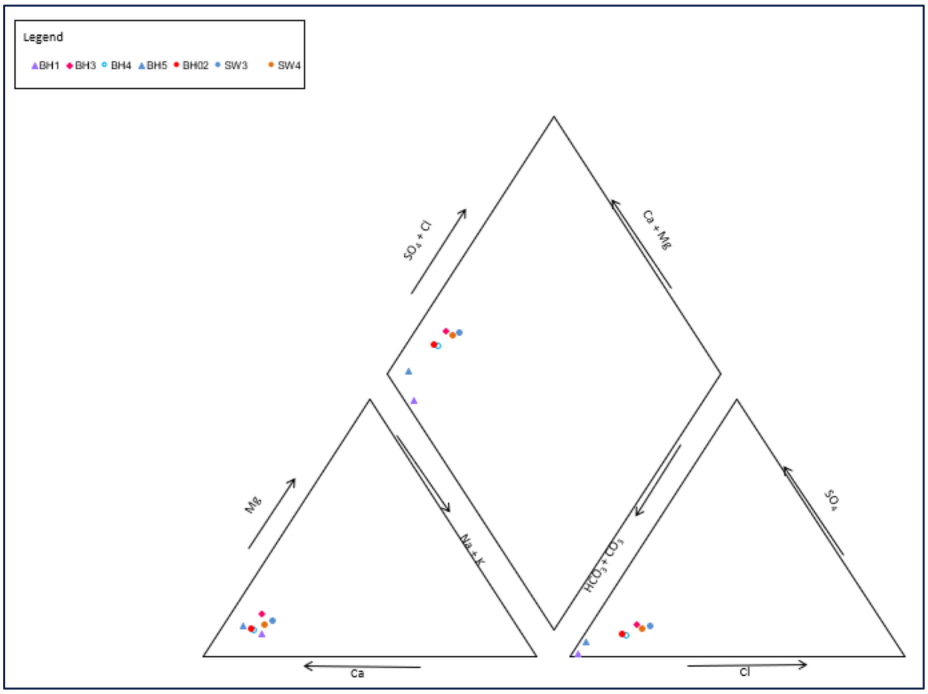

Figure 6-2. Piper Diagram for Surface water and Groundwater Samples

The Piper diagram and associated hydrochemical data indicate that groundwater samples BH1 through BH5, as well as surface water samples SW3 and SW4, exhibit broadly similar ionic compositions. This suggests that these waters are hydrochemically related and likely originate from the same source or are influenced by similar geochemical processes. The dominance of calcium and bicarbonate ions, along with relatively low concentrations of sodium and chloride, points to a groundwater system primarily recharged by rainfall percolating through subsurface geological strata

The similarity in cation and anion profiles across groundwater samples from both the southern portion of the site (Pollaphuca Formation) and the northern portion (Lucan Formation) supports the interpretation of hydrochemical continuity between these geological units. This implies that the aquifer system beneath the site is hydraulically connected or influenced by a common recharge regime.

Notably, samples BH1 (upgradient) and BH5 (downgradient) show slightly lower concentrations of sodium and chloride compared to the other groundwater and surface water samples. While their overall hydrochemical signatures remain consistent with the rest of the dataset, this subtle difference may reflect a greater influence of direct rainfall recharge or shorter residence time within the aquifer, resulting in less mineralization.

Considering groundwater flow direction, measured water levels, and site observations in conjunction with the hydrochemical data, it is reasonable to conclude that the Corbally Stream, located along the eastern and northern boundaries of the site, functions as a local groundwater discharge zone. The chemical similarity between the stream and adjacent groundwater further supports this interpretation.

6.6 Groundwater Flow Estimates

To evaluate the effectiveness of the proposed land drainage system in maintaining the shallow groundwater flow regime and supporting the translocated wetland habitat, a quantitative assessment of groundwater flow was undertaken using Darcy's Law. This approach provides an estimate of the volume of shallow groundwater that will be intercepted and conveyed by the land drains installed across the site.

The Proposed Development includes the installation of a network of land drains designed to intercept shallow groundwater and direct it toward the Corbally Stream, Coldwater Stream and Cooldown Stream. A proposed overflow will be constructed to divert water from the Coldwater Stream to the translocated marshland area. The layout and specifications of the drainage system are detailed in Figure 3-4 and the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025; submitted under separate cover as part of the planning application).

The primary objectives of the drainage system are to:

- Maintain the natural shallow groundwater flow regime across the site.
- Ensure continuous hydrological support to the translocated wetland.

To assess the volume of groundwater intercepted by the proposed land drains, Darcy's Law was applied using site-specific hydrogeological parameters. The estimated volume of shallow groundwater intercepted by the land drains is presented in Table 6-4. It is noted that groundwater is conservatively assumed to be intercepted ground level to the invert of the proposed drainage channel.

Table 6-4. Groundwater Flow Volumes

Location / Zone	Hydraulic Conductivity (k)	Approximate Groundwater Depth (D)*	Drainage - Length (L)	Cross Sectional Area (DxL)	Hydraulic Gradient	Groundwater Discharge
Catchment 4	0.147m/d (BH4)	2.0mbGL	34.03m	68.06m^2	0.0488m/m	0.49m^3/day
		2.0mbGL	30.83m	61.66m^2		0.44m^3/day
Catchment 5	0.147m/d (BH4)	1.4mbGL	30.02m	42.03m^2	0.0488m/m	0.30m^3/day
		1.4mbGL	30.01m	42.01m^2		0.30m^3/day
		2.8mbGL	38.24m	107.07m^2		0.77m^3/day
		2.8mbGL	39.42m	110.38m^2		0.79m^3/day
		2.8mbGL	32.36m	90.61m^2		0.65m^3/day
		1.6mbGL	24.55m	39.28m^2		0.28m^3/day
		1.6mbGL	24.89m	39.82m^2		0.29m^3/day
		2.1mbGL	18.10m	38.01m^2		0.27m^3/day
		2.1mbGL	28.97m	60.84m^2		0.44m^3/day
		2.3mbGL	37.30m	85.79m^2		0.62m^3/day
		1.1mbGL	39.03m	42.93m^2		0.31m^3/day
		1.5mbGL	32.55m	48.83m^2		0.35m^3/day
		1.7mbGL	16.89m	28.71m^2		0.21m^3/day
Catchment 6	1.168m/d (BH3)	1.7mbGL	36.12m	61.40m^2	0.0488m/m	3.50m^3/day
		1.7mbGL	34.09m	57.95m^2		3.30m^3/day
		2.3mbGL	40.26m	92.60m^2		5.28m^3/day
		1.5mbGL	41.88m	62.82m^2		3.58m^3/day
Catchment 7	1.168m/d (BH3)	1.2mbGL	30.81m	36.97m^2	0.0488m/m	2.11m^3/day
		1.2mbGL	26.35m	31.62m^2		1.80m^3/day
					Total	**26.07m^3/day**

Notes:
'*' = Groundwater is conservatively assumed to be intercepted ground level to the invert of the proposed drainage channel.

As documented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025; submitted under separate cover as part of the planning application), the proposed drainage system has sufficient capacity to accommodate the total estimated 26.07m^3/day of intercepted shallow groundwater. This confirms that the system is appropriately designed to manage the anticipated groundwater volumes under steady-state conditions.

Furthermore, the drainage network is capable of intercepting and conveying adequate groundwater to maintain continuous flow toward the receiving surface water bodies, namely the Corbally Stream, Coldwater Stream, and Cooldown Stream, as well as to support the hydrological requirements of the translocated wetland.

The calculated groundwater volumes are consistent with the ecological and hydrological needs of the proposed wetland habitat, ensuring:

- Sustained baseflow to the wetland across seasonal fluctuations.
- Hydrological connectivity between groundwater and surface water features.
- Long-term ecological viability of groundwater-dependent vegetation and fauna.

These findings support the conclusion that the proposed drainage system will effectively maintain the shallow groundwater regime and contribute to the successful establishment and resilience of the translocated wetland ecosystem.

7 HYDROGEOLOGICAL RISK ASSESSMENT

7.1 Risk-Based Impact Assessment

A risk-based and receptor-focussed approach was adopted to include an 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. This is informed by the assessment of potential for viable pollutant linkage(s) to be present. A pollutant linkage is established when there is a viable or potentially viable Source, a Pathway and a Receptor (refer to Section 2.4 below).If one or more of the three elements are missing, the exposure pathway is considered incomplete and there is no risk associated with the activity or contaminant source (i.e., a viable means of exposure is not considered to be present or is unlikely to be present).

The objective of the Water Framework Directive (WFD) is to prevent further deterioration and protect and enhance the status of aquatic ecosystems, as well as terrestrial ecosystems and wetlands directly depending on aquatic ecosystems. The "prevent or limit" objective is a key element of achieving the WFD status for all waterbodies, regardless of their current water quality status. Prevent or limit measures, such as avoidance and mitigation, serve as the first line of defence in restricting inputs of pollutants from a development (i.e., "source" removal) and preventing 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 will be identified to develop a Conceptual Site Model (CSM), 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 and proposed development.

7.2 Conceptual Site Model

A CSM represents the characteristics of the site and identifies the possible relationship and potential risk between contaminant sources (i.e., characteristics of the proposed development), pathways and receptors (receiving environment). 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.
- 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 preliminary CSM for the site of the proposed development is initially defined and this is then revised throughout the risk-based assessment process.

7.2.1 Site Hydrogeology

Local groundwater flow across the site is interpreted to occur predominantly toward the northwest and northeast, discharging into the Corbally Stream (also referred to as the Brownsbarn Stream), which borders the eastern and northern boundaries of the site. The Cooldown Stream and Coldwater Stream are also considered to be hydraulically connected to the underlying groundwater system. Similarly, the existing marshland area is interpreted to be groundwater-fed, with hydraulic connectivity to the subsurface aquifer.

Site investigation results suggest that the standing water observed in the marshland is primarily attributable to groundwater emergence at the surface, likely occurring where there is a change in topographical gradient. The presence of low-permeability clay subsoils may also contribute to localised waterlogging, particularly following rainfall events. Additionally, it is noted that existing trunk watermains crossing the site may be influencing groundwater emergence in the marshland area, either through leakage or alteration of subsurface flow paths.

Recharge within the Kilcullen Groundwater Body (GWB) and the Dublin GWB is expected to occur predominantly via diffuse infiltration, with rainfall percolating through the overlying subsoils. However, a significant portion of this potential recharge is likely to be rejected, due to the low storativity and low permeability of the underlying bedrock aquifers. Groundwater flow is expected to occur primarily within the upper 3 to 10 metres of the rock profile, particularly within the weathered zone, and to move laterally toward discharge points such as the Corbally, Cooldown, and Coldwater Streams.

Typical groundwater flow paths are estimated to be in the range of a few hundred metres, and generally not exceeding one kilometre. Groundwater level monitoring indicates a maximum recorded elevation of 136.81mOD at BH4 in the southern portion of the site, decreasing to 118.127mOD at BH5 and 118.201mOD at BH3 in the northern portion, consistent with the inferred flow direction toward the northeast.

7.2.2 Building Foundation and Drainage Design and Construction

Based on the available groundwater level data for the 30th of June 2025 and the 2nd of July 2025 and the proposed levels for subsurface structures it would appear that levels for building foundations and drainage infrastructure would be below groundwater during and post construction. The design floor and invert levels and available groundwater levels are provided in Table 7-1.

The building foundations and attenuation tank have the potential to impede local groundwater flow and movement through the site with potential for groundwater mounding upgradient of structures. There may be an increase in hydrostatic pressure which can reduce the void space of below ground attenuation systems, and result in buoyancy and structural integrity risks for subsurface structures.

Standard design and construction measures that include incorporating groundwater drainage around impermeable subsurface structures (i.e., building foundations, attenuation tanks and temporary barriers during construction) will minimise adverse effects of groundwater mounding at the upgradient side of the structures and potential buoyancy issues.

The proposed drainage to intercept and locally convey groundwater through the site (refer to the drainage layout drawings presented in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025) submitted under separate cover as part of the planning application) will also minimise the potential adverse effects of groundwater on subsurface structures.

Local dewatering will likely be required during construction based on recorded groundwater levels with a potential temporary localised change in groundwater levels. As there will be works below the groundwater table there is a potential for adverse effects to groundwater quality that may be exposed during works.

During the Construction Phase, all works will be undertaken in accordance with the Preliminary Construction Environmental Management Plan (CEMP) (DNV, 2025). Following appointment, the contractor will be required to further develop the CEMP to provide detailed construction phasing and methods to manage and prevent any potential emissions to ground with regard to the relevant industry standards (e.g., Guidance for Consultants and Contractors, CIRIA-C532', CIRIA, 2001).

Table 7-1. Design Floor and Invert Levels Relative to Groundwater Levels

Location / Zone	Drainage or Structure Name	Invert Level / Finished Floor Level (mOD)	Approximate Building Foundation Level (mOD)	Monitoring Location ID	Groundwater Elevation (mOD)
Catchment 1	Buildings	139.80-142.90	137.80-140.90	BH01	137.0-134.0
	Attenuation Pond	136.95	-		
Catchment 2	Buildings	137.20-143.75	135.20-141.75	BH01	132.0-137.0
	Attenuation Pond	135.00	-		
Catchment 3	Buildings	136.18-140.24	134.18-138.24	BH01	131.0-134.0
	Attenuation Pond	133.5	-		
Catchment 4	Buildings	135.29-144.93	133.29-142.93	BH04	132.0-137.0
	Attenuation Pond	132.00	-		
Catchment 5	Buildings	124.78-135.93	122.78-133.93	BH02	125.0-134.0
	Attenuation Pond	122.25	-		
Catchment 6	Buildings	120.75	118.75	BH5	118.0
	Attenuation Pond	119.25	-		
Catchment 7	Buildings	121.0	119.0	BH3	118.0-123.0
	Attenuation Pond	118.5-119.25	-		

7.2.3 Translocated Marshland

The existing wetland will be translocated to the northwestern corner of the site. A method statement has been prepared by Gannon & Associates Landscape Architecture (Gannon & Associates Landscape Architecture, 2025. Marsh Translocation Report; submitted with the planning application under separate cover) detailing the proposed translocation of marshland vegetation from the current location to the northern section of the site.

The construction of the proposed drainage system will involve in-stream and near-stream works, which will require appropriate environmental management measures to mitigate potential impacts.

To manage shallow groundwater and mitigate surface-level groundwater flood risk, network of land drains will be installed across the site. These are detailed in the Drainage and Water Infrastructure Engineering Report (Roger Mullarkey & Associates, 2025; submitted under separate cover as part of the planning application). The drains are designed to intercept and convey shallow groundwater, maintaining the site's hydrological and hydrogeological flow regime and supporting the viability of the translocated wetland.

It is estimated that 26.07m³/day of shallow groundwater will be intercepted by the proposed land drains (refer to Table 6-4). These drains will discharge to the Corbally Stream, the Coldwater Stream and the Cooldown Stream thereby preserving the hydrogeological and hydrological flow regime of the site.

An overflow structure will be constructed from the Coldwater Stream, located centrally within the site, to provide a sustained water supply to the translocated marshland. Water from the marshland will subsequently discharge to the Corbally Stream via both overflow and infiltration to ground, ensuring no net change to the site's overall hydrological regime.

The proposed drainage system has been designed with sufficient capacity to accommodate the total estimated 26.07m³/day of intercepted shallow groundwater, confirming that it is appropriately designed to manage anticipated volumes under steady-state conditions and reducing flood potential (refer to the SSFRA report (Kilgallen & Partners Consulting Engineers, 2025; submitted with the planning application under separate cover). The proposed drainage system is capable of:

- Intercepting and conveying adequate groundwater to maintain continuous flow toward receiving waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams).
- Supporting the hydrological requirements of the translocated wetland.

The calculated groundwater volumes align with the ecological and hydrological requirements of the proposed marshland habitat, ensuring:

- Sustained baseflow to the wetland across seasonal variations.
- Hydrological connectivity between groundwater and surface water features.
- Long-term ecological viability of groundwater-dependent vegetation and fauna.

These findings support the conclusion that the proposed drainage system will effectively maintain the shallow groundwater regime and contribute to the successful establishment and resilience of the translocated marshland ecosystem. Further assessment of the viability of the translocated marshland are presented in the method statement prepared by Gannon & Associates Landscape Architecture (Gannon & Associates Landscape Architecture, 2025. Marsh Translocation Report; submitted with the planning application under separate cover).

7.3 Risk Evaluation of Source-Pathway-Receptor Linkages

A risk-based assessment of the Source-Pathway-Receptor Model and the potential risk linkages associated with the construction phase and operational phase of the Proposed Development was undertaken. The results were evaluated to determine if the Proposed Development could potentially adversely affect any potential receptors associated with the site.

The CSM is presented in Table 7-2 together with the findings of the risk assessment and where necessary design avoidance and mitigation measures are outlined.

Table 7-2. Conceptual Site Model (Source – Pathway – Receptor) and Risk Evaluation

Source	Pathway	Receptor	Risk Assessment and Avoidance / Mitigation
Construction Phase			
Dewatering During Construction of Building Foundations and Utility Infrastructure	Groundwater (Subsurface) Flow Regime	Local Groundwater Levels Groundwater / Surface Water Flow Offsite Surface Water Flow Offsite Onsite Groundwater Dependent Receptors	**Residual Moderate to Low Risk** Any required groundwater dewatering and will be localised and temporary and associated adverse effects will be within a localised area of the underlying aquifer. The Corbally Stream is culverted downstream of the site and therefore there will be no adverse effects on offsite hydrological flow regime. The dewatering strategy will ensure the expected localised temporary adverse effects on

Source	Pathway	Receptor	Risk Assessment and Avoidance / Mitigation
		(Including Sensitive Habitats)	groundwater levels will be maintained within the work area onsite and not extend offsite. The existing marshland will be transposed to the northwest corner of the Proposed Development. Where required during construction, temporary rewatering of the translocated marshland area will be incorporated in the dewatering management plan. Groundwater drainage will be installed to prevent any localised mounding of groundwater upgradient of subsurface structures (i.e., building foundations and attenuation tanks).
Instream / Near Stream Works for the Construction of the Proposed Headwalls to Receiving Waterbodies (i.e., Corbally, Coldwater, And Cooldown Streams) and Overflow to the Translocated Marshland Area.	Surface Water Flow Regime	Downstream Habitats Onsite and at the Site Boundaries Receiving Surface Waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams)	**Low Risk** Any local diversion of surface water (e.g., the Coldwater Stream) required to facilitate construction of the proposed headwalls and overflow to the translocated marshland area will not adversely affect the offsite flow regime, as temporary surface water drainage measures will be implemented during construction to ensure that water flow across the site is not impeded.
Discharge of Contaminants to Ground / Groundwater	Vertical And Lateral Groundwater Migration in Bedrock Aquifer	Downgradient Aquifers Receiving Surface Waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) Natura 2000 Sites (i.e., North Dublin Bay SAC, South Dublin Bay SAC, Rockabill to Dalkey Island SAC, North-West Irish Sea SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA)	**Low Risk (worst-case unmitigated scenario)** Potential for infiltration of contaminants to groundwater from surface is limited due to the nature of the bedrock aquifers. During bulk excavations for the construction of building foundations and utility infrastructure in a worst-case unmitigated scenario there is potential for infiltration to groundwater. The groundwater within the Kilcullen GWB and / or Dublin GWB will be locally impacted and taking account of the limited attenuation within the aquifer, it is considered that there is an indirect risk to receiving surface waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) and locally within the downstream Camac River. Considering the distance downstream and the significant dilution which will occur, it is considered that there is no perceived impact on any downstream Natura 2000 sites. During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality.
Discharge of Entrained Contaminants in Surface Runoff	Lateral Migration at the site to Receiving Surface Waterbodies (i.e., Corbally, Coldwater, and	Receiving Surface Waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) Natura 2000 Sites (i.e., North Dublin Bay SAC, South Dublin Bay SAC,	**Low to Moderate Risk (worst-case unmitigated scenario)** The excavation, handling, stockpiling, reprofiling and removal offsite of soils and subsoils during construction works at the site could result in generation of runoff with entrained sediment or other contaminants which could potentially impact

Source	Pathway	Receptor	Risk Assessment and Avoidance / Mitigation
	Cooldown Streams). Lateral Migration to the Existing Drainage Along Public Roads	Rockabill to Dalkey Island SAC, North-West Irish Sea SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA)	on the receiving water quality and WFD status of the receiving surface waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) and locally within the downstream Camac River. Considering the distance downstream and the significant dilution which will occur, it is considered that there is no perceived impact on any downstream Natura 2000 sites. There is also a potential risk of runoff with contaminants migrating offsite via existing drainage along public roads. During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality. Exclusion zones around surface waterbodies within and at site boundaries will be maintained throughout the construction phase. Construction measures including pollution control measures and surface water management will also be developed by the appointed contractor and detailed in the CEMP.
Instream / Near Stream Works for the Construction of the Proposed Headwalls to Receiving Waterbodies (i.e., Corbally, Coldwater, And Cooldown Streams) and Overflow to the Translocated Marshland Area.	Receiving Waterbodies (i.e., Corbally, Coldwater, And Cooldown Streams)	Receiving Surface Waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) Natura 2000 Sites (i.e., North Dublin Bay SAC, South Dublin Bay SAC, Rockabill to Dalkey Island SAC, North-West Irish Sea SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA)	**High Risk (worst-case unmitigated scenario)** Potential risk of runoff with contaminants migrating offsite in the absence of mitigation. Potential adverse effects to water quality in the receiving surface waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) and downstream waterbodies and locally within the downstream Camac River. Considering the distance downstream and the significant dilution which will occur, it is considered that there is no perceived impact on any downstream Natura 2000 sites. Appropriate design avoidance and mitigation for the construction works will prevent or limit any potential adverse effects to offsite receptors and the receiving water quality: • Environmental/Ecological Clerk of works will oversee works where required. • Construction measures including use of pre-cast materials. • Temporary diversions prior to construction works commencing. • Silt fencing or similar to be used where necessary. • All works to be carried out in accordance with IFI guidelines (2016).
Operational Phase			
Discharge of Entrained	Surface Water Drainage and	Receiving Surface Waterbodies (i.e.,	**Low to Moderate Risk (worst-case unmitigated scenario)**

Source	Pathway	Receptor	Risk Assessment and Avoidance / Mitigation
Contaminants in Surface Runoff (e.g., Fuel Spill in Carpark Areas)	Discharge Offsite via Outfall to Downstream Watercourses	Corbally, Coldwater, and Cooldown Streams) Natura 2000 Sites (i.e., North Dublin Bay SAC, South Dublin Bay SAC, Rockabill to Dalkey Island SAC, North-West Irish Sea SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA)	During the operational phase of the proposed development, there is limited potential for discharge of any contaminated runoff to the receiving water courses associated with surface water runoff from the site. However, in a worst-case scenario during the operational phase (e.g., failure of SuDS) in the absence of any mitigation measures there is potential for discharge of contaminants to receiving surface waterbodies (i.e., Corbally, Coldwater, and Cooldown Streams) and locally within the downstream Camac River. Considering the distance downstream and the significant dilution which will occur, it is considered that there is no perceived impact on any downstream Natura 2000 sites. Surface runoff from roofs and paved areas will be managed and treated in accordance with SUDS and pass through petrol interceptor and attenuation tanks prior to discharging to local surface water drainage network.
Subsurface Structures Intercepting Groundwater	Groundwater (Subsurface Flow) and Surface Water Regime	Local Groundwater Levels Groundwater / Surface Water Flow Regime	**Low risk** The building foundations and attenuation tank have the potential to impede local groundwater flow and movement through the site with potential for groundwater mounding upgradient of structures. There may be an increase in hydrostatic pressure which can reduce the void space of below ground attenuation systems and result in buoyancy and structural integrity risks for subsurface structures. Standard design and construction measures that include incorporating groundwater drainage around impermeable subsurface structures (i.e., building foundations, attenuation tanks and temporary barriers during construction) will minimise adverse effects of groundwater mounding at the upgradient side of the structures and potential buoyancy issues. The proposed drainage to intercept and locally convey groundwater through the site will also minimise the potential adverse effects of groundwater on subsurface structures. It is understood the detailed design will include measures to counter buoyancy of tanks and subsurface structures. The proposed drainage system has been designed with sufficient capacity to accommodate the total estimated 26.07m^3/day of intercepted shallow groundwater, confirming that it is appropriately designed to manage anticipated volumes under steady-state conditions and reducing flood potential. Therefore, there will be no adverse effects on subsurface or groundwater flows offsite and no associated adverse effect on the hydrological regime of receiving surface waterbodies.

Source	Pathway	Receptor	Risk Assessment and Avoidance / Mitigation
Translocation of Existing Marshland	Sustained Water Supply to the Translocated Marshland	Onsite Groundwater Dependent Receptors (Including Sensitive Habitats)	**Low Risk** It is estimated that XXm³/day of shallow groundwater will be intercepted by the proposed land drains. These drains will ultimately discharge to the Corbally Stream, the Coldwater Stream and the Cooldown Stream. An overflow structure will be constructed from the Coldwater Stream, located centrally within the site, to provide a sustained water supply to the translocated marshland. Water from the marshland will subsequently discharge to the Corbally Stream via both overflow and infiltration to ground, ensuring no net change to the site's overall hydrological regime. The proposed drainage system has been designed with sufficient capacity to accommodate the total estimated 26.07m³/day of intercepted shallow groundwater. It is also capable of supporting the hydrological requirements of the translocated wetland habitat. Overall, the proposed drainage system will effectively maintain the shallow groundwater regime and contribute to the successful establishment and long-term resilience of the translocated marshland ecosystem.
Foul Water Discharge	Discharge to Mains Sewer	Receiving surface waterbodies (i.e., the River Dodder, the Liffey Estuary, and Dublin Bay) Natura 2000 Sites (i.e., North Dublin Bay SAC, South Dublin Bay SAC, Rockabill to Dalkey Island SAC, North-West Irish Sea SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA)	**Low Risk** Foul water during the operational phase of the proposed development will be discharged to the UE drainage network and ultimately discharged to the Liffey Estuary and Dublin Bay via Ringsend WWTP. Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE. The Ringsend WWTP (EPA Licence D0034-01) was identified by UE to have sufficient capacity to accept foul water from the Proposed Development. Therefore, the proposed development will not cause a potential impact at any receiving waterbody or Natura 2000 sites associated with discharges from the site.

7.4 Design Avoidance and Mitigation

The assessment of the potential adverse effects on the receiving environment takes account of the embedded design avoidance measures and standard good practice construction methods to reduce the potential for adverse effects to the water environment. These are outlined below together with additional specific measures based on the findings of the risk assessment.

Standard design and construction measures will be implemented to mitigate potential impacts associated with shallow groundwater. These include the incorporation of groundwater drainage systems around impermeable subsurface structures, such as building foundations, attenuation tanks, and temporary construction barriers. These measures will minimise the risk of groundwater mounding on the upgradient side of structures and reduce the potential for buoyancy-related issues.

Where building foundations and utility infrastructure intersect the groundwater table, appropriate structural design and perimeter drainage will be employed to prevent groundwater ingress and maintain the integrity of below-ground assets.

To manage shallow groundwater and reduce surface-level flood risk, a network of land drains will be installed across the site. These drains are designed to intercept and convey groundwater, discharging to the Corbally Stream, Coldwater Stream, and Cooldown Stream.

An overflow structure will be constructed from the Coldwater Stream, located centrally within the site, to provide a sustained water supply to the translocated marshland. Water from the marshland will subsequently discharge to the Corbally Stream via both overflow and infiltration to ground, ensuring no net change to the site's overall hydrological regime.

The proposed drainage system has been designed with sufficient capacity to accommodate the total estimated 26.07m³/day of intercepted shallow groundwater. This confirms that the system is appropriately engineered to manage anticipated volumes under steady-state conditions, while also contributing to flood risk reduction and the long-term viability of the translocated wetland habitat.

During the Construction Phase, all works will be undertaken in accordance with the CEMP (DNV, 2025). Following appointment, the contractor will be required to further develop the CEMP to provide detailed construction phasing and methods to manage and prevent any potential emissions to ground with regard to the relevant industry standards (e.g., Guidance for Consultants and Contractors, CIRIA-C532', CIRIA, 2001). The CEMP will be implemented for the duration of the construction phase, covering construction and waste management activities that will take place during the construction phase of the Proposed Development. Mitigation works will be adopted as part of the construction works for the Proposed Development. These measures will address the main activities of potential adverse effects which include:

- Control and management of water and surface runoff.
- Control and management of groundwater during excavation and dewatering.
- Management and control of works in and adjoining water courses.
- Management and control of imported soil and aggregates from off-site sources.
- Fuel and Chemical handling, transport and storage; and
- Accidental release of contaminants.

The CEMP will outline measures for the control and treatment of water encountered during construction and methodology for the treatment of water to ensure that there are no prior to discharge from the Site.

The dewatering methodology to be implemented by the contractor (once appointed) will ensure that any dewatering is confined to the localised zone and does not extend towards the boundaries of the site.

Surface water runoff management will be required to prevent runoff entering excavations during construction. Surface water will require diversion around the open excavations using standard temporary drainage methods to ensure that surface water is effectively conveyed around works areas and with no adverse effects to the overall existing surface water flow regime.

A 20m buffer will be retained at all open waterbodies. Site traffic will only be permitted within this buffer to facilitate instream and near stream works for the construction of the proposed headwalls to receiving waterbodies (i.e., Corbally, Coldwater, And Cooldown Streams), overflow to the Translocated Marshland Area and bridge crossings to facilitate vehicular, pedestrian and cyclist connections to adjoining developments at Corbally Heath and Corbally Glade to the east and Carrigmore Green to the north, and pedestrian/cyclist access into Carrigmore Park to the east.

Buffer zones will be established by erecting a silt fencing or bunding along the length of the open waterbodies (i.e., Corbally Stream, Coldwater Stream, and Cooldown Stream) with cognisance to Inland Fisheries Ireland (IFI) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016). Silt fencing will comprise wooden posts and double walled geotextile membrane buried in an 'L' shape to a minimum depth of 250mm. The silt fencing will act in filtering any potential surface water run-off from the site generated during the proposed works and will be retained in place for the duration of the construction phase until the development is complete. Heras fencing will be installed in front of the silt fencing at the Site to prevent "Site creep", the progressive movement of site activities towards this silt fence. The project specific CEMP (which will be prepared by the main contractor in advance of construction works commencing) will identify how this silt curtain is to be installed and maintained throughout the construction phase.

All run-off from the Site or any areas of exposed soil will be managed as required with temporary pumping and following appropriate treatment as required (e.g., settlement and / or hydrocarbon interceptor). Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to temporary onsite settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge at a controlled rate. Furthermore, silt fencing or bunding will be installed along the boundaries of all onsite and adjoining waterbodies including the Corbally Stream, Coldwater Stream, and Cooldown Stream. The silt fencing will comprise wooden posts and double walled geotextile membrane buried in an 'L' shape to a minimum depth of 250mm. The silt fencing will act in filtering any potential surface water run-off from the site generated during the proposed works

A watching brief by an Ecological Clerk of Works (ECoW) is recommended during critical stages of the construction works associated with surface water in particular works for the translocation of the marshland area. To this effect, all works for the proposed translocation will be undertaken in accordance with the method statement prepared by Gannon & Associates

Landscape Architecture (Gannon & Associates Landscape Architecture, 2025. Marsh Translocation Report; submitted with the planning application under separate cover). These works will be undertaken in advance of other construction works commencing and the contractor will ensure that appropriate temporary rewatering is utilised as appropriate until the proposed drainage network is established.

All instream / near stream works will follow the measures outlined in the CEMP and the guidelines published by Inland Fisheries Ireland (IFI) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016).

The contractor will employ an Environmental Clerk of Works (EnCoW) who will monitor water quality upstream and downstream of the area of works. The programme of water quality monitoring and locations of sampling will be agreed with SDCC in advance of construction works commencing. However, it is anticipated that data on pH, electrical conductivity, and turbidity, suspended solids and hydrocarbons will be collected as follows:

- Twice weekly visits during general site works
- Daily site visits during key construction activities (to be agreed between the environmental specialist, the appointed contractor and SDCC (e.g., during the construction of the translocated wetland, during installation of the proposed outfalls and stream crossings, during and immediately after clearance of on-site vegetation)).
- Event inspection (e.g., following heavy rainfall events or during concrete pours).

Monitoring will be undertaken for a period of at least two months prior to works commencing and one-month post construction. Trigger concentrations will be agreed at commencement and based on the baseline established in the two months prior to works commencing. It is noted that where a deterioration in water quality is observed downstream of the site this will be brought to the attention of the contractor by the Environmental / Ecological Clerk of Works, and any suitable contingency measures will be instigated.

All monitoring data will be collated by the EnCoW to show trends for indicator parameters pH, conductivity, turbidity or suspended solids and hydrocarbons, and will be shared with SDCC as requested.

Unauthorised discharge of water (groundwater / surface water runoff) to ground, drains or watercourses will not be permitted. The Appointed contractor will ensure that the discharge of water to ground, drains or watercourses will be in accordance with the necessary discharge licences issued by Uisce Eireann (UE) under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from SDCC under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water.

Under no circumstances will any untreated wastewater generated onsite (from equipment washing, road sweeping etc.) be released to ground or to drains. Existing surface water drainage located along public roads will be protected for the duration of the works to ensure that any untreated wastewater generated onsite does not enter the public sewers.

Stockpiles of loose materials pending re-use onsite or removal offsite will be located as far as feasible from the Corbally Stream, Coldwater Stream, and Cooldown Stream (a minimum set back of 20m from watercourses will be maintained) and will be appropriately sealed / covered and a silt fence or bunding will be installed around it to ensure no soils and sediments are washed out overland to the receiving surface waterbodies.

The performance of all surface water management measures including settlement ponds and silt fences will be monitored to ensure that they remain functional throughout construction of the Proposed development. Where necessary, maintenance will be carried out to ensure that the measures continue to be effective. This will be particularly important after heavy rainfall events.

Small quantities of fuel, oils and chemicals will be strictly controlled in accordance with procedures outlined in the CEMP and will be stored on an impervious base within a bund remote from any surface water drains and water courses. All tank, container and drum storage areas will be rendered impervious to the materials stored therein and will be rooved to exclude rainwater. Bunds will be designed having regard to the EPA guidelines on the 'Storage and Transfer of Materials for Scheduled Activities' (EPA, 2013) and Enterprise Ireland Best Practice Guidelines (BPGCS005).

Refuelling of plant during the construction phase of the proposed development will be carried out in accordance with standard best practice. Onsite refuelling will only be carried out at the out at the designated, impermeable refuelling station location onsite with appropriate containment in place.

Precast concrete will be utilised where possible. However, where in-situ pours are required pumping of concrete will be monitored to ensure that there is no accidental discharge. All work will be carried out in the dry and effectively isolated from any drains and nearby watercourses (i.e., the Corbally Stream, Coldwater Stream, and Cooldown Stream). The production, transport, and placement of all cementitious materials will be strictly planned and supervised by the Appointed contractor. A suitable risk assessment for wet concreting will be completed prior to works being carried out

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

7.5 Protected and Designated Sites (Natura 2000 sites)

Based on the findings of this assessment, it is considered that, in the absence of mitigation or avoidance measures, there could be a potential impact on water quality within the receiving watercourses, namely the Corbally Stream, Coldwater Stream, Cooldown Stream, and locally within the Camac River. However, taking into account the baseline condition of these watercourses and their associated catchments, it is considered that there will be no significant adverse effects on downstream transitional and coastal waterbodies, including the Liffey Estuary Upper, Liffey Estuary Lower, and Dublin Bay.

Furthermore, given the distance downstream, and the significant dilution and attenuation that occurs due to tidal fluxes, it is concluded that there will be no perceived impact, either individually or in combination with other plans or projects, on any further downstream Natura 2000 sites, including:

- North Dublin Bay SAC.
- South Dublin Bay SAC.
- Rockabill to Dalkey Island SAC.
- North-West Irish Sea SPA.
- North Bull Island SPA.
- South Dublin Bay and River Tolka Estuary SPA.

Regardless of this conclusion, a suite of mitigation measures will be implemented to ensure protection of the receiving groundwater and surface water environment:

- Construction Phase The construction phase will be managed in accordance with the Construction Environmental Management Plan (CEMP) (EGC, 2025), which will be further developed by the appointed contractor. The CEMP will include appropriate avoidance and mitigation measures to prevent any potential impact on receiving water bodies and associated Natura 2000 sites.
- Operational Phase – Groundwater Management The proposed land drains will intercept and convey shallow groundwater, maintaining the site's hydrological and hydrogeological flow regime.
- Operational Phase – Surface Water Management Surface water and intercepted groundwater will be managed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS). These systems will treat and attenuate water prior to discharge to ground via infiltration, ensuring no impact on baseline conditions at any Natura 2000 sites.
- Operational Phase – Foul Water Discharge Foul water from the site will discharge via the Ringsend Wastewater Treatment Plant (WWTP) to the Liffey Estuary and Dublin Bay. The WWTP operates under relevant statutory approvals, and therefore, there will be no impact on baseline conditions at any Natura 2000 sites associated with foul discharges from the Proposed Development.

7.6 Water Framework Directive

The findings of the risk-based assessment identified that in the absence of any mitigation and avoidance measures there could be a potential impact on the water quality within receiving water bodies associated with the Proposed development, specifically within the Kilcullen GWB, the Dublin GWB, the Camac_020 (i.e., the Corbally Stream, Coldwater Stream, Cooldown Stream) and locally within the Camac_030. However, given the distance downstream, and the significant dilution it is considered that there will be no significant adverse effects on the Camac_040 and downstream transitional and coastal waterbodies, including the Liffey Estuary Upper, Liffey Estuary Lower, and Dublin Bay.

The mitigation measures as outline above, including the implementation of a robust CEMP during the construction phase and the incorporation of SuDS in the design of the Proposed development, will prevent any 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).

The proposed development will not cause a deterioration in the status of waterbodies hydraulically connected with the proposed development, taking account of design avoidance and mitigation measures that will be implemented. The proposed development will not jeopardise the attainment of ‘good’ surface water status, ‘good’ ecological potential and ‘good’ surface water chemical status.

There will be no impact to the existing WFD status of water bodies associated with the Proposed development including the Kilcullen GWB, the Dublin GWB, the Camac_020 (i.e., the Corbally Stream, Coldwater Stream, Cooldown Stream) and Camac_030 taking account of embedded design avoidance and mitigation measures.

8 CONCLUSIONS

DNV has carried out a risk-based hydrological and hydrogeological impact assessment for the Proposed Development to determine if there is any potential for significant impacts on the receiving water environment and designated Natura 2000 sites in the absence of avoidance and mitigation measures.

The CSM was developed identifying plausible S-P-R linkages for the Proposed development and receiving water environment. The CSM formed the basis of the evaluation of any potential impacts to receptors including waterbodies, GWDTEs and Natura 2000 sites associated with the Proposed Development. The assessment assumed a worst-case scenario and in the absence of any mitigation measures intended to avoid or reduce potential harmful effects.

Based on the findings of this assessment the following can be concluded:

- Local groundwater across the site predominantly flows toward the northwest and northeast, discharging into the Corbally (Brownsbarn) Stream, with hydraulic connectivity to the Cooldown and Coldwater Streams and the existing marshland. Site investigations indicate that standing water within the existing marshland is primarily due to groundwater emergence at topographical breaks, with low-permeability clay subsoils contributing to localised waterlogging. Existing trunk watermains may also influence subsurface flow paths through leakage or structural interference.
- Construction of subsurface structures, including building foundations and attenuation tanks, has the potential to impede groundwater flow and cause mounding, increasing hydrostatic pressure and buoyancy risks. Standard design measures, such as perimeter drainage and groundwater interception systems, will mitigate these effects. The proposed drainage network, designed to intercept approximately 26.07m^3/day of shallow groundwater, will discharge to the Corbally, Cooldown, and Coldwater Streams, maintaining hydrological connectivity and supporting the viability of the translocated wetland. Overflow structures will ensure sustained water supply to the translocated wetland, preserving the site’s overall hydrological regime.
- In the unmitigated scenario, there could be a potential impact on the water quality and WFD status of receiving waterbodies associated with the Proposed development, specifically within the Kilcullen GWB, the Dublin GWB, the Camac_020 (i.e., the Corbally Stream, Coldwater Stream, Cooldown Stream) and locally within the Camac_030. However, given the distance downstream, and the significant dilution it is considered that there will be no significant adverse effects on the Camac_040 and downstream transitional and coastal waterbodies, including the Liffey Estuary Upper, Liffey Estuary Lower, and Dublin Bay. Furthermore, taking into account of the distance downstream, and the significant dilution and attenuation that occurs due to tidal fluxes, it is concluded that there will be no perceived impact, either individually or in combination with other plans or projects, on any downstream Natura 2000 sites.
- The existing marshland will be translocated to the northwestern corner of the site in accordance with the method statement prepared by Gannon & Associates Landscape Architecture (Gannon & Associates Landscape Architecture, 2025. Marsh Translocation Report; submitted with the planning application under separate cover), ensuring ecological viability.
- The appropriate standard design measures for the construction phase and operational phase of the Proposed Development including implementation of the CEMP and SuDS measures within the drainage design will prevent, limit and mitigate any the potential for the worst-case scenario to occur. These design avoidance measures will ensure there is no risk to water quality of the receiving watercourses.

Overall, taking account of design avoidance and mitigation measures, the Proposed Development will not adversely affect the WFD status of associated waterbodies, including the Kilcullen GWB, the Dublin GWB, the Camac_020 (i.e., the Corbally Stream, Coldwater Stream, Cooldown Stream), the Camac_030 and associated downstream waterbodies. the proposed drainage system has been designed with sufficient capacity to manage anticipated groundwater volumes, minimise flood risk, maintain the hydrogeological regime and ensure sustained baseflow to the translocated wetland.

9 REFERENCES

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