



**HYDROLOGICAL &
HYDROGEOLOGICAL
QUALITATIVE RISK
ASSESSMENT**
for
**Proposed Strategic Housing
Development (Alterations to
Phase 1 Residential and
Proposed Phase 2 Residential
Development)**

The Tecpro Building,
Clonsaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

Technical Report Prepared For

IMRF II Frascati Limited Partnership

Technical Report Prepared By

Teri Hayes Director
BSc MSc PGeo

Our Reference

TH/20/11768SR01

Date of Issue

18 August 2020

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	
TH/20/11768		04 08 2020	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval



Details	Written by	Approved by
Signature		
Name	Teri Hayes	Dr Fergal Callaghan
Title	Director	Director
Date	18 th August 2020	18 th August 2020

TABLE OF CONTENTS		Page
1.0	INTRODUCTION	4
1.1	Site Location & Hydrological Setting	4
1.2	Objective of Report	4
2.0	ASSESSMENT OF BASELINE WATER QUALITY, RIVER FLOW AND WATER BODY STATUS	5
2.1	Hydrological Catchment Description	6
2.2	Aquifer Description & Superficial Deposits	7
3.0	REVIEW OF PROPOSED SITE DRAINAGE	9
4.0	CONCEPTUAL SITE MODEL	9
4.1	Assessment of Plausible Sources	10
4.2	Assessment of Pathways	10
4.3	Assessment of Receptors	10
4.4	Assessment of Source Pathway Receptor Linkages	10
5.0	CONCLUSIONS	13
6.0	REFERENCES	13

Tables

Table 4.1 - Pollutant Linkage Assessment (without mitigation)

1.0 INTRODUCTION

1.1 Site Location & Setting

The proposal relates to alterations to the Phase 1 permission for 45 no. apartments (Reg. Ref.: D17A/0950 & ABP Ref.: 300745-18), from second to fourth floor level of the rejuvenated Frascati Centre. The proposed development also includes the provision of 57 no. additional apartments, as an extension of the Phase 1 permission, located above the existing / permitted podium car park to the north west of the centre, as a Phase 2 residential development. The subject application therefore relates to a total of 102 no. residential units.

The proposed development site (Figure 1.1) is located on an existing hardstand development on the Frascati Road, Blackrock, Co. Dublin (formerly known as Frascati Shopping Centre).

The surrounding environment can be described as predominantly a mix of both retail/commercial setting and residential. Dublin Bay SAC/pNHA is located to the north east.



Source: www.epa.ie

Figure 1.1 Site Location in relation to local drainage

1.2 Objective of Report

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

In particular, this review considers the possible 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 north east of the proposed development (see Figure 1.1). The assessment relies on information regarding construction and design provided by Barrett Mahoney Engineers (BM).

This report is prepared by *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.

This report relies on information provided within the report prepared by Barrett Mahoney, Civil Engineering Infrastructure and flood risk assessment report provided with planning.

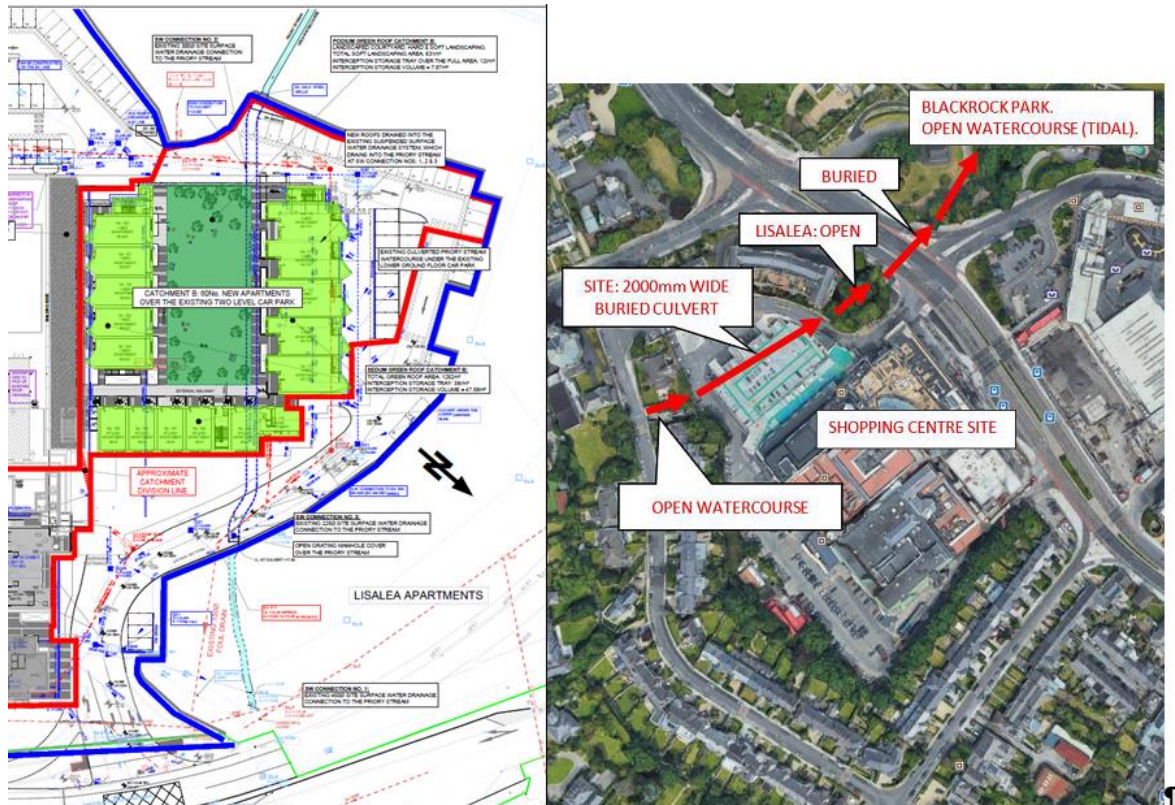
2.0 ASSESSMENT OF BASELINE WATER QUALITY, RIVER FLOW AND WATER BODY STATUS

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 and Existing Site Infrastructure

Figure 2.1 show the site in relation to its hydrological setting.

The EPA (2020) on-line database indicates two watercourses (the Brewery Stream and Priors Stream) within the general area of the subject site. The Priors stream is culverted under the existing Frascati Shopping centre development as shown in Figure 2.1 which is an excerpt from the BM drainage drawing



Source: Barrett Mahoney – Eastern section of drainage drawing BM-19248C1001

Figure 2.1 Priory Stream channel in relation to the proposed development

The stream continues in partial culvert and open stream before outfalling to blackrock beach c. 250 m from the site.

The proposed development site lies within the Liffey River and Dublin Bay Catchment 09. The nearest surface water receptors are the Priory Stream (EPA code: 09P05) which is culverted beneath the site but open above and below the development, and the Brewery Stream (EPA code: 09B13) located to the east of the development. Both streams then flow into Dublin Bay coastal water which hosts SAC SPA and NHA habitats. These are further described in the AA screening report prepared by Openfield Ecological Services.

Stormwater drainage from the site currently discharge to the stream at a manhole in the northwest of the site (as shown in Figure 2.1). The existing stormwater infrastructure includes 3 no. oil interceptors on the stormwater drainage within the site. The existing infrastructure also includes a bunded oil tank for refuelling during construction works.

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 (2013 – 2018) of 'Good'. Dublin Bay waterbody has a WFD risk score of 'Not at risk'. The ecological status of transitional and coastal water bodies during 2013-2018 for Dublin Bay is classed as 'good' (taken from Map 4.1 EPA, 2019). The most recent surface water quality data for the Dublin Bay for the 2015–2017 assessment on trophic status of estuarine and coastal waters indicate that they are 'Unpolluted' (based on Map 10, EPA, 2018). 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.

Both watercourses, i.e. the Priory Stream and Brewery Stream, are not designated for water quality by the EPA presently. The current EPA (2020) Bathing Water Quality report has classified nearby Merrion Strand as 'Poor' for the last four years 2015-2018. The latter is primarily due to discharges from combined sewers and has no direct relevance to the status of the Natura sites.

2.2 Aquifer Description & Superficial Deposits

The Geological Survey of Ireland GSI (2020) classifies the bedrock beneath the site and the surrounding area as dominated by rocks from the Caledonian system. The site is located over rock Type 2p microcline porphyritic (Rock Unit new code: INDNLGRP) which is described as Granite with microcline phenocrysts.



Figure 2.2 Bedrock geology in relation to the proposed development

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

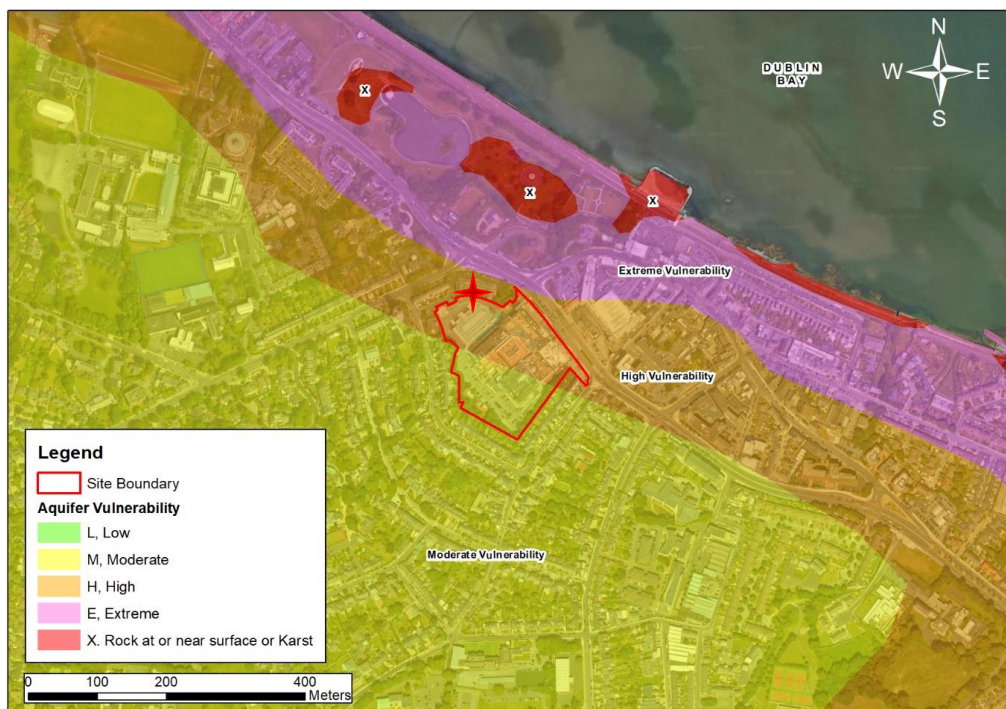
- Lk - Locally Important Aquifer - Karstified
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local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

Presently, from the GSI (2020) 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 'Dublin' groundwater body and is classified as 'Poorly productive bedrock'. Presently, the groundwater body in the region of the site (Kilcullen GWB) is classified under the WFD Status 2010-2015 (EPA, 2020) 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 (2020) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as 'Moderate' which indicates a general overburden depth potential of >5m to the south of the development and "High" vulnerability to the north of the development indicating a natural protection of the aquifer by low permeability glacial clays. The aquifer vulnerability class in the region of the site is presented as Insert 2.3 below.



Source: www.gsi.ie

Figure 2.3 Aquifer Vulnerability (site location indicated by red line)

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 REVIEW OF PROPOSED SITE DRAINAGE

The Phase 2 residential units are connecting into the existing internal drainage system, which connects into the mains connection at connection points put in place during the Phase 1 works. Phase 1 works are now under construction. Currently drainage from the site is separate foul and stormwater as shown in the BM drainage drawings provided with planning (Ref 19248 C100 and 19248 C101). The site is completely in hardstand and stormwater drains to the north east of the site discharging through existing oil interceptors to the Priory stream. The foul sewer discharges to an 825 diameter sewer in the north of the site and eventually discharges to the Ringsend WWTP and following treatment to Dublin Bay.

A flood assessment completed by BM submitted with previous planning has shown the potential for flooding to occur on the site or as a result of the site is low. In addition, proposed additional attenuation including permeable paving and green roofs included in the design will reduce potential for downstream flooding.

4.0 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.

4.1 Assessment of Plausible Sources

Potential sources during both the construction and operational phases are considered. For the purposes of assessing 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) Accidental leakage may occur from construction site equipment refuelling or leakage from a bunded fuel tank on site. As a worst-case scenario an unmitigated leak of c. 500 litres outside of the bund is considered. This would be a single short-term event. Based on the presence of 3 no. oil interceptors at discharge points to the stream, to the there is no likely emission off site to Dublin Bay.
- (ii) 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 phases of work this is again considered as a single short-term event rather than an ongoing event.
- (iii) The proposed development has only minor earthworks, as such unmitigated run-off will only likely contain low concentration of suspended solids.

These impacts could be considered as intermittent short-term events.

Operational Phase

No additional oil storage is required during operation of the proposed development. Therefore, the only plausible leak is petrol/ diesel fuel from individual cars in basement parking areas, run-off may contain a worst-case scenario of 70 litres. The risk of a short-term release of oil is already considered under the construction scenario above i.e. without mitigation. Drainage from the car park area is through a petrol interceptor providing treatment before discharging to the sewer.

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. 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 discharge to the public stormwater network which will ultimately discharge to Dublin Bay.

4.2 Assessment of Pathways

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

- (i) 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 off site migration through the underlying granite is considered low.
- (ii) There is a hydrological linkage for construction or operational run-off from the site to the Priory Stream as stormwater discharges to this stream through the existing drainage infrastructure. This stream ultimately discharges to Dublin Bay c. 0.5 km downgradient of the site.
- (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.

4.3 Assessment of Receptors

The receptors considered in this assessment include the following:

- (i) Underlying [poor] Granite bedrock aquifer;
- (ii) Priory Stream;
- (iii) River Liffey Estuary Lower and Dublin Bay;
- (iv) Natura 2000 sites.

4.4 Assessment of Source Pathway Receptor Linkages

Table 4.1 below summarises the plausible pollutant linkages (S-P-R) considered as part of the assessment and a review of the assessed risk to waterbodies is also summarised below.

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 Priory stream or naturally settle at the point of discharge (Blackrock

Beach. 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] 500 litre [worst case scenario used] hydrocarbon leak, the pathway will be through the stormwater drainage infrastructure present on site. This includes 3 no. interceptors and as such there is no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009/ Surface Water Amendment Regs SI No. 386 of 2015 and amendments when the receiving Priory Stream discharges to Dublin Bay. During operation, with the presence of an oil/ petrol interceptors in trafficked areas, there is no likely impact above statutory thresholds on the Priory stream or Dublin Bay.

Based on the assessment of 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 which discharges to the Priory Stream.

The average daily wastewater discharge of 0.541 l/s and peak flow discharge is 3.248 l/s (Source : BM 2020)

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 peak foul discharge calculated for the proposed development is well within the capacity of the WWTP. Even without treatment at the Ringsend WWTP, the peak effluent discharge, calculated for the proposed development, would equate to 0.012% 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. 0.001% 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 at the Natura site 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 loading from the proposed development.

There have been a number of breaches of the EPA licence for the Ringsend WWTP, due to stormwater overflows etc. However, recent water quality assessment shows that these overflows have been shown not to have had a long term detrimental impact on the water body status. Map 4.1 in the 2019 EPA Water quality in Ireland (2013-2018) shows that the ecological status of transitional and coastal water bodies during 2013-2018 for Dublin Bay is classified as 'good'. The water quality status information for Dublin Bay has a WFD status of 'Good' (2013-2018). The WFD risk score for the waterbody is '*Not at risk*', and the surface water quality data for Dublin Bay (2015-2017) indicate that it is '*Unpolluted*' based on Map 10 in the

2018 EPA Indicators Report. *The 'Poor' bathing water status (issued by the EPA) for Merrion Strand will be unchanged by the proposed development. 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 the bathing area.*

Source	Pathways	Receptors considered	Risk of Impact
<p><u>Construction Impacts</u> Unmitigated leak from a construction vehicle/existing oil tank.</p> <p>Discharge to ground of runoff water with high pH from cement process</p> <p>Unmitigated run-off containing a high concentration of suspended solids</p>	<p>Vertical migration inhibited by overlying stiff clayey soils (Moderate-high vulnerability)</p> <p>Indirect pathway through stormwater drainage to Priory Stream watercourse</p>	<p>Granite bedrock aquifer (Poor aquifer)</p> <p>Priory Stream</p>	<p>Low risk of infiltration of any contaminated water into the underlying Granite due to thickness of protective clayey overburden and poorly connected fracturing within the rock mass (Poor Aquifer) .</p> <p>Low risk of a temporary impact without mitigation due to low chemical loading and presence of 3 No. existing Interceptors to collect and treat any leaks/spills prior to discharge of stormwater.</p>
<p><u>Operational Impacts</u> Foul effluent discharge to sewer</p> <p>Discharge to ground of hydrocarbons from carpark leak</p>	<p>Indirect pathway to Dublin Bay through public foul sewer, via Ringsend WWTP</p> <p>Indirect pathway through stormwater drainage to Priory Stream water course</p>	<p>Dublin Bay (SAC/ SPA/ pNHA)</p> <p>Priory Stream</p>	<p>No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge from the site would equate to 0.012% 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).</p> <p>No perceptible impact during operation as no bulk oil storage and any spillage from traffic areas treated through oil interceptors prior to discharge .</p>

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 received 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.

An assessment of plausible source pathway receptor linkages shows there is no resultant impact as a result of construction or operation of the proposed development, which could result in any change to the current water regime (water quality or quantity) with Dublin Bay Natura 2000 sites.

5.0 CONCLUSIONS

A conceptual site model (CSM) has been prepared following a desktop 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 a direct linkage between the proposed development site to the Dublin Bay Natura 2000 site, through the Priory River and there is an indirect source pathway linkage from the proposed development site via the public sewer discharging to Ringsend WWTP.

A review of source pathway linkages concludes that the impact of storm water run-off and foul effluent from the proposed development will not result in any change to the current regime (water quality or quantity) in any of the Dublin Bay Natura 2000 Sites.

Finally, 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.

6.0 REFERENCES

Barrett Mahoney (2020). Engineering Report

Barrett Mahoney (2014). Flood Risk Assessment Report.

EPA, (2019). Environmental Protection Agency. Available on-line at: <https://gis.epa.ie/EPAMaps/> [Accessed: 04-08-2020].

EPA, (November 2018). Water Quality in 2017: An Indicators Report. Report Ref: ISBN: 978-1-84095-806-5

DCC, (2012). EIS for the Ringsend Waste Water Treatment Project. [

GSI, (2019). Geological Survey of Ireland; Available on-line at: <http://www.gsi.ie> [Accessed: 04-08-2020].

Irish Water, (June 2018). Ringsend Wastewater Treatment Plant Upgrade Project Environmental Impact Assessment Report. [

NPWS, (2019). National Parks & Wildlife Service. Available on-line at: <http://webgis.npws.ie/npwsviewer/> [Accessed: 04-08-2020].