HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT

for

MASTER PLAN 18 MASTERPLAN, ASHBOURNE, CO. MEATH

Technical Report Prepared For

Master Plan 18
Masterplan Ashbourne, Co. Meath

Technical Report Prepared By

Marcelo Allende BSc, BEng,
Senior Environmental Consultant
(Hydrologist)

Our Reference

MA/227501.0462/WR01

Date of Issue

26 August 2022

awnconsulting

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

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

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/227501.0462SR01		26 August 2022	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Marcelo Allende	Teri Hayes
Title	Senior Environmental Consultant	Director
Date	26 August 2022	26 August 2022

TABLE OF CONTENTS

Figures

Tables

1.0 INTRODUCTION

1.1 Background

AWN have been requested to carry out a Hydrological and Hydrogeological Qualitative Risk Assessment prepared in relation to c.20.04 hectares of lands located in the townlands of Milltown & Baltrasna, located to the south of Ashbourne town centre, which are identified as Master Plan 18 (MP 18) in the Meath County Development Plan, 2021-2027 (hereafter "Development Plan").

The MP18 Master Plan lands will provide for the following indicative aspects:

- Circa 750 no, up to a maximum of 800 no. new residential units;
- A net density of greater than 35 units per hectare (in accordance with DM OBJ 14 of the Development Plan and DoE Guidance);
- Circa 15% open space provision, in accordance with DM OBJ 26 of the Development Plan;
- Delivery of the east-west link road that will provide access from the Dublin Road (R135) through the Master Plan lands to adjoin the F1 zoned lands to the west;
- A site for a new school and playing pitch.

The Meath County Development Plan 2021-2027 sets out the main organising principles for the site to guide the future development of the lands. It proposes that these lands shall provide a primary school site, lands for recreational uses, including playing fields, and lands for residential development. The development of the lands shall be on a phased basis to be agreed as part of the preparation of the Masterplan.

The potential impacts on the receiving water environment considered withing this report are:

- The management of foul, surface water run-off and accidental oil leaks during construction phase.
- Connection to foul sewer and stormwater sewer during operation. Due to the residential development proposed it has been assumed that there will be no bulk oil storage during operation.

1.2 Hydrological Setting

The existing site is predominantly greenfield and the topography of the site generally falls from the north-east corner towards the west corner. It is noted that there are a number of drainage ditches located along the site boundary. These ditches discharge to the existing Fairyhouse Stream located to the south of MP18. There is an existing 375 mm surface water line located opposite Cherry Lane on the Dublin Road.

The EPA (2022) on-line database identify a small tributary to the Fairyhouse Stream c. 130 m to the south of the Masterplan boundary. The Fairyhouse Stream flows eastwards c. 470 m to the south of the subject site (refer to Figure 1.1 below). The Broadmeadows River crosses Ashbourne and is located c. 560 m to the north of the site. The Fairyhouse Stream joins the Broadmeadows River c. 2.2 km to the east of MP18.

The Broadmeadows outfalls into the Malahide Estuary c. 12 km to the east of the subject site. The Malahide Estuary hosts Natura 2000 sites (Malahide Estuary Special Area of Conservation (SAC, site code 000205) and Special Protection Area (SPA, site code 004025)), located c. 12.6 km and c. 12.7 km east of the Masterplan, respectively. The review of the EPA (2022) on-line database indicates that the

nearest designated lands to the site are the aforementioned Malahide Estuary SAC/SPA.

A review of the EPA (2022) on-line database indicates that the nearest designated lands to the site are the aforementioned Malahide Estuary SAC/SPA. The Masterplan site will have an indirect discharge to the Malahide Estuary from the Masterplan site through the stormwater and foul water site drainage as described in Section 1.4 below.

There will also be an indirect discharge to South Dublin Bay through the foul water drainage as also explained in Section 1.4 below. The South Dublin Bay also hosts a range of Natura 2000 Sites – South Dublin Bay Special Area of Conservation (SAC), South Dublin Bay and River Tolka Estuary / Special Protection Area (SPA)/ and South Dublin Bay proposed Natural Heritage Area (pNHA). These sites are located c. 23.0 km to the southeast of the Masterplan site.

The Masterplan site will have an indirect discharge to the Malahide Estuary via the stormwater and foul water site drainage as described in Section 1.4 below.

Figure 1.1 Location and Hydrological Environment

For reference, Figure 1.2 below presents the extent of the Masterplan 18 in the context of the Meath County Development Plan 2021-2027.

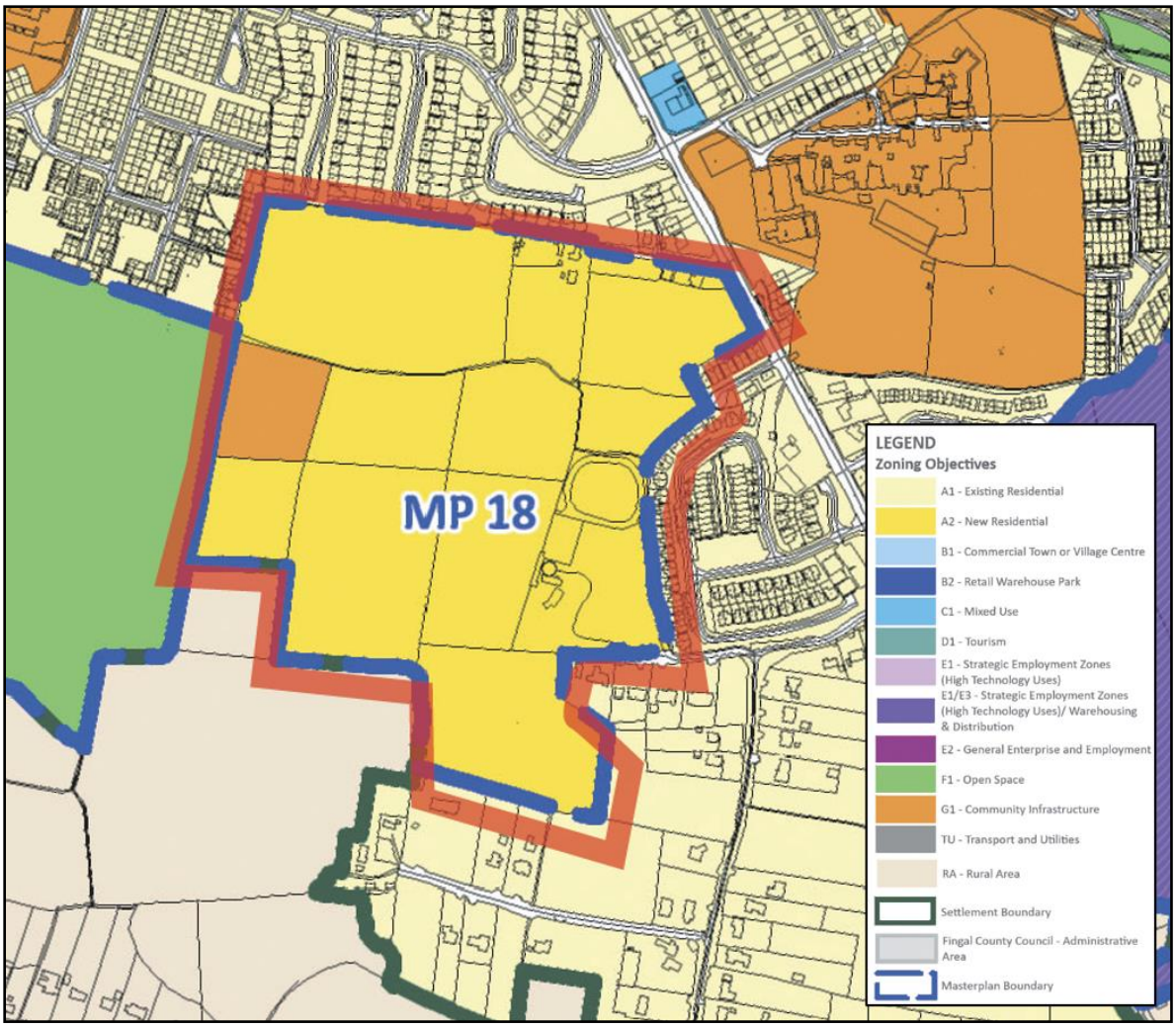

Figure 1.2 Masterplan Area 18 (Source: Davey & Smith, 2021)

1.3 Objective of Report

The scope of this desktop review is to assess the potential for any likely significant impacts on receiving waters and protected ecological 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. design or 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 Malahide Estuary (where the relevant European Sites are located). The assessment relies on information regarding construction and design provided by the applicant as follows:

- Masterplan Lands at Milltown, Ashbourne. Davey & Smith Architects, December 2021;
- Strategic Environmental Assessment (SEA) Screening of Master Plan 18 (MP 18) in the Meath County Development Plan, 2021-2027 (Armstrong Fenton);
- Strategic Flood Risk Assessment (SFRA) undertaken for the Meath County Development Plan 2021-2027.

This report was prepared by Marcelo Allende (BSc, 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 a

Senior Environmental Consultant (Hydrologist) 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 Existing Site and Proposed Drainage

Existing and Proposed Surface Water Drainage

There are a number of drainage ditches located on the site's boundary. These discharge to the existing Fairyhouse stream to the south. There is no surface water infrastructure within the site, However, there is an existing 375 mm surface water main located opposite Cherry Lane on the Dublin Road. It is proposed to connect the outflow of the surface water drainage to this sewer which ultimately discharges into the Broadmeadows River.

The development of the MP18 lands will necessitate the installation of a new surface water drainage network to cater for the additional hardstanding. The surface water runoff will be limited to greenfield runoff rates (Qbar) in accordance with the Greater Dublin Strategic Drainage Study (GDSDS).

In accordance with the GDSDS it is proposed to use Sustainable Urban Drainage systems (SUDS) for managing storm-water for MP18. The aim of the SUDS strategy for the site will be to:

- Attenuate storm-water runoff.
- Reduce storm-water runoff.
- Reduce pollution impact.
- Replicate the natural characteristics of rainfall runoff for the site.
- Recharge the groundwater profile.

It should be noted that SuDS measures have not been taken into account in the subsequent analysis. The surface water drainage network within MP18 will collect surface water runoff from the site via a piped network prior to discharging off site via the attenuation tank and/or above ground in detention/infiltration basins, vortex flow control device (Hydrobrake or equivalent), and Class 1 separator (sized in accordance with permitted discharge from the site).

The stormwater and foul water networks within MP18 will be independent systems.

Flood Risk Assessment

The Eastern CFRAM Study indicates that the subject site is located within Flood Zone C (i.e., less than 0.1% AEP (Annual Exceedance Probability) or 1 in 1000 chance of flooding in a given year). Therefore, the future development of the lands for residential and community uses is appropriate for the subject lands.

The Strategic Flood Risk Assessment (SFRA) undertaken for the Meath County Development Plan 2021-2027 contains "Settlement Zoning Review" (under section 5) which:

- Considered the land use zoning objectives utilised within County Meath as a whole and assessed their potential vulnerability to flooding.
- Based on the associated vulnerability of the particular use, a clarification on the requirement of the application of the Justification Test is provided.
- The consideration of the specific land use zoning objectives and flood risk will be presented for the settlements. Comment is provided on the use of the sequential approach and Justification Test. Conclusions have been drawn on how flood risk is proposed to be managed in the settlement.

The SFRA reviewed the land use zoning objectives for each settlement in County Meath, including Ashbourne, within the Plan and provides a comprehensive summary of flood risk and justification where necessary. Section 5.2 of the Development Plan's SFRA provides details on Ashbourne, which does not identify the MP18 Master Plan lands as being at risk of flooding. It also concludes that "*the Ashbourne Flood Relief scheme will be completed at the end of 2020 and the scheme will offer protection to a significant amount of existing development. Manage flood risk and development in line with the policies of the MCDP. Development should be subject to an appropriately detailed FRA at development management stage. This will ensure that FFLs and ground levels are set appropriately and that the risk of surface water flooding is managed*".

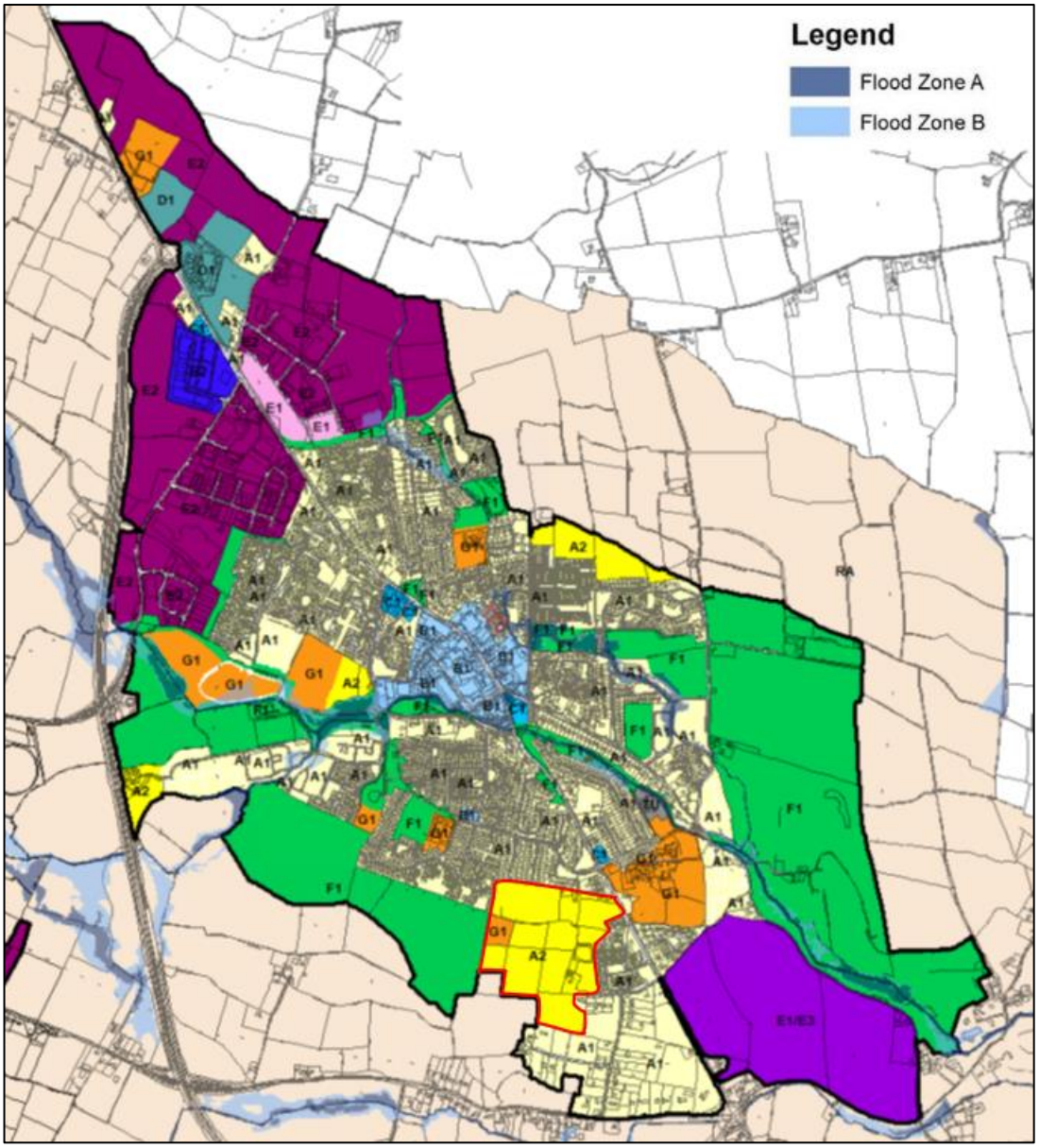

Figure 1.3 Extract from SFRA of Meath County Development Plan 2021-2027 – Flood Map for Ashbourne (MP18 Master Plan lands outlined in red)

Existing and Proposed Foul Water Drainage

The Masterplan site has no existing foul loading as it is currently a greenfield site. There is an existing 225/300mm foul sewer which is located immediately to the west of the subject site in the Dublin Road.

The site has been divided in two areas for the purposes of foul drainage management. The northern half of the site will discharge via gravity to an existing foul manhole in the Dublin Road via Cherry Lane. The units in the southern portion of the site will discharge to an existing foul sewer located in Hickeys Lane. All connections are to be agreed with Irish Water prior to commencement.

The MP18 is to cater for circa 750 no, up to a maximum of 800 no. new residential units and a site for a new school and playing pitch. The estimated foul sewer discharge per person per day of 150 litres, equates to a peak discharge of 24.75 l/s for the 800 no. residential units and 3.51 l/s for the school which results a total peak discharge flow of 28.26 l/s.

The foul water from the proposed Masterplan eventually discharges to the Ringsend Waste Water Treatment Plant (WWTP) which in turn discharges into Dublin Bay.

In the future, a new Irish Water WWTP is planned in Ashbourne. However, details of this WWTP and its commissioning date are unknown but it will be expected to accept the foul flow foreseen in the Masterplan.

As mentioned above, the stormwater and foul water networks within MP18 will be independent systems.

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 Nanny-Delvin Catchment 08 and Broadmeadow-SC-010 WFD sub-catchment 08-3 (Fairyhouse Stream_010 WFD River Sub Basin; EPA, 2022).

The Environmental Protection Agency (EPA, 2022) on-line mapping presents the available water quality status information for water bodies in Ireland. The Fairyhouse Stream belongs to the '*Fairyhouse Stream_010*' WFD surface waterbody (WFD code IE_EA_08F010500) which has a '*Poor*' Status (EPA, 2022) and its WFD risk score is '*At risk of not achieving good status*'. However, the most recent surface water quality data for the Fairyhouse Stream (2020) indicate that it is '*Unpolluted*'. According to the EPA River Quality Surveys report, the Fairyhouse Stream '*improved to 'Good' quality in 2020, a significant improvement compared with 2014 when last assessed. Some filamentous algae and siltation were noted but good numbers of Ecdyonurus sp. were present. This is the best quality this stream has achieved since monitoring began in 1988. The macroinvertebrate fauna indicated a welcome improvement to good ecological conditions in June 2020 the first time since monitoring commenced at this site in 2006, however excessive siltation of the substratum was observed*' (refer to www.catchments.ie).

The Malahide Estuary Natura 2000 Sites (SAC/SPA) extend over the Broadmeadow Water WFD transitional waterbody (WFD code IE_EA_060_0100) and Malahide Bay WFD coastal waterbody (WFD code IE_EA_060_0000). The former has been classified by the WFD (2013-2018 period) as having '*Poor*' status and the latter as having '*Moderate*' status. Both waterbodies are '*At risk of not achieving status*'.

As the proposed Masterplan will have no additional stormwater run-off, when compared with the current situation, during a stormwater event, the development will, therefore, have no measurable impact on the water quality in any overflow situation at Ringsend WWTP apart from a minor contribution from foul sewage. As explained in Section 3.4 below, the maximum contribution of foul sewage (peak flow of 28.26 l/s) from the Proposed Development is 0.25% of the peak hydraulic capacity at Ringsend WWTP. The proposed stormwater and foul water networks within MP18 will be entirely independent systems and rainfall will have no impact on foul flows to the WWTP.

It should be noted that the bathing status has no direct relevance to the water quality status of the Natura 2000 sites due to rapid mixing and dilution resulting in no measurable change in water quality within the overall water body.

2.2 Aquifer Description & Superficial Deposits

Mapping from the Geological Society of Ireland (GSI, 2022 http://www.gsi.ie, accessed on 24-08-2022) indicates the bedrock underlying the site is part of the Lucan Formation (code CDLUCN) and made up of dark limestone and shale (Calp). The lithological description comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar. The beds are predominantly fine-grained distal turbidites in the north Dublin Basin. The formation is intermittently exposed on the coast between Rush and Drumanagh Head. The formation ranges from 300m to 800m in thickness. 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 (2022) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a '*Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones*'. The proposed development is within the '*Swords*' groundwater body (Ground Waterbody Code: IE_EA_G_011) and is classified under the WFD Status 2013-2018 (EPA, 2022) as having '*Good status'* and a WFD Risk Score of '*Not as 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 (2022) guidance presently classifies the bedrock aquifer in the region of the subject site as having '*Low*' and vulnerability which indicates a general overburden depth potential greater than 10m, indicating that the aquifer is naturally well protected by low permeability tills. The GSI The aquifer vulnerability class in the region of the site is presented as Figure 2.1 below.

Figure 2.1 Aquifer Vulnerability (source: GSI, 2022)

The GSI/ Teagasc (2022) mapping database of the quaternary sediments in the area of the subject site indicates the principal subsoil type in the residential area comprises till Carboniferous (TLs i.e. Till derived from limestones).

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.

<u>Construction Phase</u>

The following potential sources are considered plausible risk scenarios 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 in this analysis which disregards the effect of bunding. 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 and contaminants such as hydrocarbons during earthworks, given the presence of contamination beneath the site according to site investigations. These could be considered intermittent short-term events, i.e. on the basis that adequate mitigation measures which are already incorporated in the Construction Environmental Management Plan (CEMP) fail.

(v) During the excavations for foundations and basements, 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 Masterplan development does not require any bulk chemical storage and therefore the potential for water quality impact is negligible.

(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.

(iii) The stormwater drainage system will follow SuDS measures and an underground attenuation system. This system has been designed in order to discharge following the characteristics of a greenfield run-off into the public sewer. As such the potential for silt laden runoff is low. It should be noted that the worst-case scenario (70 litres) under consideration here disregards the effect of SuDS and petrol interceptors.

(iv) The Masterplan 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 WWTP is required to operate under an EPA licence (D0034-01) and meet environmental legislative requirements as set out in such licence. It is noted that a planning permission for a new upgrade to this facility was received in 2019 and is currently in the process of construction/ implementation.

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 m^3/day) is less than the peak hydraulic capacity as constructed (959,040 m^3/day) i.e. prior to any upgrade works.

Irish Water is working to provide infrastructure to achieve compliance with the Urban Wastewater Treatment Directive for a population equivalent of 2.1million in the second half of 2023. When all the proposed works are complete in 2025, the Ringsend Wastewater Treatment Plant will be able to treat wastewater for up to 2.4 million population equivalent.

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 with impact assessment presented in Section 3.4:

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 '*Low*' vulnerability 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] Limestone which the GSI classifies as a *Locally Important Aquifer (*This aquifer is characterised by discrete local fracturing with little connectivity rather than large connected fractures which are more indicative of Regional Aquifers. As such, flow paths are generally local.

(ii) There is no direct hydrological linkage for construction and operation run-off or any small hydrocarbon leaks from the site to the identified surface waterbodies located farther downgradient (Fairyhouse Stream) or the Malahide Estuary. There is an indirect connection as storm water discharges into an existing public sewer which ultimately discharges to the Fairyhouse Stream and ultimately into the Malahide Estuary and Irish Sea.

(iii) There is no direct pathway for foul sewage to any receiving water body. There is however an 'indirect pathway' through the public foul sewer which ultimately discharges to the Ringsend WWTP 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) Malahide Estuary SAC (site code: 0205) and SPA (site code: 4025).
(iii) South Dublin Bay and River Tolka Estuary SPA (site code: 4024), and the South Dublin Bay SAC (site code: 0210).

Other Natura 2000 Sites within Dublin Bay that may be hydrologically connected to the proposed development site, but are located further away (North Dublin Bay SAC (site code: 0206), the North Bull Island SPA (site code: 4006), Rockabill to Dalkey Island SAC (site code: 3000) and Lambay Islands SAC (site code: 0204) and SPA

(site code: 4069)) were excluded from the assessment due to their distance from the subject site, the potential loading of contaminant from the site (risk scenarios presented in Section 3.1) and significant dilution through its pathway.

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 absence of any bulk chemical storage on site. The overburden thickness, low permeability nature of till and a lack of fracture connectivity within the limestone 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 2000 site.

During construction phase, there is no direct open-water pathway between the site and Natura 2000 sites within Malahide Estuary or South Dublin Bay. However, there is an indirect pathway through the public surface sewer which discharges into the Fairyhouse Stream. Should any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak/tank leak manage to enter into the surface water sewer, the suspended solids will naturally settle within the sewer; however, in the event of a worst case hydrocarbon leak of 1,000 litres this would be diluted to background levels (water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019) by the time the stormwater reaches the nearest Natura 2000 Sites (Malahide Estuary SAC/SPA, c. 12.6 km downgradient).

During operation, the potential for a release is low as there is no bulk fuel/chemical storage and no silt laden run-off. Stormwater will be collected by a drainage system which includes SuDS measures, an attenuation system and oil/ petrol interceptors prior to discharge off-site (albeit these measures have been disregarded for this analysis). 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, S.I. No. 386 of 2015 and S.I. No. 77 of 2019) in the worst case scenarios described above at section 3.2 and there will be no significant effect on any European site. The volume of contaminant release is low and combined with the significant attenuation within the stormwater drainage network, hydrocarbons will dilute to background levels with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019 at any Natura 2000 sites.

It can be concluded that the in-combination effects of surface water arising from the Masterplan taken together with that of other permitted developments will not be significant based on the in-combination low potential chemical and sediment expected loading. Therefore, based on the loading of any hazardous material considered in the worst case scenarios mentioned in Section 3.1 above during construction and operation phases, there is subsequently no potential for impact on downgradient Natura 2000 habitats (Malahide Estuary, located c. 12.6 km from the site).

The peak wastewater discharge is calculated at 28.26 l/s. The sewage discharge will be licensed by Irish Water, collected in public sewers and and ultimately treated at Irish Water's WWTP at Ringsend prior to discharge to Dublin Bay. As outlined in section 3.1 (iv), upgrade works 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 for a population equivalent of 2.1 million 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. After commissioning stages, the Capacity Upgrade facility began accepting flows for treatment in November 2021). This facility will enable current treatment levels to be maintained during the remainder of the upgrade of the existing secondary treatment tanks.

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 and was completed in December 2021. In September 2021, the second contract was awarded and its construction works commenced in November 2021 and is expected to take approximately 2 years to complete. In November 2021, the third contract was awarded and its Construction works are anticipated to commence in late 2022. The fourth contract is scheduled to commence in mid-2023.

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 28.26 l/s (which would equate to 0.25% 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 (0.25% of the peak hydraulic capacity at Ringsend WWTP) from foul sewage.

It should be noted that the Ringsend WWTP upgrade has experienced capacity issues during rainfall events and therefore overflows can occur following periods of heavy rainfall. These overflows occur as a result of the impact on treatment capacity during heavy rainfall events due to surges primarily caused by the historical combined drainage system in Dublin. As the Proposed Development will not contribute any additional stormwater drainage to the WWTP over the natural greenfield rate, the development will therefore have no measurable impact on the water quality in any overflow situation.

The assessment has also considered the effect of cumulative events, such as release of sediment laden water combined with a hydrocarbon leak on site (1,000 litres as a worst case scenario during the construction phase). As there is adequate assimilation and dilution between the site and the Natura 2000 sites (Dublin Bay, which is c. 23 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 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 (for a population of 2.1 million) and 2025 (for a population of 2.4 million) 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 2000 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 be of a sufficient magnitude to effect a change in the current water body status.

Finally, in a worst-case scenario of an unmitigated leak and not considering the operation of the SuDS measures already included in the design, no perceptible risk to any Natura 2000 Sites is anticipated given the distance from source to Malahide Estuary protected areas (c. 12.6km). Potential contaminant loading will be attenuated, diluted and dispersed near source area.

Source	Pathways	Receptors considered	Risk of Impact
Construction Impacts (Summary)			
Unmitigated leak from an oil tank to ground/ unmitigated leak from construction vehicle (1,000 litres worst case scenario).	Bedrock protected by >10m low permeability overburden. Migration within weathered/ less competent limestone is low (limestone has discrete local fracturing rather than large connected fractures).	Limestone bedrock aquifer (Locally Important Aquifer)	Low risk of migration through poorly connected fracturing within the limestone rock mass (Locally Important 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 and river network to Malahide Estuary (distance source-receptor: >12.6km)	Malahide Estuary SAC/ SPA	Potential for local temporary exceedances of statutory water quality standards at outfall. However, no perceptible risk to water requirements for the Natura 2000 sites in Malahide Estuary based on loading and high level of dilution in the surface water sewer and on the distance of c. 12.6 km between the source and the estuary.
Operational Impacts (Summary)			
Foul effluent discharge to sewer	Indirect pathway to South Dublin Bay through public sewer	South Dublin Bay SAC/SPA/pNHA	No perceptible risk – Even without treatment at Ringsend WWTP, the peak effluent discharge (28.26 l/sec which would equate to 0.25% 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 (70 litres worst case scenario)	Indirect pathway through stormwater drainage and river network to Malahide Estuary (distance source-receptor: >12.6km)	Malahide Estuary SAC/ SPA	No perceptible risk – taking into account the extent of loading of contaminant, distance between the source and Malahide Estuary is c. 12.6 km and significant dilution in the surface water sewer, Fairyhouse Stream and Broadmeadows River 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, S.I. No. 386 of 2015 and S.I. No. 77 of 2019).

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.

During construction and operation phases there is no direct source pathway linkage between the Masterplan site and open waters. There is no direct source pathway linkage between the Masterplan site and any Natura 2000 sites (i.e. Malahide Estuary SAC/SPA and South Dublin Bay SAC/SPA/pNHA). There are indirect source pathway linkage from the Masterplan development through the public stormwater sewer which discharges into the Fairyhouse Stream and ultimately to Malahide Estuary, and the foul sewer which will eventually discharges to the Ringsend WWTP and ultimately discharges to South Dublin Bay. The future development has a peak foul discharge that would equate to 0.25% of the licensed discharge at Ringsend WWTP (peak hydraulic capacity).

Even disregarding the operation of design measures including SuDS and an attenuation system and petrol interceptors on site, it is concluded that there will be imperceptible impacts from the proposed Masterplan to the water bodies due to emissions from the site stormwater drainage infrastructure to the wider drainage network. It should be noted the proposal also includes permeable paving, an attenuation system and petrol interceptors as part of best practice project design, and these features will provide additional filtration from the site to the drainage network.

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 2000 sites within Malahide Estuary and South Dublin Bay.

Finally, and in line with good practice, appropriate and effective mitigation measures will be included in the construction design, management of construction programme

and during the operational phase of the proposed development. With regard the construction phase, adequate mitigation measures will be incorporated in the Construction Environmental Management Plan (CEMP). 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 and they have not been taken into account in this assessment.

5.0 REFERENCES

EPA, (2022). Environmental Protection Agency. Available on-line at: https://gis.epa.ie/EPAMaps/ [Accessed: 24-08-2022].

GSI, (2022). Geological Survey of Ireland; Available on-line at: http://www.gsi.ie [Accessed: 24-08-2022].

NPWS, (2022). National Parks & Wildlife Service. Available on-line at: http://webgis.npws.ie/npwsviewer/ [Accessed: 24-08-2022].

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.

Davey & Smith Architects (2021). Masterplan Lands at Milltown, Ashbourne.

DBFL Consulting Engineers (2022). Infrastructure Design Report. Lands at Cherry Lane, Ashbourne, Co, Meath.

DBFL Consulting Engineers (2022). Site Specific Flood Risk Assessment. Lands at Cherry Lane, Ashbourne, Co, Meath.