

**HYDROLOGICAL &
HYDROGEOLOGICAL
QUALITATIVE RISK
ASSESSMENT**

for

**PROPOSED DEVELOPMENT AT
31 and 31A RAVENS ROCK
ROAD, SANDYFORD BUSINESS
PARK, DUBLIN 18
CO. DUBLIN**

Technical Report Prepared For

Ravensbrook Ltd.

Technical Report Prepared By

Marcelo Allende

BEng, Environmental Consultant

Teri Hayes Director

BSc MSc PGeo, Director

Our Reference

MA/21/12222SR01

Date of Issue

1 March 2022

Cork Office

Unit 5, ATS Building,
Carrigaline Industrial Estate,
Carrigaline, Co. Cork.
T: + 353 21 438 7400
F: + 353 21 483 4606

AWN Consulting Limited
Registered in Ireland No. 319812
Directors: F Callaghan, C Dilworth,
T Donnelly, T Hayes, D Kelly, E Porter

Document History

Document Reference		Original Issue Date	
MA/21/12222SR01		1 March 2022	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Marcelo Allende	Teri Hayes
Title	Environmental Consultant	Director
Date	1 March 2022	1 March 2022

TABLE OF CONTENTS		Page
1.0	INTRODUCTION	4
1.1	Background	4
1.2	Hydrological Setting	4
1.3	Objective of Report	5
1.4	Description of Drainage	6
2.0	ASSESSMENT OF BASELINE WATER QUALITY, RIVER FLOW AND WATER BODY STATUS	7
2.1	Hydrological Catchment Description	8
2.2	Aquifer Description and Superficial Deposits	9
3.0	CONCEPTUAL SITE MODEL	10
3.1	Assessment of Plausible Sources	10
3.2	Assessment of Pathways	12
3.3	Assessment of Receptors	12
3.4	Assessment of Source Pathway Receptor Linkages	12
4.0	CONCLUSIONS	17
5.0	REFERENCES	17

Tables

Table 3.1 - Pollutant Linkage Assessment (without mitigation)	16
---	----

Figures

Figure 1.1 – Site Location in relation to Local Drainage	5
Figure 1.2 – Indicative Foul Sewer from West Pier to Ringsend WWTP	7
Figure 2.1 – Aquifer Vulnerability	10

1.0 INTRODUCTION

1.1 Background

AWN have been requested by Ravensbrook Ltd., to carry out a Hydrological and Hydrogeological Qualitative Risk Assessment for a proposed residential development at 31 and 31A Ravens Rock Road, Sandyford Business Park, Dublin 18.

The development will consist of the demolition of the existing 2 no. storey building (c.717sqm) and hard surface parking area on the site and construction of a Build to Rent residential development comprising 101 no. residential apartments as follows:

- 101 no. build to rent apartments within a part 5, part 6 to part 11 no. storey building over partial basement comprising 65 no. 1 bedroom apartments and 36 no. 2 bedroom apartments (balconies on all elevations);
- 734sqm of external communal amenity space provided in the form of a podium courtyard at first floor level and a series of rooftop terraces at fifth, sixth and tenth floor levels, c. 514sqm of public open space provided fronting Carmanhall Road;
- 511 sqm of resident support facilities/ services and amenities space provided at ground and first floor levels;
- Vehicular access to the development will be from the upgraded existing access from Ravens Rock Road;
- Provision of 10 no. car parking spaces [1 no. accessible] at surface level, 2 no. motorcycle spaces; and 234 no. cycle parking spaces;
- Provision of 4 no. Ø0.3m Microwave link dishes to be mounted on 2 No. steel support pole affixed to lift shaft overrun, all enclosed in radio friendly GRP shrouds, together with associated equipment at roof level;
- Provision of an ESB substation, switch room and plant room at ground floor level, hard and soft landscaped areas, public lighting, attenuation, service connections and all ancillary site development works.

The development site is at present occupied by industrial units and associated on site car parking. The surrounding environment can be described as predominantly a mix of both retail/commercial setting and residential. There are no licensed industrial emission activities associated with the subject site.

1.2 Hydrological Setting

According to the EPA river network (EPA maps, <https://gis.epa.ie/EPAMaps/> accessed on 15-11-2021), the nearest surface water receptor is the Carrickmines River which is located c. 360 m to the south of the subject site. The Brewery Stream is located c. 980 m to the northeast of the subject site (refer to Figure 1.1 below).

The site is part of the Liffey-Dublin Bay Catchment (Hydrometric Area 09) and the River Dodder subcatchment (WFD code: Dodder_SC_10). WFD refers to the Water Framework Directive (Directive 2000/60/EC). The boundary with the Ovoca-Vartry catchment (Hydrometric Area 10) and the Dargle WFD subcatchment is located c. 200 m to the south of the site (refer to Figure 1.1 below).

The Slang River is located c. 1.8 Km to the northwest of the subject site and flows northwards for c. 3.0 Km where it joins the Dodder River. The Dodder River eventually discharges into the Liffey River c. 8 km to the north of the subject site at Ringsend. The Liffey outfalls into the Dublin Bay which hosts a number of Natura 2000 Sites.

On the other hand, the Carrickmines Stream is located c. 360 m to the south of the site and it appears to be culverted in its section crossing Sandyford. This stream flows south-eastwards and joins the Shanganagh River at Cherrywood c. 6 Km of the subject site from where it flows c. 1.7 Km before discharging into the Killiney Bay. This bay also hosts some Natura 2000 Sites (Dalkey Coastal Zone And Killiney Hill pNHA, Rockabill to Dalkey Island SAC and Bray Head SAC).



Figure 1.1 Site Location in relation to Local Drainage

A review of the EPA (2021) on-line database indicates there are no NPWS protected areas in the vicinity of the Proposed Development site. The nearest protected areas is the already mentioned South Dublin Bay SPA/SAC/pNHA which is c. 3.6 Km to the northeast of the site. There would be an indirect discharge to Dublin Bay water body from the Proposed Development site through the stormwater site drainage which outfalls directly into the Brewery Stream as described in Section 1.3 below.

1.3 Objective of Report

The scope of this desktop review is to assess the potential for any likely significant impacts on receiving waters within protected areas during construction or post development, in the absence of taking account of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures).

In particular, this review considers the likely impact of construction and operation impacts (construction run-off and domestic sewage) from the Proposed Development on water quality and overall water body status within the Dublin Bay, including bathing water locations. The assessment relies on information regarding design provided by the applicant as follows:

- Engineering Services Report for a Proposed Development at 31 & 31A Ravensrock, Sandyford, Dublin 18. CS Consulting Group, May 2021.
- Site Specific Flood Risk Assessment for a Proposed Development at 31 & 31A Ravensrock, Sandyford, Dublin 18. CS Consulting Group, May 2021.

This report was prepared by Marcelo Allende (BEng), and Teri Hayes (BSc MSc PGeol EurGeol). Marcelo is a Water Resources Engineer with over 15 years of experience in environmental consultancy and water resources studies. Marcelo is an Environmental Consultant with AWN Consulting, a member of the International Association of Hydrogeologists (Irish Group) and a member of Engineers Ireland (MIEI). Teri is a hydrogeologist with over 25 years of experience in water resource management and impact assessment. She has a Masters in Hydrogeology and is a former President of the Irish Group of the Association of Hydrogeologists (IAH) and has provided advisory services on water related environmental and planning issues to both public and private sector bodies. She is qualified as a competent person as recognised by the EPA in relation to contaminated land assessment (IGI Register of competent persons www.igi.ie). Her specialist area of expertise is water resource management eco-hydrogeology, hydrological assessment and environmental impact assessment.

1.4 Description of Drainage

The nearest surface water receptors are the Carrickmines Stream (Surface Waterbody code IE_EA_10C040350, EPA code: 10C04), which is located c. 360m to the south of the Proposed Development site and the Brewery Stream (Surface Waterbody code IE_EA_09B130400, EPA code: 09B13) which begins its course c. 980m to the northeast of the site (refer to Figure 1.1 above).

The Carrickmines Stream flows culverted in this area. The Brewery Stream seems to be also culverted but it is open from the Stillorgan Road towards Dublin Bay (c. 1.5 Km to the northeast of the site). This stream discharges into the Dublin Bay coastal water c. 3.6 Km from the site which hosts SAC, SPA and NHA habitats.

It is believed that the stormwater site drainage Surface water from the existing development is discharged directly into the Brewery Stream, as the nearest stormwater discharge in the vicinity of the site is located in this stream at Stillorgan (according to EPA maps). Therefore, there is an indirect hydraulic connection between the site and Dublin Bay.

Dún Laoghaire-Rathdown County Council's drainage records indicate a 300mm diameter storm sewer flowing south to north on Ravensrock Road. At present the hardstanding areas of the site all drain into this storm water sewer. However, the proposed development will require the demolition of the existing building on site and the removal of the existing storm water system.

The attenuation system has been designed in order to discharge a greenfield run-off rate (i.e., the same level as under pre-development conditions) into the public sewer. The attenuation volume to be retained on site is to provide for a 1-in-100 year extreme storm event, increased by 20% for the predicated effects of climate change. The attenuation volume will be provided in an attenuation tank sized to retain storm volumes predicated (i.e., 1-in-100 year event plus climate change). The proposed tank will be filled and drained by gravity.

As part of the proposed development, SuDS features have been designed to prioritise interception and reduction of flow rates. The features that will be incorporated into the design are green roofs, tree pits, road gullies, etc.

Foul water will be drained separately by gravity. Dún Laoghaire-Rathdown County Council's drainage records indicate a 225mm public foul sewer located in Ravensrock Road and falling to the north into the junction between Ravensrock Road and Carmanhall Road.

The proposed development will require a complete redevelopment of the subject lands, including the demolition of the existing building on site. All foul effluent generated above ground floor level from the proposed development shall be collected in pipes of 150 mm and 225 mm in diameter and flow under gravity to the existing 225mm diameter sewer on Arkle Road via a new connection.

This foul sewer eventually discharges to the West Pier pumping station which transfers wastewater to Ringsend Waste Water Treatment Plant (WWTP) where it is treated and ultimately discharges into South Dublin Bay (refer to Figure 1.2 below). The WWTP and pumping station operate under an EPA licence D0034-01.

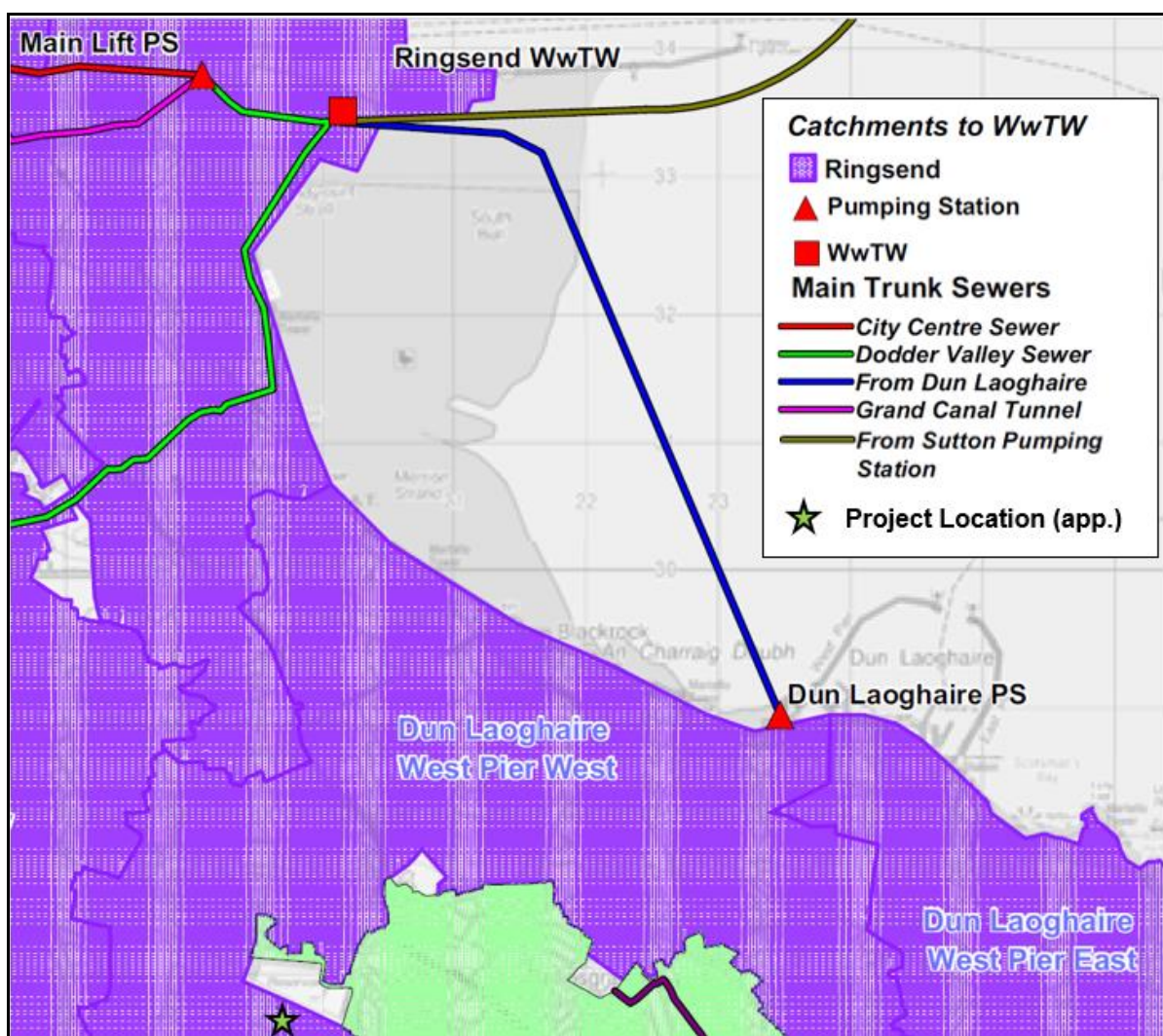


Figure 1.2 Indicative Foul Sewer from West Pier to Ringsend WWTP (Source: Greater Dublin Strategic Drainage Study, 2005)

According to the Flood Risk Assessment carried out by CS Consulting (2021), there is a no risk of flooding affecting the site from tidal, fluvial, pluvial or groundwater sources. The site lies within a Flood Zone C (i.e., where the probability of flooding from rivers is less than 0.1% or 1 in 1000). Any flood events will not cause flooding of the Proposed Development, and the development will not affect the flood storage

volume or increase flood risk elsewhere. The site historically has no recorded flood events as noted in the OPW historical flood maps.

2.0 ASSESSMENT OF BASELINE WATER QUALITY, RIVER FLOW AND WATER BODY STATUS

A reliable Conceptual Site Model (CSM) requires an understanding of the existing hydrological and hydrogeological setting. This is described below for the Proposed Development site and surrounding hydrological and hydrogeological environs.

2.1 Hydrological Catchment Description

The proposed development site lies within the Liffey and Dublin Bay Catchment (Hydrometric Area 09) and River Dodder sub-catchment (WFD name: Dodder_SC_010, Id 09_16) (EPA, 2021).

The Environmental Protection Agency (EPA, 2022) on-line mapping presents the available water quality status information for water bodies in Ireland. The Brewery Stream has no recorded water quality information; but it has a 'Moderate' WFD status based on expert judgement (EPA, 2022) and its WFD risk score is 'Under Review'. The Coastal Waterbody Dublin Bay has a WFD status (2013 – 2018) of 'Good' and a WFD risk score of 'Not at risk'. The ecological status (which comprises biological and chemical status) of transitional and coastal water bodies during 2013-2018 for Dublin Bay is classed as 'good'. The most recent surface water quality data for Dublin Bay for the 2015–2017 assessment on trophic status of estuarine and coastal waters indicate that they are 'Unpolluted' (based on *Water Quality in Ireland*, EPA, 2021). Under the 2015 'Trophic Status Assessment Scheme' classification of the EPA, 'Unpolluted' means there have been no breaches of the EPA's threshold values for nutrient enrichment, accelerated plant growth, or disturbance of the level of dissolved oxygen normally present.

The pumping station at West Pier is designed to transfer wastewater to Ringsend WWTP for treatment prior to ultimate discharge to Dublin Bay. It is operated under the Ringsend WWTP licence. As described above, the catchment for this pumping station (like most in Dublin) contains combined drains (collection storm and foul) rather than just foul drainage. This can result in overcapacity for the existing storage and pumping capacity present during heavy and prolonged rainfall events.

In general, urban wastewater is pumped to Ringsend WWTP, with additional capacity in a holding tank. When the flow is 6-7 times the dry weather flow, there is an approved overflow to the long sea outflow pipe (which extends out into Dublin Bay) and when this capacity is exceeded there is allowed overflow through a short sea outfall at West Pier. The understanding behind this design is that during these conditions, the discharge is highly diluted by rainfall and this is a short-term event into a water body with significant dilution.

Dublin Bay hosts a number of swimming locations protected by the bathing water directive 2006/7. Water quality data collected at bathing areas is reported by the EPA on www.beaches.ie. The EPA bathing status is not based on single events, rather it is based on a review of data over 4 years (based on data collected during the bathing season only). Bathing classes are determined as Excellent (highest cleanest class), Good (Generally good water quality), Sufficient (The water quality meets the minimum standard) and Poor (The water quality has not met the minimum standard).

A review of this data for the last four years, shows that despite these temporary overflows, the current EPA (2020) Bathing Water Quality report has classified Seapoint Strand (e.g.) as 'Excellent' for the last four years 2017-2020.

As the Proposed Development will have no additional stormwater run-off from current during stormwater event, the development will therefore have no impact on the water quality in any overflow situation apart from a minor contribution from foul sewage. The maximum contribution of foul sewage (Peak flow of 3.12 l/s) from the Proposed Development is 0.028% of the peak hydraulic capacity at Ringsend WWTP. It should be noted that the bathing status has no direct relevance to the water quality status of the Natura sites due to rapid mixing and dilution resulting in no measurable change in water quality within the overall water body.

2.2 Aquifer Description and Superficial Deposits

Mapping from the Geological Society of Ireland (GSI, 2021) indicates the bedrock underlying the site is classified as dominated by rocks from the Caledonian system. The site is located over rock Type 2e equigranular (Rock Unit new code: IDNLGRE) which is described as Pale grey fine to coarse-grained granite.

The GSI also classifies the principal aquifer types in Ireland as:

- Lk - Locally Important Aquifer - Karstified
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Rkd - Regionally Important Aquifer (karstified diffuse)

Presently, from the GSI (2021) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a *Poor Aquifer (PI)*, i.e. *Bedrock which is Generally Unproductive except for Local Zones*. The proposed development lies within the Kilcullen Groundwater Body (GWB), classified as poorly productive bedrock. As such it is considered a significant pathway for groundwater migration between the site and Dublin Bay.

The proposed development is within the '*Kilcullen*' groundwater body and is classified under the WFD Status 2013-2018 (EPA, 2021) as having '*Good status*'. The WFD Risk Score system indicates the GWB as '*At risk*'.

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. The GSI (2021) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as '*Moderate*' which indicates a general overburden depth potential of 5-10m. This shows that the aquifer is well protected by low permeability glacial clays. The aquifer vulnerability class in the region of the site is presented as Insert 2.1 below.

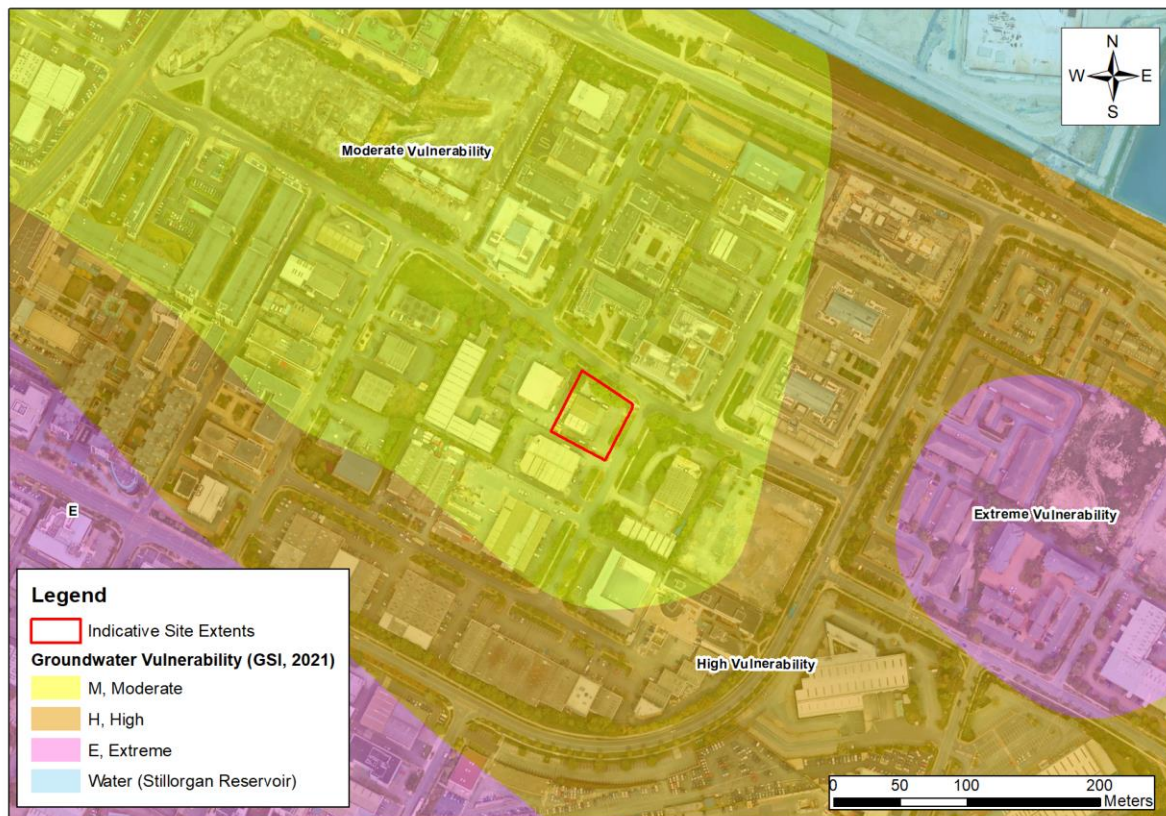


Figure 2.1 Aquifer Vulnerability

The GSI/ Teagasc (2021) mapping database of the quaternary sediments in the area of the subject site indicates the principal subsoil type in the area comprises Limestone till Carboniferous (TLs, i.e. Till derived from limestones).

On the basis of the hardstand already present together with the natural protection provided by the soil and poor hydraulic connectivity in the aquifer shows there is no likely pathway through the soil and aquifer to Dublin Bay. The potential for any leakage of oil, etc. to ground to migrate horizontally or vertically within the aquifer is considered to be relatively low with surface water being the most likely pathway for any accidental release.

3.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is developed based on a good understanding of the hydrological and hydrogeological environment, plausible sources of impact and knowledge of receptor requirements. This in turn allows possible Source Pathway Receptor (S-P-R) linkages to be identified. If no S-P-R linkages are identified, then there is no risk to identified receptors. The sources pathways and receptors are presented in the following sections with the overall impact presented in section 3.4.

3.1 Assessment of Plausible Sources

Potential sources during both the construction and operational phases are considered. For the purposes of undertaking the potential of any hydrological/hydrogeological S-P-R linkages, all potential sources of contamination are considered *without taking account of* any measures intended to avoid or reduce harmful effects of the proposed project (mitigation measures) i.e. a worst-case scenario. Construction sources (short-term) and operational sources (long-term) are considered below.

Construction Phase

The following sources are considered plausible for the proposed construction site:

- (i) Hydrocarbons or any hazardous chemicals will be stored in specific bunded areas. Refuelling of plant and machinery will also be carried out in bunded areas to minimise risk of any potential being discharged from the site. As a worst-case scenario, a rupture of a 1,000-litre tank to ground is considered. This would be a single short-term event.
- (ii) Leakage may occur from construction site equipment. As a worst-case scenario an unmitigated leak of 300 litres is considered. This would be a single short-term event.
- (iii) Use of wet cement is a requirement during construction. Run-off water from recent cemented areas will result in highly alkaline water with high pH. As this would only occur during particular phases of work this is again considered as a single short-term event rather than an ongoing event.
- (iv) Construction requires soil excavation and removal. Unmitigated run-off could contain a high concentration of suspended solids during earthworks. These could be considered intermittent short-term events, i.e. if adequate mitigation measures which are already incorporated in the Construction Environmental Management Plan (CEMP) fail.
- (v) During the excavations for foundations, no significant dewatering is expected given the low permeability overburden underlying the site.

Operational Phase

The following sources are considered plausible post construction:

- (i) The Proposed Development does not require any bulk chemical storage and therefore the potential for water quality impact is negligible.
- (ii) The proposed development site includes car parking area at the site. Leakage of petrol/ diesel fuel may occur from these areas; run-off may contain a worst-case scenario of 70 litres for example.
- (iii) The stormwater drainage system comprises green roofs and petrol interceptors. The interception storage system will be designed in order to discharge following the characteristics of a greenfield run-off into the public stormwater sewer. As such the potential for silt laden runoff is low.
- (iv) The development will be fully serviced with separate foul and stormwater sewers which will have adequate capacity for the facility and discharge limits as required by Irish Water licencing requirements. Discharge from the site to the public foul sewer will be sewage and grey water only due to the residential nature of the Proposed Development. The foul discharge from the site will join the public sewer and will be treated at the Irish Water Ringsend Wastewater Treatment Plant (WWTP) prior to subsequent discharge to Dublin Bay.

This plant operates under an EPA licence (D0034-01) and is currently in the process of being upgraded to a PE of 2.4million to meet the increased demand of the Dublin area. The most recent Annual Environmental Report (AER 2020) shows it is currently operating for a PE peak loading of 2.27million

while originally designed for 1.64million. However, the current maximum hydraulic load (832,269 m³/day) is less than the Peak hydraulic capacity as constructed (959,040 m³/day) i.e. prior to any upgrade works. These upgrade works (described in section 3.4 below) have commenced and comprise a number of phases and are ongoing and expected to be fully completed by 2025.

3.2 Assessment of Pathways

The following pathways have been considered within this assessment:

The potential for offsite migration due to any construction discharges is low as there is no significant pathway in the aquifer or through land ditches or streams.

- (i) Vertical migration to the underlying limestone is minimised due to the recorded 'Moderate' vulnerability existing at the site together with the hardstand already present at the site, resulting in good aquifer protection from any localised diesel/ fuel oil spills during either construction or operational phases. The site is underlain by [generally low permeable] Granite which the GSI classifies as a Poor Aquifer (PI), i.e. Bedrock which is Generally Unproductive except for Local Zones. Flow paths are generally not connected and limited to within the upper weathered zones identified. As such any potential for offsite migration through the underlying granite is considered low.
- (ii) There is no 'direct' hydrological linkage for construction or operational run-off from the site to the Dublin Bay Dublin Natura 2000 Sites. There is however an 'indirect' pathway through the drainage sewer which ultimately discharges into Brewery Stream.
- (iii) There is no 'direct' pathway for foul sewage to any receiving water body (as identified above). There is however an 'indirect pathway' through the public sewer, which is pumped from West Pier and ultimately discharges to the Irish Water WWTP at Ringsend prior to discharge to Dublin Bay post treatment.

3.3 Assessment of Receptors

The receptors considered in this assessment include the following:

- (i) Underlying [poor] Granite bedrock aquifer;
- (ii) South Dublin Bay SAC/SPA/pNHA.

3.4 Assessment of Source Pathway Receptor Linkages

Table 3.1 below summarises the plausible pollutant linkages (S-P-R) considered as part of the assessment and a review of the assessed risk is also summarised below.

The potential for impact on the aquifer is low based on the low chemical storage on site. The overburden thickness, low permeability nature of till and a lack of fracture connectivity within the granite bedrock aquifer will minimise the rate of off-site migration for any indirect discharges to ground at the site. As such there is no potential for a change in the groundwater body status or significant source pathway linkage through the aquifer to any Natura site.

There is no direct open-water pathway between the site and Dublin Bay. However, there is an indirect pathway through the stormwater drainage which would discharge into the Brewery Stream which outfalls into Dublin Bay c. 3.6 Km from the site;

should any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak manage to enter the mentioned watercourse. The suspended solids will naturally settle within the drainage pipes and hydrocarbons will dilute to background levels (water quality objectives as outlined in S.I. No. 272 of 2009 and S.I. No. 77 of 2019 amendment) by the time the stormwater reaches any open water based on the distance to waterways.

During operation, the potential for sediment runoff is low based on the SuDS design measures. In addition, the potential for hydrocarbon discharge is quite minimal based on an individual vehicle (70 litres) leak being the only source for hydrocarbon release. However, even if the operation of the proposed SuDS, and interceptor systems are excluded from consideration, there is no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009 and S.I. No. 77 of 2019) in the worst case scenarios described above at section 3.2. It can also be concluded that the in-combination effects of surface water arising from the proposed development taken together with that of other possible proposed residential developments will not be significant during the operational phase, given the potential quantity of loading of contaminant (a worst-case scenario of 70 litres of leakage of petrol during the operation phase) and even if the attenuation and SuDS measures required to be included in the design of any such developments are not considered.

The peak wastewater discharge is calculated at an average wastewater discharge of 3.12 litres/sec.. Sewage will be separated from stormwater on the site, and collected in the public sewer, and treated ultimately Irish Water's WWTP at Ringsend prior to discharge to Dublin Bay. As outlined in section 3.1 (iv), upgrade works have commenced in 2018 and are expected to be fully completed by 2025. The upgrade works will result in treatment of sewage to a higher quality than current, thereby ensuring effluent discharge to Dublin Bay will comply with the Urban Wastewater Treatment Directive by Q4 2023.

The project is being progressed in stages to ensure that the plant continues to treat wastewater to the current treatment levels throughout the delivery of the upgrade. The project comprises three key elements and underpinning these is a substantial programme of ancillary works:

- Provision of additional secondary treatment capacity with nutrient reduction (400,000 population equivalent);
- Upgrade of the 24 existing secondary treatment tanks to provide additional capacity and nutrient reduction, which is essential to protect the nutrient-sensitive Dublin Bay area; and
- Provision of a new phosphorous recovery process.

In February 2018, the work commenced on the first element, the construction of a new 400,000 population equivalent extension at the Ringsend Wastewater Treatment Plant. These works are at an advanced stage with testing and commissioning stages expected to be completed in the second half of 2021.

The 2019 planning permission facilitated upgrading works to meet nitrogen and phosphorus standards set out in the licence, which are temporarily exceeded currently. Works on the first of four contracts to retrofit the existing treatment tanks with aerobic granular sludge technology commenced in November 2020. Award of the second contract is due in Q3 2021 and the third and fourth contracts are scheduled to commence in late 2021 and mid 2023 respectively.

The application for the upgrade of the WWTP in 2012 and the revised upgrade in 2018 was supported by a detailed EIAR. As outlined in the EIAR, modelling of water quality in Dublin Bay has shown that the upgrades (which are now currently

underway) will result in improved water quality within Dublin Bay. The 2018 EIAR predicts that the improvement in effluent quality achieved by the upgrade will compensate for the increase in flow through the plant. The ABP inspector's report summarises the positive findings of the modelling for the post WWTP upgrade scenario on Dublin Bay water quality in sections 12.3.5 and 12.3.12 of his report and the overall positive impact for human health and the environment in his conclusions in section 12.9.1.

In addition, the EIAR report acknowledges that under the do-nothing scenario "*the areas in the Tolka Estuary and North Bull Island channel will continue to be affected by the cumulative nutrient loads from the river Liffey and Tolka and the effluent from the Ringsend WWTP*", which could result in a deterioration of the biological status of Dublin Bay (Irish Water, 2018). Nevertheless, these negative impacts of nutrient over-enrichment are considered "unlikely" (Irish Water, 2018). This is because historical data suggests that pollution in Dublin Bay has had little or no effect on the composition and richness of the benthic macroinvertebrate fauna. Therefore, the do-nothing scenario predicts that nutrient and suspended solid loads from the WWTP will "continue at the same levels and the impact of these loadings should maintain the same level of effects on marine biodiversity". Therefore, it can be concluded that significant effects on the current status of the European sites within Dublin Bay from the current operation of Ringsend WWTP are unlikely. This conclusion is not dependent upon any future works to be undertaken at Ringsend.

Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the Proposed Development as 3.12 litres/sec (which would equate to 0.028% of the licensed discharge at Ringsend WWTP [peak hydraulic capacity]), would not have a measurable impact on the overall water quality within Dublin Bay and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive). This assessment is supported by hydrodynamic and chemical modelling within Dublin Bay which has shown that there is significant dilution for contaminants of concern (DIN and MRP) available quite close to the outfall for the treatment plant (Ringsend WWTP 2012 EIS, Ringsend WWTP 2018 EIAR; refer to Section 12.4.22, ABP-301798-18 Inspector's report). The most recent water quality assessment of Dublin Bay WFD Waterbody undertaken by the EPA (Water Quality in 2020: An Indicator Report, 2021) also shows that Dublin Bay on the whole, currently has an 'Unpolluted' water quality status (refer to www.catchments.ie).

With regard to bathing waters in Dublin Bay, as mentioned above the Proposed Development will have no impact on the water quality in any overflow situation apart from a minor contribution (0.028% of the peak hydraulic capacity at Ringsend WWTP) from foul sewage.

The assessment has also considered the effect of cumulative events, such as release of sediment laden water combined with a hydrocarbon leak on site. As there is adequate assimilation and dilution between the site and the Natura 2000 sites (Dublin Bay, which is c. 3.6 Km from the site), it is concluded that no perceptible impact on water quality would occur at the Natura 2000 sites as a result of the construction or operation of this Proposed Development. It can also be concluded that the cumulative or in-combination effects of effluent arising from the Proposed Development with that of other permitted proposed developments, or with development planned pursuant to statutory plans in the greater Dublin, Meath and Kildare areas, which will be discharged into Ringsend WWTP will not be significant having regard to the size of the calculated discharge from the Proposed Development and having regard to the following:

- Recent water quality assessment for Irish Sea Dublin and Dublin Bay shows

that they currently continue to meet the criteria for 'Unpolluted' water quality status (EPA, data until July 2021).

- The Ringsend WWTP upgrade which is currently being constructed will result in improved water quality by Q4 2023 to ensure compliance with Water Framework Directive requirements.
- All new developments are required to comply with SuDS which ensures management of run-off rate within the catchment of Ringsend WWTP.
- The natural characteristics of Dublin Bay result in enriched water rapidly mixing and degrading such that the plume has no appreciable effect on water quality at Natura sites.

As the Proposed Development will have no additional stormwater run-off during a stormwater event over and above the current level, surface water run-off from the development in the operational phase will therefore have no impact on the current water quality in any overflow situation at Dublin Bay.

It should also be noted that the bathing status has no direct relevance to the water quality status of the Natura sites due to rapid mixing and dilution resulting in no measurable change in water quality within the overall water body.

In addition, there is no long term discharge planned which could have an impact on the status of the water body. In the scenario of an accidental release (unmitigated leaks mentioned above) there is potential for a temporary impact only which would not have an impact on the water body status.

Finally, in a worst-case scenario of an unmitigated leak and not considering the operation of the SuDS and interceptor already included in the design, no perceptible risk to any Natura Sites 2000 is anticipated given the distance from source to Dublin Bay protected areas (c. 2.3 Km). Potential contaminant loading will be attenuated, diluted and dispersed near source area.

Table 3.1 below presents a summary of the risk assessment undertaken.

Source	Pathways	Receptors considered	Risk of Impact
Construction Impacts (Summary)			
Unmitigated leak from an oil tank to ground/ unmitigated leak from construction vehicle.	Bedrock protected by 5-10m low permeability overburden. Low fracture connectivity within the granite will limit any potential for offsite migration	Granite bedrock aquifer (poor important aquifer)	Low risk of migration through poorly connected fracturing within the granite rock mass (Poor Aquifer). No likely impact on the status of the aquifer/off site migration due to low potential loading, natural attenuation within overburden and discrete nature of fracturing reducing off site migration.
Discharge to ground of runoff water with High pH from cement process/ hydrocarbons from construction vehicles/run-off containing a high concentration of suspended solids	Indirect pathway through stormwater drainage to Dublin Bay water course (distance source-receptor: 3.6 Km)	South Dublin Bay SAC/SPA/pNHA	Potential for local temporary exceedances of statutory water quality standards at outfall. However, no perceptible risk to water requirements for the Natura sites in Dublin Bay based on loading and high level of dilution in stormwater sewer and the Brewery Stream and on the distance of c. 3.6 Km between the source and Dublin Bay.
Operational Impacts (Summary)			
Foul effluent discharge to sewer	Indirect pathway to Dublin Bay through public sewer	South Dublin Bay SAC/SPA/pNHA	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge (3.12 litres/sec which would equate to 0.028% of the licensed discharge at Ringsend WWTP), would not impact on the overall water quality within Dublin Bay and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive).
Discharge to ground of hydrocarbons from car leak	Indirect pathway through stormwater drainage to Dublin Bay water course (distance source-receptor: 3.6 Km)	South Dublin Bay SAC/SPA/pNHA	No perceptible risk – Negligible loading of chemical distance between the source and Dublin Bay is c. 3.6 Km and significant dilution in the stormwater sewer and Brewery Stream will ensure any released hydrocarbons are at background levels (i.e., with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009 and S.I. No. 77 of 2019 amendment)

Table 3.1 Pollutant Linkage Assessment (*without mitigation*)

4.0 CONCLUSIONS

A conceptual site model (CSM) has been prepared following a desk top review of the site and surrounding environs. Based on this CSM, plausible Source-Pathway-Receptor linkages have been assessed assuming an absence of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures) in place at the Proposed Development site.

There is no direct source pathway linkage between the Proposed Development site and open water (i.e. South Dublin Bay SAC/SPA/pNHA). There are indirect source pathway linkage from the Proposed Development through the public stormwater sewer which discharges into the Brewery Stream. There is also an indirect connection through the foul sewer which will eventually discharge to the Ringsend WWTP and ultimately discharges to Dublin Bay. The future development has a peak foul discharge that would equate to 0.028% of the licensed discharge at Ringsend WWTP (peak hydraulic capacity).

It is concluded that there are no pollutant linkages as a result of the construction or operation of the Proposed Development which could result in a water quality impact which could alter the habitat requirements of the Natura sites within Dublin Bay.

Finally, in line with good practice, mitigation measures are included during construction to minimise the potential for any accidental releases off site. During operation, the potential for an impact to ground or storm water is negligible and there are design measures incorporated within the Proposed Development to manage stormwater run-off quality. These specific measures will provide further protection to the receiving soil and water environments. However, the protection of downstream European sites is in no way reliant on the implementation of mitigation measures during the construction or operational phases of the proposed development.

5.0 REFERENCES

EPA (2021). Environmental Protection Agency. Available on-line at: <https://gis.epa.ie/EPAMaps/> [Accessed: 15-11-2021].

GSI (2021). Geological Survey of Ireland; Available on-line at: <http://www.gsi.ie> [Accessed: 15-11-2021].

NPWS (2021). National Parks & Wildlife Service. Available on-line at: <http://webgis.npws.ie/npwsviewer/> [Accessed: 15-11-2021].

Irish Water (2021). Ringsend Wastewater Treatment Plant Annual Environmental Report 2020.

Irish Water (2018) Ringsend Wastewater treatment plant Upgrade Project Environmental Impact Assessment Report.

Inspector's Report – ABP-301798-18. 10-year permission for development of the Ringsend wastewater treatment plant upgrade project including a regional biosolids storage facility.

Board Order and Report of Inspector – ABP-301798-18. 10-year permission for development of the Ringsend wastewater treatment plant upgrade project including a regional biosolids storage facility.

CS Consulting Group (2021). Engineering Services Report for a Proposed Development at 31 & 31A Ravensrock, Sandyford, Dublin 18.

CS Consulting Group (2021). Site Specific Flood Risk Assessment for a Proposed Development at 31 & 31A Ravensrock, Sandyford, Dublin 18.