HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT for PROPOSED DEVELOPMENT at SPENCER PLACE BLOCK 2 SPENCER DOCK D1

Technical Report Prepared For

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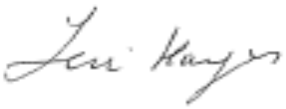
Signature		
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1.0 INTRODUCTION

1.1 Site Location & Hydrological Setting

The development comprises 464 no apartment units and the change of use of the perrmitted aparthotel development to shared accomodation. The site is located at City Block 2 Spencer Dock Dublin 1, bound by Sherriff Street to the norths, Mayor Street to the south and New Wapping Street to the east (refer site location in Figure 1.1 below).

Figure 1.1 Site Location (Grid Reference O 176 346)

The site gradient is shallow and has an average topographical level of approximately 2.5m AOD (Malin Head). The Liffey river flows west to east c. 200 metres south of the site, discharging to Dublin Bay. Dublin Bay contains a number of areas of Natura 2000 sites as shown in Figure 1.2 below. These are further described in the AA Screening provided with this planning application and the Biodiversity chapter of the EIA report. The Royal Canal flows further west of the site. This is fully lined and has no connectivity with the site.

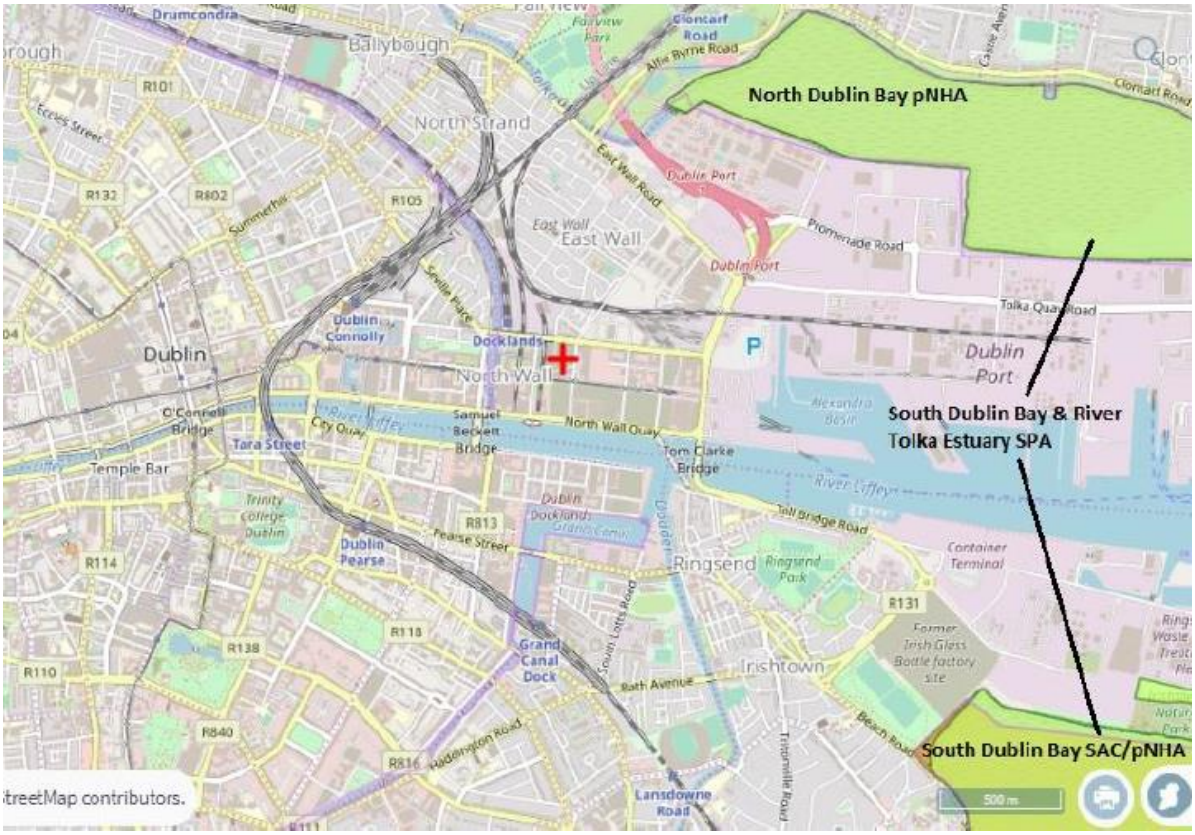

Figure 1.2 Site Location (Red Cross) and nearest areas of nature conservation

1.2 Objective of Report

The scope of this desk top review is to assess the potential for any likely significant impacts on receiving waters during construction or post development The assessment considers the likely impact on water body status 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 run-off and domestic sewage from the proposed development on water quality and overall water body status within Dublin Bay and Natura 2000 sites. The assessment relies on information regarding construction and design provided in the following reports:

Engineering Services Report prepared by CS Consulting Group (August, 2019)
Construction Management Plan by PJ Hegarty (July 2019)

This report is prepared by *Teri Hayes* (BSc MSc EurGeol). Teri is a hydrogeologist with over 25 years' 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). Teri's 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/river proposed as part of this development.

The nearest surface water receptor is the River Liffey (IE_EA_090_0300) which lies 200 m to the south of the proposed development site (refer Figure 1.1 above). The area is part of the Liffey and Dublin Bay catchment and the Tolka subcatchment Tolka SC_020). Code 09_4) There is no direct hydraulic linkage between the proposed development and these water bodies.

The proposed development will incorporate separate storm and foul sewer lines. Stormwater collected from the site will be collected and attenuated (to predevelopment run-off rates) prior to discharge through an oil interceptor to the combined sewer on New Wapping Street. Ultimately this discharges to Ringsend WWTP

The proposed development will include design of a new foul drainage system. Above ground development will drain to the combined sewer on New Wapping Street. This combined sewer eventually discharges to Ringsend Waste Water Treatment Plant (WWTP).

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 River Liffey and Dublin Bay Catchment. The nearby Dublin Bay (Site Code: 00210) waterbody includes 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*'. The Liffey Estuary Lower (IE_EA_090_0300) waterbody has a WFD risk score of '*At risk of not achieving good status*' while the Dublin Bay waterbody has a WFD risk score of '*Not at risk'*. The most recent surface water quality data for the Liffey Estuary Lower and Dublin Bay (2010-2012) indicate that they are '*Unpolluted*'. 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.

2.2 Aquifer Description & Superficial Deposits

The Geological Survey of Ireland GSI (2019) classifies the bedrock beneath the site and the surrounding area as dominated by limestone bedrock (Calp). 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 (LI), i.e. Bedrock which is Moderately Productive only in Local Zones*

The proposed development is within the '*Dublin*' groundwater body and is classified as '*Poorly productive bedrock*'. Presently, the groundwater body in the region of the site is classified under the WFD Status 2010-2015 (EPA, 2019) as '*Expected to achieve good status'*. 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 overburden depth potential of >10m, indicating a natural protection of the aquifer by low permeability alluvial/glacial clays. The aquifer vulnerability class in the region of the site is presented as Insert 2.1 below.

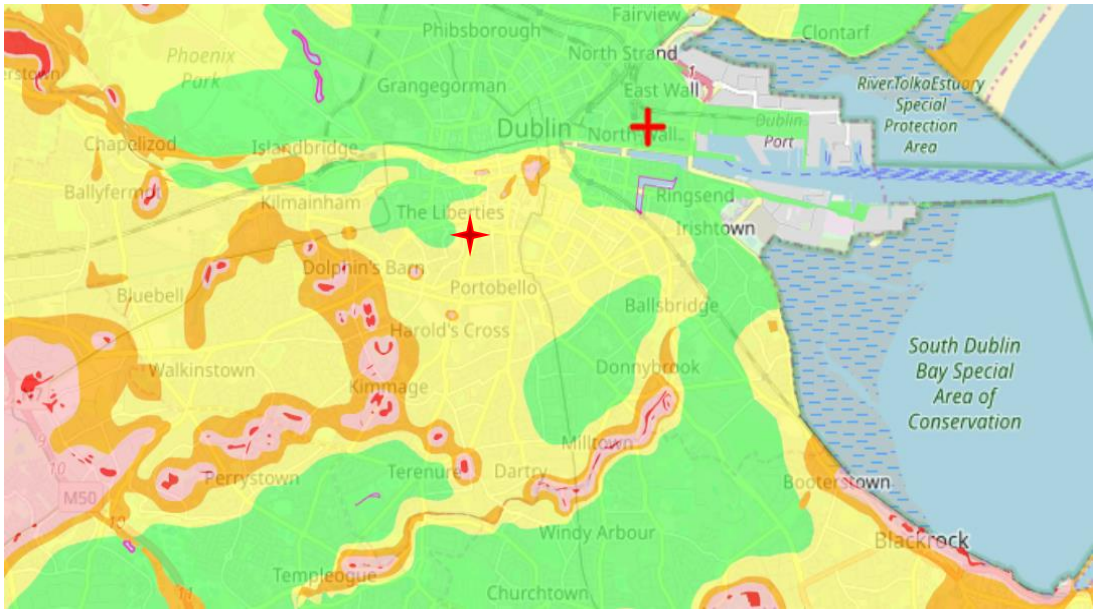

Figure 2.1 Aquifer Vulnerability (site location indicated, red cross)

On the basis of the 'Low Vulnerability' classification the potential for any leakage of oil etc to ground to migrate horizontally or vertically to the underlying bedrock is considered to be relatively low.

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) Leakage may occur from construction site equipment. There will be no bulk fuel tank storage for re-fuelling the site. Fuel is delivered to site every few days and all plant is filled directly. There is no storage of fuel in general. At most, there may be some small amounts of fuel (less than 100L) stored in bunded containers for small plant such as consaws, compressors etc. As a worst-case scenario an unmitigated leak of 300 litres is considered. This would be a single short-term event.

(ii) Use of wet cement is a requirement during construction. Run-off water from recent cemented areas can 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.

(iii) Construction requires soil excavation and removal. Unmitigated run-off could contain a high concentration of suspended solids during earthworks. This could be considered an intermittent short-term event, i.e. if adequate mitigation measures were not incorporated in the Construction Management Plan (CMP). Removal of soil will also result in long term improvement in local water quality due to removal of historically contaminated soil.

Operational Phase

The following sources are considered plausible post construction:

(i) The proposed development will be heated via heat pumps (electric) and the co living units will be heated using a multi-purpose chiller (again electric). The co-living units will have their water heated by a centralised water heating system (gas fired). No bulk fuel/ chemical storage form part of the development plans.

(ii) 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. Any corresponding risk here will be mitigated by the proposed oil/ petrol interceptor at the outfall of the stormwater discharge from the site.

(iii) 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/ retail 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 (combined sewer) and therefore ultimately to the Irish Water Ringsend WWTP.

3.2 Assessment of Pathways

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

(i) Vertical migration to the underlying limestone aquifer (Ll) is minimised due to the recorded alluvial clays (Low Vulnerability) present at the site providing protection from any localised diesel/ fuel oil spills during either construction or operational phases. The site is underlain by (generally low permeability) limestone with poor connectivity of fractures, which the Geological Survey of Ireland classifies as a *locally Important (Ll),*

(ii) There is no ‘direct’ hydrological or hydrogeological linkage for construction or operational run-off or any small hydrocarbon leaks from the site to the Liffey or Dublin Bay located farther down-gradient. However, an ‘indirect pathway’ does exist through the off site combined sewer network which ultimately discharges to Dublin Bay following treatment at Ringsend WWTP.

(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 combined 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 limestone bedrock aquifer;

(ii) River Liffey Estuary Lower and Dublin Bay.

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 clayey overburden thickness/ and a general lack of fracture connectivity associated with limestone beneath the site will minimise the rate of off-site migration for any indirect discharges to ground at the site.

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 by the time the stormwater reaches any open water. 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. 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 (on site interceptor or treatment at Ringsend WWTP), there is a low potential for some impact above water quality objectives as outlined in S.I. No. 272 of 2009/ Surface Water Amendment Regs SI No. 386 of 2015 in Dublin Bay prior to dilution. However, with the presence of an oil/ petrol interceptor, there is no likely impact above statutory thresholds. Based on the possible loading of any hazardous material during construction and operation there is subsequently no potential for impact on Dublin Bay water quality status from an accidental discharge to stormwater drain.

Based on an effluent volume of 450 litres/person/day (l/p/day) and 500 litres/room/day (l/p/day) (applying Irish Water Code of Practise for Wastewater Infrastructure (Clause 3.6)), the dry weather wastewater discharge is calculated at 2.92 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. Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the proposed development, would equate to 0.026 % of the licensed discharge 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). 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 (WWTP 2012 EIS, WWTP 2018 EIAR). 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 th*e 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 Dublin Bay SACs/ pNHAs, 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.

Source	Pathways	Receptors considered	Risk of Impact
<u>Construction Impacts</u> Unmitigated leak from a construction vehicle.	Vertical migration inhibited by overlying clayey soils (Low vulnerability)	Limestone bedrock aquifer (Locally Important aquifer)	No perceptible risk of localised impact to limestone due to protection by thick deposits of alluvial clays. No likely impact on the status of the groundwater body due to likely volume of a leak, natural attenuation within overburden.
Discharge to ground of runoff water with High pH from cement process	Indirect pathway through leakage from the off site combined sewer	Liffey River and	Low risk of a temporary impact without mitigation (removed within a single tidal cycle) from a leaking off site sewer, due to low chemical loading but no perceptible impact with the proposed mitigation (CMP) in place
Unmitigated run-off containing a high concentration of suspended solids		Dublin Bay and Natura 2000 sites	No perceptible risk due to low chemical loading, distance to bay through the sewer system and dilution.
<u>Operational Impacts</u> Foul effluent discharge to sewer	Indirect pathway to Dublin Bay through public sewer, via Ringsend WWTP	Dublin Bay and Natura 2000 sites	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge would equate to 0.026% 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 leakage from the off site combined sewer	Liffey River	No perceptible risk due to low chemical loading even without mitigation. The presence of an oil interceptor will be mitigate any localised car leaks at source.

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 (Dublin Bay). It is concluded that there is also no impact from the additional discharge from the proposed development through the combined public [foul and stormwater] sewer network which could result in any change to the current water regime (water quality or quantity).

Finally, and in line with good practice, appropriate and effective mitigation measures have been included in the construction design, management of construction programme and during the operational phase 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

EPA, (2019). Environmental Protection Agency. Available on-line at: https://gis.epa.ie/EPAMaps/ [Accessed: 12-08-2019].

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GSI, (2019). Geological Survey of Ireland; Available on-line at: http://www.gsi.ie [Accessed: 12-08-2019].

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