HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT for PROPOSED RESIDENTIAL DEVELOPMENT SITE at East Wall Road Development

Technical Report Prepared For

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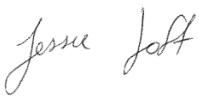
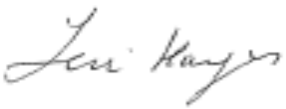
Signature		
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1.0 INTRODUCTION

1.1 Site Location & Hydrological Setting

The proposed development consists of the demolition of the existing 2 no. storey light industrial / commercial units (except units 11, 15, 16) and the construction of 336 residential units. The proposed development also includes the provision of a retail unit, creche, café / restaurant and office accommodation. The development also includes resident amenity spaces such as concierge, gym and roof terraces.

The proposed development also includes the retention of some of the existing light industrial / commercial units on the site, Units 11, 15 and 16. These units will be retained, and the external elevations refurbished to improve the visual amenity and appearance of these structures in accordance with the proposed development on the site.

The proposed development will also include significant landscaping works comprising of hard and soft landscaping, provision of public and communal open spaces, new internal roads and new boundary treatments.

The proposed development formed is part of the development at the IDA Business Park, East Wall Road, Dublin 3 (refer site location in Figure 1.1 below). The site is 1.45 Ha and is currently used as a commercial / residential site and the lands surrounding the site consist of urban and commercial buildings. The topography range of approx. +4 mOD (north) to +2 mOD (south).

Figure 1.1 Site Location in relation to regional drainage (hydrological setting)

The EPA (2019) on-line database indicates two watercourses within the general area of the subject site, as shown in Figure 1.1 above, and discussed further in Section 1.3 below. The nearest watercourse is the Tolka River Estuary located <600 m from the site which is located north of the development, <1 km to the south the Liffey Lower Estuary is located. It is understood that both of these surface water features have modified urban watercourse. Both the Liffey River Estuary and the Tolka River Estuary drain in an easterly direction where it discharges into Dublin Bay. There is also a public and private network of surface water pipe in which the site currently drains (POGA, 2019).

1.2 Objective of Report

The scope of this desk top review is to confirm any hydrological pathway to a Natura 2000 sites and determine the risks based on the construction and operation of the proposed development.

In particular, this review considers the likely impact of construction run-off and domestic sewage from the proposed development on water quality and overall water body status within Dublin Bay habitats SAC/ SPA/ pNHA which is located to the east of the proposed development (see Figure 1.1). The assessment relies on information regarding construction and design provided by POGA Consulting Engineers (POGA, 2019) for the site as outlined in their '*Engineering Planning Report:* (Report ref: 1731-ER(I)-R2., dated December 2019).

This report is prepared by *Jessie Loft* (BSc and MSc) and *Teri Hayes* (BSc MSc PGeol EurGeol). 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.

1.3 Description of Drainage

There is no direct discharge to an open stream/Dublin Bay proposed as part of this development. Discharge from the site has been directly to public service water pipes and existing private drainage within the existing industrial development (the private drainage discharges into the public service pipe).

The nearest surface water receptors lie to the north and south of the proposed development site (refer Figure 1.1 above). These are identified as the Tolka River Estuary (EPA code: 09T01) located to the north of the site (<600 m), and Liffey River Estuary (EPA code: 09L01) located <1 km to the south of the site. There is no direct open-water linkage between the proposed development and these water bodies.

The development will involve the upgrade of associated infrastructure and to renew a large portion of the existing private networks within the site (the new surface water drainage will connect back at the same location to the public service pipe). The wastewater network which currently services the existing site is located under Merchants Road to the east of the development. It is proposed to renew a portion of this network to allow for deeper invert levels.

The development is susceptible to flooding and varying flood mitigation measures have been implemented for this project, some examples include: a flood barrier gate at the basement car park access; emergency access plans to ensure safety; and surface water flows onsite will be incorporated into the developments stormwater system.

With regard to stormwater drainage, the development will incooperate a Stormwater Retention System to the roof areas and the podium slab over the basement. The surface water collected will be released into an attenuation tank at a fixed rate (4.84 L/s for the roof areas and 3.36 L/s for the podium area). The attenuation tanks from the roof and podium area in conjunction with the secondary attenuation tank (built for a 1 in 100-year storm event) and can hold 851.8 m^3 (refer to Figure 1.2).

Surface water run-off from the proposed development will then discharge into the public service pipe (at a rate of 2.6 l/s), which based on a hydrological pathway will eventually end up in the bay. The South Dublin Bay and River Tolka River Estuary SPA is located over 2.8 river km downstream and the North Dublin Bay SAC and North Bull Island SPA which are located over 5.3 km downstream. The South Dublin Bay SAC is located outside the South Bull wall and while hydrologically more disconnected from the Liffey River, it overlaps the South Dublin Bay and River Tolka River Estuary SPA.

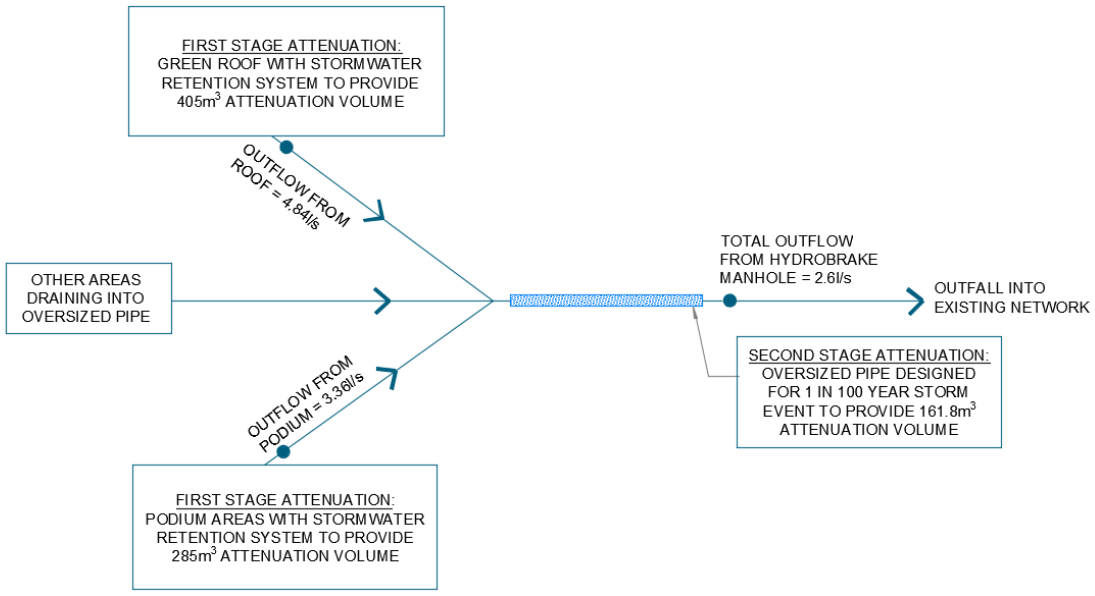

Figure 1.2 Sustainable Drainage Flow Chat (Taken from POGA, 2019)

Landscaping works comprise of sedum vegetation on the roofs which will minimise excess water on impermeable areas and encourage stormwater to soak into the soft landscaping while filtering pollutants.

The calculated flows from the development to the foul sewer network has a peak capacity flow of up to 2.2 l/s. The foul sewer connects to Ringsend WWTP and after treatment is eventually discharged to the Liffey River.

The development approach to ensure that run-off is of high quality is to use SUDS designs (Greater Design Strategic Drainage Study -Dublin City Council, and Dun-Laoghaire Rathdown County Council) surface water treatment train approach, this will be applied to the design of the surface water drainage for this development.

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 environments.

2.1 Hydrological Catchment Description

The proposed development site lies within the Liffey River and Dublin Bay Catchment 09. The Liffey River (EPA, 2019) begins in Liffey head bog (near the Wicklow mountains) and flows generally north- eastwards with intermittent open water course and culverted sections before finally discharging to Dublin Bay. In contrast, the Tolka River (EPA, 2019) flows generally south- eastwards with intermittent open water course and culverted sections before finally discharging to Dublin Bay.

The Dublin Bay waterbody includes Special Area of Conservation (SAC), Special Protection Area (SPA), and proposed Natural Heritage Area (pNHA). The Environmental Protection Agency (EPA, 2019) on-line mapping presents the available water quality status information for water bodies in Ireland. Dublin Bay has a WFD status of '*good*' (2013-2018) and has a WFD risk score of '*not at risk'*. The most recent surface water quality data for the Dublin Bay (2010-2012) indicate that they are '*unpolluted*'.

The southern and northern transitional waterbodies were investigated to see the status of their WFD. The available water quality status information for the Tolka River Estuary has a WFD status of '*moderate*' and has a '*at risk*' risk score (2013-2018). The Liffey River Estuary Lower waterbody has a WFD risk score of '*at risk of not achieving good status*' while the Tolka River Estuary waterbody has a WFD risk score of '*at risk'* (2013-2018). The most recent surface water quality data for the Liffey River Estuary Lower and Tolka River Estuary (2010-2012) indicate that they are '*unpolluted*' and '*potentially eutrophic'* respectively. 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 current EPA (2019) bathing water quality report has classified nearby Dollymount Strand as '*sufficient'* for 2015 and '*good*' for 2016 – 2018

2.2 Aquifer Description & Superficial Deposits

The Geological Survey of Ireland GSI (2019) classifies the bedrock beneath the overall site and the surrounding area as Lucan Formation which comprises of dark limestone and shale.

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

- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Pl - 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 (2019) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a *locally important aquifer (Ll), i.e. 'bedrock which is moderately productive only in local zones'*.

The proposed development lies within the Dublin Groundwater Body (GWB, IE_EA_G_008), classified as '*moderately productive'*. Presently, the groundwater body in the region of the site (Dublin GWB) is classified under the WFD status 2010-2015 (EPA, 2019) as '*good'*. The WFD risk score system indicates the GWB as '*not 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 (2019) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as '*low'* which indicates a general thick overburden depth potential of > 10m, indicating good protection of the underlying aquifer by low permeability subsoil. This desk study data was confirmed by drilling on site showing the overburden had depths up to 24 mbgl before hitting any obstruction. The aquifer vulnerability class in the region of the site is presented as Figure 2.1 below.

Figure 2.1 Aquifer Vulnerability

The GSI/ Teagasc (2019) mapping database of the quaternary sediments in the area of the subject site indicates the principal subsoil type in the study area, underlying namely *made ground* which reflects the urbanised land use in the immediate area.

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.

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) Re-fuelling will generally be undertaken off site.
(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) The demolition of the existing building units and re - construction requires soil excavation and removal and import. Unmitigated run-off could contain a high concentration of suspended solids during earthworks. This could be considered an intermittent short-term event.

Operational Phase

The following sources are considered plausible post construction:

(i) Leakage of petrol/ diesel fuel may occur from individual cars in parking areas, run-off may contain a worst-case scenario of 70 litres, for example. The risk of a short-term release of oil is already considered under the construction scenario above i.e. without mitigation. It is noted that mitigation will be provided by a proposed oil/ petrol interceptor at the site. Within the basement carpark area, any rainwater entering the sealed system as a result of snow melt or raindrops from cars will pass through a petrol interceptor providing treatment before discharging to the foul sewer. These mitigation measures have not been considered in this risk assessment.
(ii) The development will be fully serviced with [separate] foul and storm sewers which will have adequate capacity for the facility as required by Irish Water licencing. 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 WWTP prior to subsequent discharge to Dublin Bay. This WWTP is required to operate under an EPA licence and must meet environmental legislative requirements as set out in such licence. It is noted that an application for a new upgrade to this facility (Irish Water, 2018) has recently received planning and is expected to be fully operational with greater treatment capacity within 5 years. All [attenuated] stormwater will go to the public stormwater network which will discharge to Dublin Bay.

3.2 Assessment of Pathways

The following pathways have been considered within this assessment with impact assessment presented in Section 3.4:

(i) The potential for vertical migration to the bedrock aquifer is minor due to the recorded low vulnerability present at the site, there is a thick subsoil which will encourage excess stormwater to soak into the soft landscaping while filtering

pollutants. The site is underlain by a *locally important aquifer (LI)* GSI classifies as a *bedrock which is moderately productive only in local zones.*

(ii) There is no open water hydrological linkage with Dublin Bay located farther down-gradient. However, an 'indirect pathway' does exist through the public stormwater sewer network which ultimately discharges to Dublin Bay (5.3 km to the east).

(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 ultimately discharges to the Irish Water WWTP at Ringsend prior to final discharge to Dublin Bay post treatment.

3.3 Assessment of Receptors

The receptors considered in this assessment include the following:

(i) Underlying [moderate] limestone bedrock aquifer;
(ii) Liffey River Estuary and Tolka River Estuary;
(iii) Dublin Bay;
(iv) Dollymount Strand bathing water quality (for reference); and
(v) Natura 2000 sites.

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 overburden thickness/ strength will help to minimise the rate of off-site migration for any indirect discharges to ground at the site.

Standard mitigation e.g. use of a silt buster or similar to allow settlement of any silt laden stormwater during construction will be incorporated into the construction plan design to minimise any impacts on stormwater drains. However, should any silt-laden stormwater from construction manage to enter the public stormwater sewer i.e. without on-site mitigation, the suspended solids will naturally settle within the drainage pipes and at the outfall to Dublin Bay SAC/SPA/pHNA. Short term settlement of sediment will have no detrimental impact on the habitat requirements of Dublin Bay.

In the event of a [theoretical] 300 litre [worst case scenario used] hydrocarbon leak fully discharging to the stormwater sewer during low flow conditions without mitigation, there is potential for some short-term impact above water quality objectives as outlined in S.I. No. 272 of 2009/ Surface Water Amendment Regs in Dublin Bay. This would be a short-term event. The storm pipe which services this development also services a large catchment area and the storm pipe being 600 m - 1000 m to the nearest discharge site. Due to these factors the dilution and attenuation from the impact would not be measurable >0.5 km from the site or for a duration of longer than c. 5 days i.e. there would be no likely exceedance above statutory guidelines within the bay. However, with the presence of an oil/ petrol interceptor within the sealed basement car park area of the proposed development,

there is no likely impact above statutory thresholds in the off-site stormwater drainage. Based on the possible loading of any hazardous material during construction and operation there is no potential for impact on Dublin Bay water quality status from an accidental discharge to stormwater.

Based on a value of 270 litres/capita/day (l/c/day) for the development site (including residential units, commercial area, creche areas, and retail areas) and an occupancy of 1651 people within 336 residential units, a commercial area, a creche areas, and retail areas. The average wastewater discharge is calculated at 0.66 l/s and the peak foul DWF is calculated to be 2.2 l/sec.

The sewage discharge will be licensed by Irish Water, collected in the public sewer and treated at Irish Water's WWTP at Ringsend prior to treated discharge to Dublin Bay. This WWTP is required to operate under an EPA licence (D0034-01) and to meet environmental legislative requirements. The plant has received planning (2019) and will be upgraded with increased treatment capacity over the next five years. The foul discharge, calculated for the proposed development is well within the capacity of the proposed outfall, i.e. 2.2 l/sec to the Irish Water foul sewer line. Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the proposed development, would equate to 0.02% of the licensed discharge (peak hydraulic capacity) at Ringsend WWTP and 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). (*Note: the average effluent discharge equates to approx. 0.01% of the* licensed discharge (peak hydraulic capacity) at Ringsend WWTP). Recent water quality assessment of Dublin Bay also shows that Dublin Bay on the whole, currently has an '*unpolluted*' water quality status (EPA, 2019).

The assessment has also considered the *effect of cumulative events, such as* release of sediment-laden water combined with a minor hydrocarbon leak on site. As the potential hazard loading is low and short term in nature, it is concluded that no perceptible impact on water quality would occur. It can also be concluded that the cumulative or in-combination effects of effluent arising from the proposed development with that of other developments discharging to Ringsend WWTP will not be significant having regard to the size of the calculated discharge from the proposal.

The '*good*' bathing water status (issued by the EPA) at Dollymount Strand will be unchanged by the proposed development at East Wall road. The existing and proposed foul and storm sewers are 'separate' in compliance with the Building Regulations and Dublin City Councils '*Regional Code of Practice for Drainage works and Irish Waters Code of Practice for Wastewater Infrastructure'*. As such, there is no potential for sewage-laden water from the proposed development to enter the local stormwater network ultimately discharging to Dollymount Strand at Dublin Bay.

Source	Pathways	Receptors considered	Risk of Impact (without mitigation)
Construction Impacts Unmitigated leak from a construction vehicle.	Vertical with protection by overlying clayey subsoils (Low vulnerability)	limestone bedrock aquifer (Moderate aquifer)	Minor to moderate risk of localised impact to the underlying bedrock aquifer due to thickness of the protective overburden. No likely impact on the status of the aquifer due to volume of leak indicated, some natural attenuation within overburden [albeit variable] which will also reduce off site migration.
Discharge to ground of runoff water with High pH from cement process	Indirect pathway through stormwater drainage to Dublin Bay	Dublin Bay (SAC/ SPA/ pNHA)	Minor to moderate risk of a temporary impact without mitigation on Tolka and Liffey River Estuary (No likely impact on source due to dilution and distance to discharge point).
Unmitigated run-off containing a high concentration of suspended solids			No likely impact due to low contaminant loading and distance (5.3 km) allowing attenuation and dilution near source area.
Operational Impacts Foul effluent discharge to sewer	Indirect pathway to Dublin Bay through public sewer, however main pathway is via Ringsend WWTP	Dublin Bay (SAC/ SPA/ pNHA)	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge from the site would equate to 0.02% [Note 1] 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 carpark leak	Indirect pathway through stormwater drainage to Liffey and Tolka River Estuary water course	Dublin Bay (SAC/ SPA/ pNHA)	No likely impact due to low contaminant loading and short-term nature of any likely impact.

Table 3.1 Pollutant Linkage Assessment *(without mitigation)*

Note 1: This assessment is based on the current licenced discharge from the Ringsend WWTP. IW have a number of projects which have receive planning or are within the planning process which will result in greater capacity for wastewater treatment for the greater Dublin area. In particular, the following key projects are applicable:

(i) Ringsend WWTP upgrade – An application for the upgrade was lodged with An Bord Pleanála in June 2018 and planning permission was granted in April 2019. Upgrade works are scheduled to increase the treatment capacity from 1.64 million p.e. to 2.4million p.e. This upgrade is currently programmed to be complete in 2025.

(ii) Greater Dublin Drainage Project – A planning application was lodged with An Bord Pleanála in June 2018, an oral hearing held in March 2019 and a decision is currently awaited.

(iii) 9C sewer duplication. A planning application for this project was lodged with FCC on 11th May 2017 and FCC granted planning permission on 5th July 2017. Construction has commenced in summer 2019 and will be completed by September 2022.

(iv) The Liffey Siphons refurbishment project – Construction of this project commenced in May 2018 and is expected to be completed in December of this year.

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 open water linkage between the proposed development site and Tolka and Liffey River Estuary or Dublin Bay Natura 2000 site. It is concluded that there is also no resultant indirect source pathway linkage from the proposed development through public sewers which could result in any change to the current water regime (water quality or quantity) with Dublin Bay Natura 2000 sites

Finally, as outlined in the report prepared by POGA (2019), and in line with good practice, mitigation measures have been included in the construction design, management of construction programme and during operation of the proposed development. 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 these measures.

5.0 REFERENCES

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