8 Water

8.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) considers & assesses the potential impacts on Water & Hydrology from the proposed scheme. Measures to mitigate any likely significant adverse impacts of the proposed scheme are reviewed and analysed

This chapter has been prepared by John Considine, BE, MIStructE, MIEI, CEng, FConsEIM, Chartered Engineer of Barrett Mahony Consulting Engineers.

8.2 Methodology

The methodology followed for this section is in accordance with the EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft) 2017, Advice Notes for Preparing Environmental Impact Statements (Draft) 2015 and 2018 DHPLG Guidelines on Environmental Impact Assessment for Planning Authorities and An Bord Pleanála. The following section outlines the legislation and guidelines considered, and the adopted methodology for preparing this chapter.

8.3 Study Methodology

The following documents were reviewed in the preparation of this chapter.

- Historical Flood Data, obtained from the national hazard Mapping Website, (www.opw.ie);
- CIRIA C753 – The SuDs Manual.
- Revised Guidelines on the Information to be contained in Environmental Impact Statements (EPA 2015a);
- Advice Notes for Preparing Environmental Impact Statements (EPA 2015b);
- Draft Guidelines on the Information to be contained in Environmental Impact Assessments Reports (EPA 2017);
- Department of Housing, Planning & Local Government (2018). Guidelines for Planning Authorities & Bord Pleanála on Carrying Out environmental Impact Assessments;
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report, European Commission, 2017
- Greater Dublin Strategic Drainage Study, (DCC 2005);
- Regional Code of Practice for Drainage Works, (DCC 2005);
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Former Dept of Environment, Heritage & Local government, (Government of Ireland 2009);
- Dún Laoghaire-Rathdown County Council Development Plan.
- Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters (IFI, 2016)

A Civil Engineering Infrastructure Report and Flood Risk Assessment has been completed by Barrett Mahony Consulting Engineering (BMCE) and accompanies the planning application under separate cover. The findings and outcomes from the report have informed this assessment.

In order to identify the current conditions and to establish any potential impacts for the proposed development it is necessary to undertake a desk top review of the existing water features and site topography conditions for the subject lands. The existing conditions have been interpreted from a desk top study.

To establish same information from the following list of statutory bodies were consulted.

- Dún Laoghaire-Rathdown County Council.
- Geological Survey of Ireland.
- Ordnance Survey of Ireland.
- Environmental Protection Agency.
- Office of Public Works.

8.3.1 Desktop Study

The following sources of information were reviewed to evaluate the Water & Hydrology aspects of the site.

- Site Investigations carried out in 2016 and 2020.
- Current & historical Ordnance Survey Maps (1829 – 1842,1837 – 1842 & 1888, 1913);
- Aerial photography (1995 & 2000).
- Office of public Works, Historical Flood Mapping.
- Office of Public Works, Flood Risk Management Plans.
- Dún Laoghaire-Rathdown County Council, Development Plan, 2017 – 2023.
- Site visit by Barratt Mahony engineers

8.3.2 Assessment Methodology

The potential impact i.e., significance of the effects of the proposed development is generally understood to mean the importance of the effects (the consequences of the change). Significance is determined by a combination of (objective) scientific and subjective (social) concerns. Effects are assessed on the following:

- Quality (i.e. positive, negative, or neutral),
- Significance (imperceptible, slight, moderate, significant, or profound),
- Duration (short term, medium term, long term, permanent or temporary),
- Extent and
- Context.

In the collation of information to describe effects reference has been made to the criteria set out in Table 3-4 *Checklist for Information Required to Describe Effects* as set out in the EPA document – *Guidelines on the Information to be contained in Environmental Impact Assessment Report* DRAFT, August 2017.

Assessment should also take consideration of secondary impacts e.g., deterioration of surface water quality in an area due to site clearance and soil run-off. Finally, cumulative impacts are also to be addressed/considered, i.e., the addition of many minor or significant effects, including those of neighbouring projects to create larger more significant effects.

This document outlines a thirteen-step methodology as per the *Guidelines for the preparation of Soils, Geology, and hydrogeology Chapters of Environmental Impact Statements*, IGI 2013, which has four distinct elements as follows.

- Initial Assessment (Steps 1 – 5);
- Direct & Indirect Site Investigation and Studies (Steps 6 – 9);
- Mitigation Measures, Residual Impacts and Final Impacts Assessment (Steps 10 – 12); and
- Completion of the Hydrogeological (Water) Sections of EIAR (Step13).

The initial site assessment as outlined in section 8.4 describes the hydrological and hydrogeological receiving environment and presents a description of the past and present uses of the site and other neighbouring sites.

This section also describes the nature of the site based on both site specific and neighbouring site investigation data from publicly available sources where available.

Section 8.6 describes the potential impacts associated with the development of the site (in the absence of mitigation). The magnitude of the potential impact is ranked in accordance with the IGI Guidelines and this allows the significance of the impact to be determined.

Cumulative impacts are described in section 8.7. The magnitude and significance of these residual impacts have also been classified based on the IGI Guidelines.

Following the assessment of the impacts, specific mitigation measures have been developed to avoid, reduce and if possible, remedy any negative impacts on the hydrology & hydrogeology. These are described in section 8.10.

8.4 The Existing Receiving Environment (Baseline)

The subject site is located on lands within the townland of St. Joseph's House, (a protected structure), Leopardstown Road, Dublin 18. The site is bounded by 2no. access roads. Silver Pines leading to the N31 Brewery Road to the northeast and the R113 Leopardstown Road to the South. The Silver Pines residential development is located to the north and west of the proposed development. The overall site area totals 2.59ha. Part of the site is currently occupied by St. Joseph's House for Adult Deaf and Deafblind and its grounds. Three domestic houses on the north-east and seven more on the south side make up the remainder of the site.

8.4.1 Existing Surface Water

The lands/roads surrounding the site contain a number of surface water sewers and a combined sewer. In summary:

- 600mm diameter concrete surface water sewer along the edge of the park to the north of the site;
- 225mm diameter concrete surface water sewer along Leopardstown Road to the South of the site;
- The existing surface water connection for St. Joseph's House is via a 225mm concrete pipe to the surface water sewer serving the Silverpines development.

There are no existing SuDS measures on the site, any rainfall on the site is naturally attenuated by the soil and then infiltrates into the ground.

8.4.2 Existing Foul Water Drainage

The site is served by a 225mm diameter foul sewer system along Leopardstown Road. There is a separate 225mm concrete foul sewer network serving the Silverpines to the West of the proposed development. The houses fronting onto the Leopardstown Road & St. Joseph's House discharge to the foul sewer on the Leopardstown road.

8.4.3 Existing Water Supply

There is an existing connection to the 160mm diameter MOPVC public watermain (1996) on the Leopardstown Road. This consists of a service pipe that supplies St. Joseph's House.

8.4.4 Topography

The site is currently made up of a combination of existing residential housing to the southeast with the existing St. Joseph's House, supplementary buildings and green space making up the remaining western and northern extents of the site. A detailed topographical survey of the existing site has been prepared; a summarised excerpt can be seen in Figure 8-1 below.

There is little variation in ground levels across the site. In broad terms the site generally slopes down from the higher western side of the site to the lower eastern boundary. The difference in ground levels is minimal, with the highest point of the site recorded at approximately +82.84, and the lowest point recorded at +80.66, a difference of 2.18m over a distance of 150m.

There is no significant risk of flooding affecting the proposed development site or flooding of the site drainage network impacting adjoining properties. Therefore, the development is deemed acceptable from a flood risk assessment perspective. This is dealt with in detail in the Barrett Mahony Flood Risk Assessment Report.

Figure 8-1 – Topographical Survey Extract

8.4.5 Ground Water

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub soils. Aquifers are rocks or deposits that contain sufficient void spaces, and which are permeable enough to allow water to flow through them in significant quantities. The potential of the rock to store and transport water is governed by permeability, of which there are two types, intergranular and fissure permeability. Intergranular permeability is found in sediments, sands, gravels, and clays. Fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes, and solution openings.

When considering groundwater, it is important to consider the underlying geology, its complexity including faults, the large amounts of water and rainfall available for recharge and the overlying Quaternary deposits. The bedrock geology of this area is defined as the Maulin formation (granite). The bedrock mapping for the area as defined in the GSI is included as above.

The Geological Survey of Ireland has devised a system for classifying the aquifers in Ireland based on the hydrogeological characteristics, size, and productivity of the groundwater resource. The three main classifications are Regionally Important Aquifers, Locally Important Aquifers and Poor Aquifers.

In Figure 8-2 below, the site area is classified by the GSI as a Poor Aquifer. Rainwater falling on the site will be drained in part into the groundwater system via soakaways on site and direct infiltration in green spaces. The remainder will drain to the surface water sewer on the Leopardstown Road after passing through SuDS features and an attenuation tank. Ground water on the site naturally drains downhill towards the sea, approximately two kilometres east of the site.

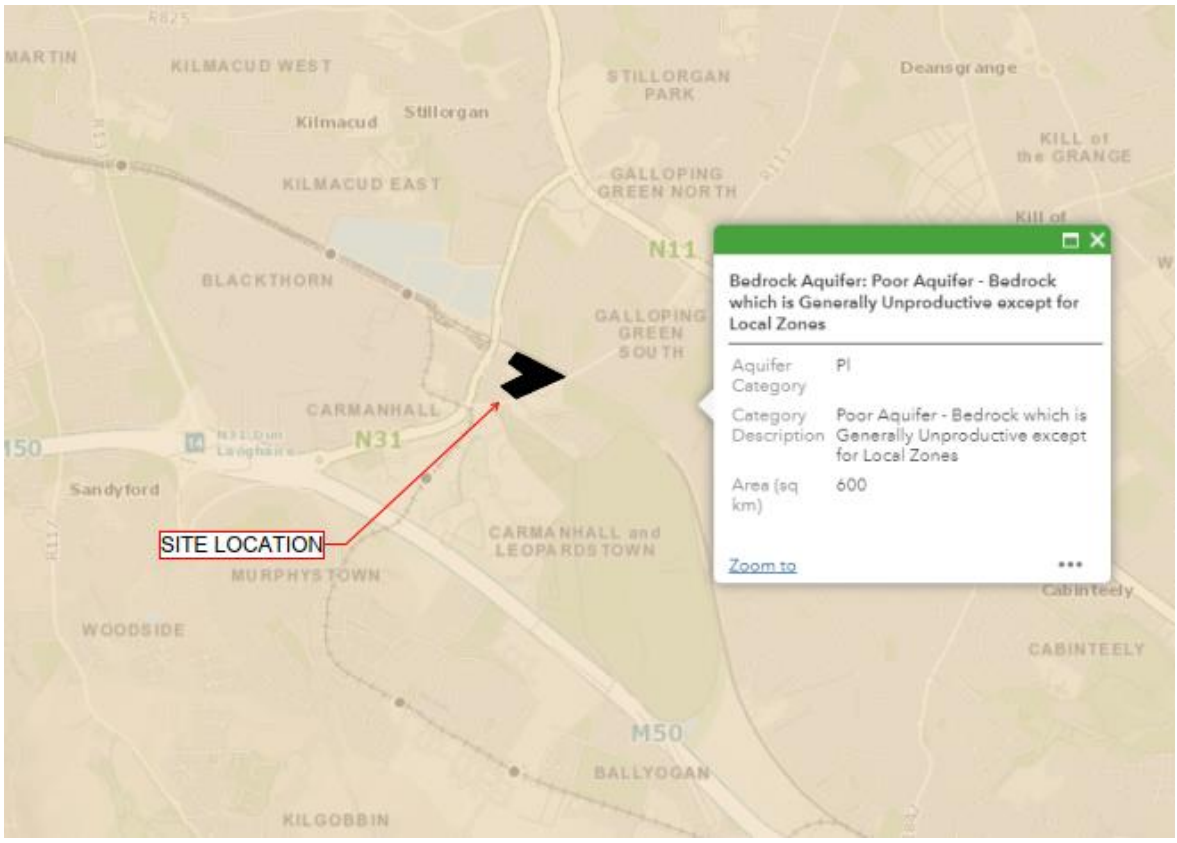

Figure 8-2 – Groundwater Aquifer

8.4.6 Site Hydrology and Groundwater

The characteristics of the underlying granite bedrock and local topography appear to have a strong influence in the hydrogeology of the site. Groundwater is unlikely to be present within the upper levels of the bedrock due to the nature of the granite, and there is limited groundwater present within the subsoils as was confirmed with the lack of groundwater strikes found during the trial pits for the geotechnical site investigation.

8.4.7 Groundwater Quality

Under the requirements of the Water Framework Directive, the groundwater body was classified as having an overall good status for water quality and quantity 2013 - 2018. Please refer to Figure 8-3, EPA map extract below.

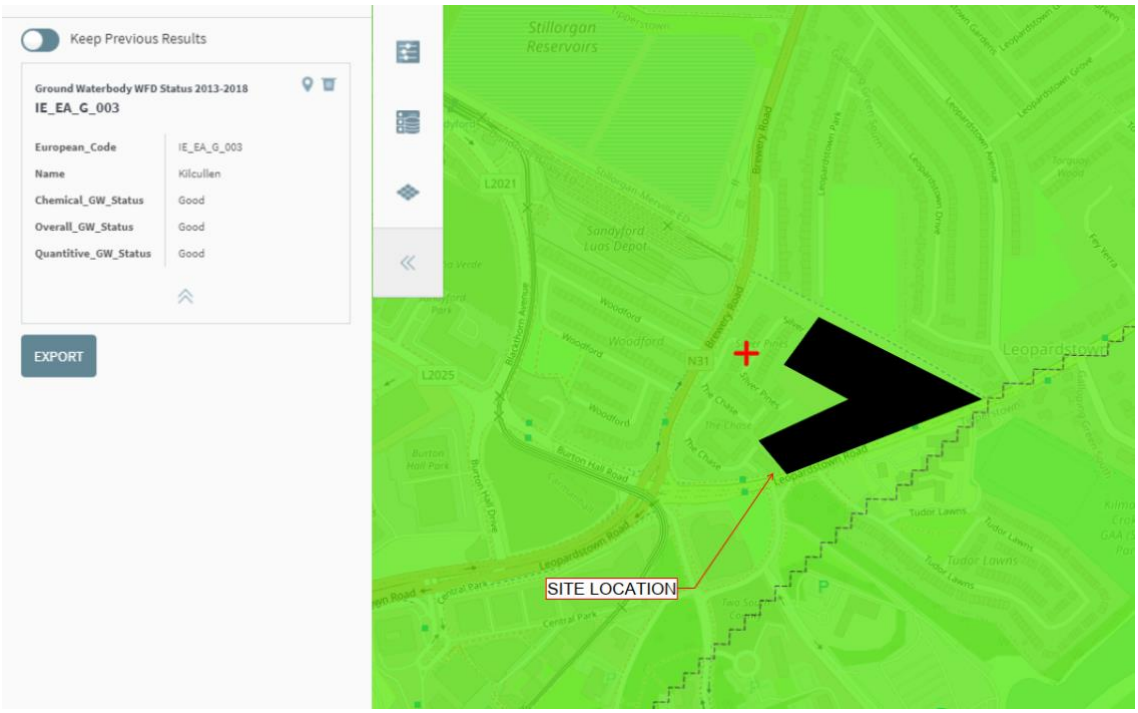

Figure 8-3 – Ground Water Quality (EPA Map Extract)

8.4.8 Flooding and Flood Risk

As part of the project planning application, a flood risk assessment has been carried out in accordance with the OPW publication "*The Planning System and Flood Risk Assessment Guidelines for Planning Authorities*". The full details can be found in the Flood Risk Assessment Report prepared by Barret Mahony Consulting Engineers, included with the SHD Application, with the conclusion of that assessment outlined below.

Per the Barrett Mahony Consulting Engineers Floor Risk Assessment "There is no significant risk of flooding affecting the proposed development site or flooding of the site drainage network impacting adjoining properties. Therefore, the development is deemed acceptable from a flood risk assessment perspective."

8.5 Characteristics of the Proposed Development

Chapter 3 contains a full description of the proposed development. In summary, the proposed development will consist of a new residential and mixed use scheme to include apartments, residential amenity space, a café and a childcare facility. A detailed description is now set out as follows:

The proposal provides for the demolition of 10 no. properties and associated outbuildings at 'Madona House' (single storey), 'Woodleigh' (2 storeys), 'Cloonagh' (2 storeys), 'Souk El Raab (2 storeys), 'Wellbrook' (2 storeys), 'Calador' (2 storeys), 'Alhambra' (2 storeys), 'Dalwhinnie' (2 storeys), 'Annaghkeen' (1-2 storeys) and 'The Crossing' (single storey) (combined demolition approx. 2,291.3 sq m GFA).

The new development will provide for (a) the refurbishment, separation and material change of use of Saint Joseph's House (a Protected Structure, RPS No. 1548) from residential care facility to residential use and a childcare facility; and (b) the construction of a new build element to provide for an overall total of 463 no. residential units, residential amenity space and a café.

The overall development proposal shall provide for the following:

- Block A (5 storeys) comprising 49 no. apartments (13 no. 1 bed units, 33 no. 2 bed units and 3 no. 3 bed units);
- Block B (4 - 7 storeys) comprising 88 no. apartments (28 no. 1 bed units, 57 no. 2 bed units and 3 no. 3 bed units);

- Block C (5 - 7 storeys) comprising 115 no. apartments (26 no. studio units, 26 no. 1 bed units and 57 no. 2 bed units and 6 no. 3 bed units);
- Block D (5 - 10 storeys) comprising 157 no. apartments (36 no. studio unit, 40 no. 1 bed units and 81 no. 2 bed units), residential amenity areas of approx. 636 sq m and a café of approx. 49 sq m;
- Block E (Saint Joseph's House) (2 storeys) comprising 9 no. apartments (8 no. 2 bed units and 1 no. 3 bed units) and a childcare facility of 282 sq m with associated outdoor play areas of approx. 130 sq m;
- Block F (3 - 6 storeys) comprising 45 no. apartments (23 no. studio units, 10 no. 1 bed units; and 12 no. 2 bed units);

Each new build residential unit (in Blocks A, B, C, D and F) has an associated area of private open space in the form of a terrace/balcony. Open Space proposals for Saint Joseph's House (Block E) include a mixture of private terrace/balcony areas and communal open space areas.

The extent of works proposed to Saint Joseph's House (a Protected Structure) include:

- The demolition of a single storey office, conservatory, glazed link, external store, external enclosed escape stairs with associated canopies, toilet extension and 3 no. associated outbuildings to the west of Saint Joseph's House (demolition total approx. 173.4 sq m GFA);
- The removal of external steel gates, all external steel escape stairs, canopies, existing disabled access ramps, concrete steps, an external wall and associated roof area;
- Relocation of external granite steps and the provision of a new raised entrance terrace, concrete steps and ramp areas;
- Replacement of existing rooflights, the addition of roof lights, part new roof / new zinc roof, new external wall and roof to the east of the structure;
- The provision of new door and window openings;
- Modifications to internal layout including the removal of walls and partitions and the addition of new dividing walls.

The Residential Amenity Areas of approx. 636 sq m proposed in Block D comprise a residential club house/multi purpose room, library/reading room, lounge area, concierge area, office area, post room, fitness club, all at ground floor level of Block D. A terrace lounge area is proposed at fifth floor level of Block D. 2 no. roof garden areas are also proposed at fifth floor level of Blocks C and D (approx. 400 sq m and 408 sq m respectively).

Open Space (approx. 9,885 sq m) is proposed in the form of (a) public open space areas (approx. 6,680 sq m) which include a public plaza/court area, a main area of public open space (including a play area and outdoor gym area) and woodland trail; and (b) all communal open space areas (approx. 3,205 sq m) which include areas adjacent to Saint Joseph's House (Block E), Block D and Block F, a courtyard and play area located between Blocks A and B and roof terraces at fifth floor level of Blocks C and D. Visual amenity open space areas (approx. 1,000 sq m) are also proposed at various locations throughout the development.

Basement Level (approx. 9,445 sq m) is proposed with residential access from Blocks A, B, C, D and F. Bin storage areas, water storage areas, and part attenuation are located at this level. 2 no. ESB Substations, 1 no. ESB Kiosk, 2 no. Switch Rooms, waste storage areas for Block E (Saint Joseph's House) and bicycle storage areas are proposed at surface level.

A total of 259 no. car parking spaces (232 no. at basement level and 27 no. at surface level) are proposed. At basement level, a total of 30 no. electric vehicles and 202 no. standard parking spaces are provided for. A total of 968 no. bicycle spaces (816 no. at basement level and 152 no. at surface level), dedicated cycle lift and 10 no. motorcycle spaces (all at basement level) are also proposed.

Proposals for vehicular access comprise 1 no. existing vehicular access point via Silver Pines (an existing all movement junction onto Brewery Road) and 1 no. new vehicular access point at the general location of 'Annaghkeen' at Leopardstown Road (a new Left In / Left Out junction arrangement). The new access point along Leopardstown Road will replace 9 no. existing access points at 'Woodleigh', 'Cloonagh', 'Souk El Raab', 'Wellbrook', 'Calador', 'Alhambra', 'Dalwhinnie', 'Annaghkeen' and 'The Crossing'. The internal permeability proposed will provide linkages for

pedestrians and cyclists to Leopardstown Road and adjoining Greenway. Proposals also provide for the relocation of an existing bus stop along Leopardstown Road.

The associated site and infrastructural works include provision for water services; foul and surface water drainage and connections; waste water pumping station; attenuation proposals; permeable paving; all landscaping works including tree protection, tree removal and new tree planting; green roofs; boundary treatment; internal roads and footpaths; and electrical services.

8.5.1 Proposed Surface Water Drainage System

8.5.2 Introduction

The development incorporates a SuDS strategy is to ensure that a new development does not negatively affect the surrounding watercourse system, existing surface water network and groundwater system. This SuDS strategy achieves this by using a variety of SuDS measures within the site. These measures include water interception, water treatment and water attenuation.

The SuDS strategy was developed with the following steps:

- The existing greenfield run-off of the development area will be calculated and used as the minimum benchmark for the SuDS design.
- A set of SuDS measures will be chosen based on their applicability and usage for the site.
- A "CAUSEWAY FLOW" model will be created to analyse the rainfall on the site and the effectiveness of the proposed SuDS measures.
- If effective, these SuDS measures will be implemented on the site.

The proposed surface water drainage system is designed to comply with the 'Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume 2, New Developments, 2005' and the 'Greater Dublin Regional Code of Practice for Drainage Works, V6.0 2005'. CIRIA Design Manuals C753, C697 and C609 have also been used to design the surface water drainage system within the site.

8.5.3 Existing Surface Water Infrastructure

Lands/roads surrounding the site contain a number of surface water sewers and a combined sewer. In summary:

- 600mm diameter concrete surface water sewer along the edge of the park to the north of the site;
- 225mm diameter concrete surface water sewer along the Leopardstown Road to the south of the site;
- The existing surface water connection for St. Joseph's House is via a 225mm concrete pipe to the surface water sewer serving the Silverpines development.

8.5.4 Catchment Area

The site is divided into three surface water drainage catchments. The catchment areas have different SuDS measures which will have an influence on the runoff coefficient. The more porous the material, the lower the runoff coefficient. Materials in the area will consist of, but not limited to, Permeable Paving, Green roof structures, solid roofs, impermeable areas and landscaped grass areas.

8.5.5 Catchment strategy

The development has been divided by 3no. separate surface water drainage sub catchment areas, each sub catchment will be served by a gravity drainage network, with run-off attenuated in Catchment's no.1, & 2 prior to discharging to the surface water sewer on the Leopardstown Road (Catchment 2) or the surface water sewer in Silver Pines (Catchment 1). Catchment 3 uses a large soakaway to capture the surface water drainage and there is no direct discharge to the surface water sewer network. The proposed catchment division is as follows:

- Existing St Joseph's House and surrounds
- Blocks A,B & C and surrounds
- Blocks D & F and surrounds.

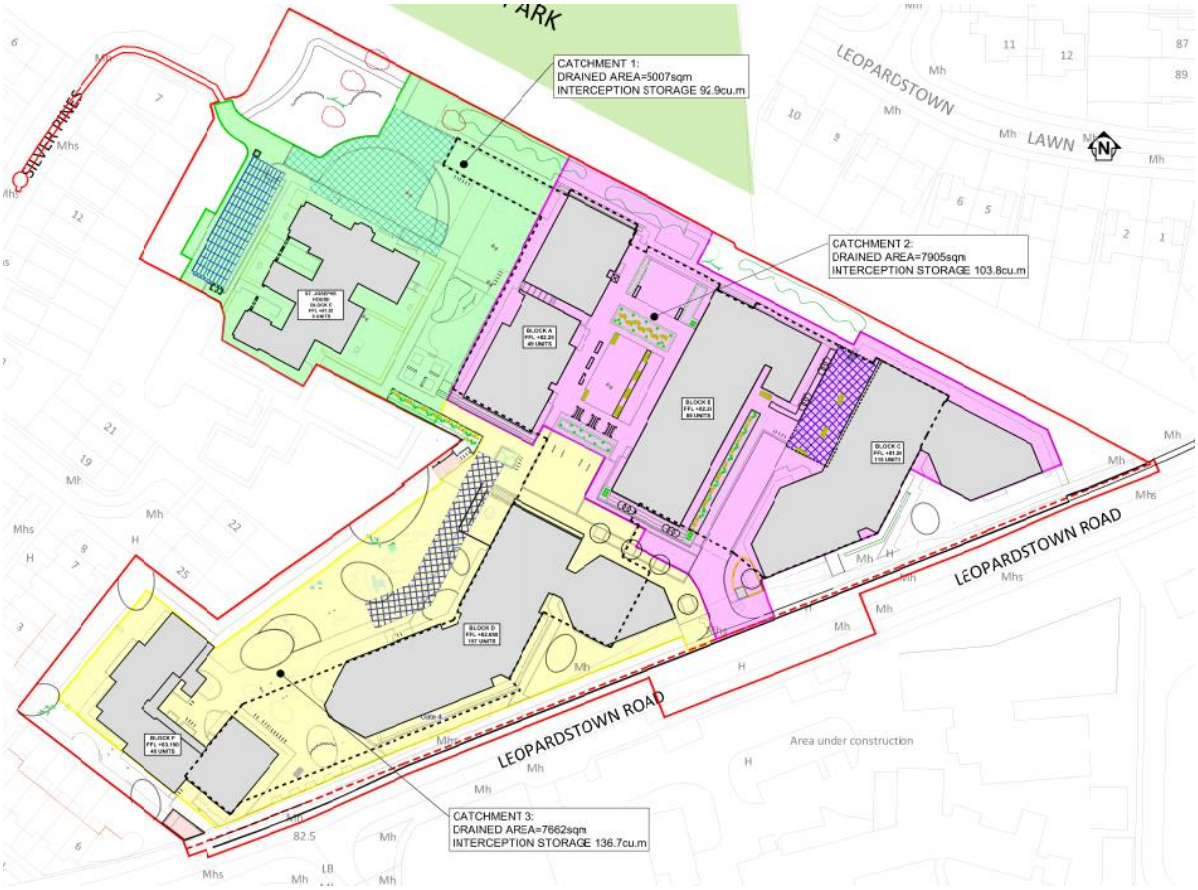

Figure 8-4 – Barrett Mahony Catchment Proposal,

8.5.6 Sub-Catchment 1: St. Joseph House

The existing connection for St. Joseph's House to the surface water sewer in Silver Pines will be retained. The surface water from this area will go through a new buried Stormtech attenuation tank located below the road and parking area to the west of St. Joesphs' House and fitted with a Hydrobrake flow control per GDSDS requirements.

8.5.7 Sub-Catchment 2: Block A, B & C

It is proposed to create a separate surface water drainage system for the new apartments (Blocks A, B & C). The flow from these will be discharged via gravity to the existing 225mm surface water sewer located along Leopardstown Road via a concrete attenuation tank located in the basement between Blocks B and C, with a hydrobrake flow control device as per GDSDS requirements.

8.5.8 Sub-Catchment 3: Block D & F

It is proposed to build a new proprietary cellular soakaway under the landscaped area. Ground conditions on site show a good infiltration which permits the construction of this proposed infiltration system. Refer to Geotechnical Site Investigation report in appendix 7.1 in chapter 7 Land and Soils of this EIAR for information regarding the infiltration parameters. An emergency overflow manhole will be connected to the soakaway, and link directly to the surface water network in Silverpines, bypassing the Catchment 1 flow control.

8.5.9 SuDS Measures Employed

To compliment the attenuation systems and soakaway mentioned above, and to reduce the rate and volume of water flowing into them, various SuDS measures have been employed. The SuDS measures have been selected in accordance with the principals of Ciria C753, which explains that the primary function of SuDS measures is to protect watercourses from any impact due to the new development. However, SuDS can also improve the quality of life in a new development and urban spaces by making them more vibrant, visually attractive, sustainable and more resilient to change. The SuDS measures selected for this development are as follows:

- Extensive Green Roof:- Typically consisting of low maintenance Sedum planting, providing benefits to biodiversity, filtration and removal of pollutants, and interception of rainwater to reduce volumes discharging from the roof.

- Intensive Green Roof:- Consisting of more complex landscaped or paved roof areas providing amenity for residents, and interception of rainwater to reduce volumes discharging from the roof. Intensive interception can also be applied on Podium areas.

- Permeable Paving:- provides a surface suitable for pedestrian and/or vehicular traffic, while also allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before slowly infiltrating to the ground.

Figure 8-5 – SuDS Measures

8.5.10 Surface Water Conclusion

Please refer to the Civil Engineering Infrastructure Report submitted as part of this application, for a comprehensive breakdown of the various SuDS measures which will be applied to the site. A pollutant

analysis and a series of SuDS management trains have been developed based upon these SuDS measures. The chosen SuDS measures have been analysed for various rainfall scenarios to ensure that all the SuDS design criteria are met. An extensive range of SuDS measures are proposed with almost full coverage of the developed area of the site.

In conclusion, SuDS measures have been chosen that are the most appropriate for the site and are the and these measures are effective in treating rainfall on the site to GDSDS and CIRIA criteria.

8.5.11 Proposed Foul System

A new system will serve the development. It is proposed to provide one connection point which will accommodate the whole site and will connect into the sewer network in the Silverpines Estate. The foul effluent produced by the site will fall by gravity to the foul Wastewater Pumping Station, from there it will be pumped to a new rising main discharge manhole which will be constructed on-line with the existing manhole on Silverpines road.

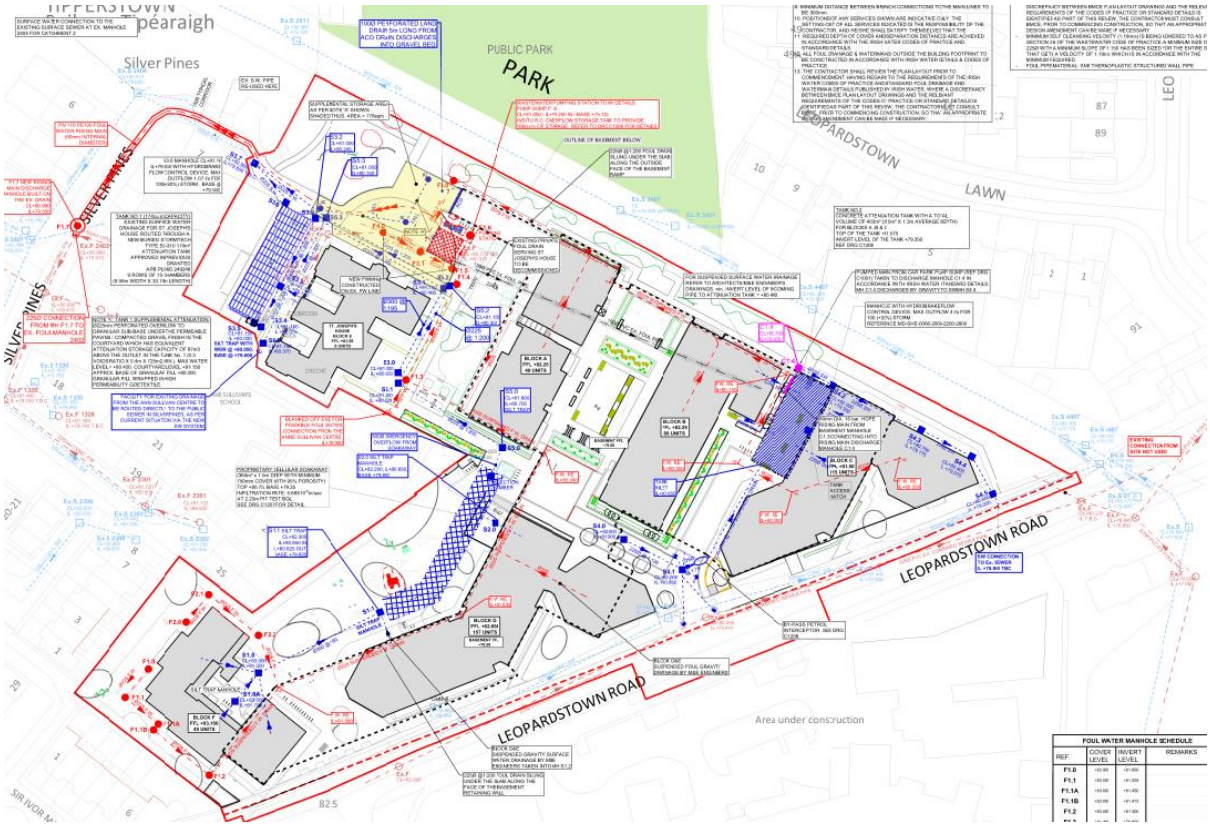

Figure 8-6 – Proposed Foul Network System

The proposed pipe network has been designed in accordance with the relevant requirements of the Irish Water Code of Practice for Wastewater Infrastructure. The foul water drained from the site will ultimately discharge to the Ringsend WWTP via the West Pier pumping station in Dún Laoghaire.

The proposed foul drainage network comprises of a series of 225mm diameter pipes, designed for a minimum velocity of 0.75m/s (self-cleansing) and maximum velocity of 3.0m/s. A pipe friction coefficient of 1.5mm has been assumed.

It is noted the proposed foul outfall pipe is an Ø80mm rising main with a controlled outflow rate from the pumping station.

8.5.12 Irish Water

A Pre-Connection Enquiry Form was submitted to Irish Water in November 2019. A Confirmation of Feasibility letter was issued by Irish Water in February 2020 and an updated Confirmation of Feasibility letter was received in July 2021 following further consultation with Irish Water

8.5.13 Proposed Water Supply

All proposed water mains will be HDPE 100 SDR17 in accordance with Irish Water Standards. Apartment blocks will have their own connections (80mm O.D. PE pipe MDPE 80 SDR11) to distribution water mains via service connections and meter boxes. Individual connections are to be installed in accordance with Irish Water Standard Details.

The proposed water main layout is arranged such that all buildings are a maximum of 46m from a hydrant in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety". Hydrants are to be installed in accordance with Irish Water's Code of Practice and Standard Details. Final positions of hydrants will be agreed as part of the Fire Safety Certificate requirements.

Sluice valves are provided at appropriate locations to facilitate isolation and purging of the system. Every block will accommodate minimum 24-hour water storage (in accordance with the requirements of Irish Water's Code of Practice) and include provision of water conservation measures such as dual flush water cisterns and low flow taps.

8.6 Potential Impact of the Proposed Development

8.6.1 Construction Stage

During the construction phase there will be a number of personnel based on site who will require canteen and toilet facilities. Waste from these facilities will be removed by suction tanker to a licensed facility. At no time during construction will foul sewerage be allowed to discharge to the surface water network.

Construction of the proposed development will require the removal of a large part of the topsoil and earthworks to facilitate the construction of the buildings, basement areas, infrastructure service provision, road construction, surface water storage systems etc. Given the extent of disturbance, there is potential for weathering and erosion of the surface soils from precipitation and run-off.

Surface water runoff from the construction phase may also contain increased silt levels or result in pollution from the construction processes. The discharge of these contaminants, such as concrete and cement, which are alkaline and corrosive, have the potential to cause pollution. Accidental oil or fuel spillages or leaks from construction activities also have the potential to find their way into groundwater through percolation. Both increased silt and contaminant levels have the risk of reducing groundwater quality.

The majority of rainwater falling on the site during construction will percolate directly into the ground. The permanent works proposal is for 33% the surface water on the site to be infiltrated into the ground, with the remainder of the surface water falling on the site discharged into the surface water sewer network. During the construction process, the contractor will imitate this proposal in the form of a temporary SuDS measures and by connecting into the local network. The temporary SuDS measures will aid in separating the rainwater falling on the site from any potential polluted contaminants.

Potential impacts that may arise during the construction phase are noted below:

- Surface water runoff during the construction phase may contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities. This may wash out onto the Leopardstown Road at the southern end of the site.

- Discharge of rainwater pumped from excavations.
- Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery and spillage during refuelling and maintenance contaminating the surrounding surface water and hydrogeological environments.
- Concrete runoff, particularly discharge of wash water from concrete trucks.
- Discharge of vehicle wheel wash water.
- Infiltration of groundwater into open excavations.

Accidental pollution of water from plant, machinery or temporary storage areas is possible, due to the nature of construction. This likely, but brief impact would be imperceptible in nature as any potential pollution would be indirect as it would percolate through the soil, prior to reaching the local groundwater. Excavation works are required, to strip the site's topsoil and for the installation of proposed drainage infrastructure.

The majority of rainwater falling on the site during construction will percolate directly into the ground. Given the permeable nature of the ground on site and the low level of the groundwater table, there is unlikely to be any significant ponding of rainwater in excavations.

The temporary effects of these works are anticipated to be imperceptible neutral effects. Care will be required for the environmental management of the site to ensure that no potential contamination issues are experienced which may impact on the overall storm water quality. Refer also to the Construction & Environmental Management Plan, submitted with the planning application, which indicates the proposed measures required to avoid same.

8.6.2 Operational Stage

Once the development is completed the operational impacts on the water & hydrology aspects of the site would be minimal. The biggest risk item is cross contamination of surface water from the operational phase of the development from accidental oil spillages, refer to the mitigation section below for proposed remedial issues.

During the operational phase of the development the following potential risks to surface water have been identified:

- Increased impermeable surface area will reduce local groundwater recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).
- Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads and in driveway areas).
- Foul waste and surface water discharging to ground through leakage in the drainage systems.
- Contamination risks arising from development use / leaking pipes / contaminated surface water runoff.

8.7 Potential Cumulative Impacts

Cumulative phase looks at the increased overall implications the proposed development may have on the environment in cumulation with existing and permitted development in the area.

Appendix 2.1, submitted as part of this application, has highlighted 25no. applications in the local area. Per the map below Figure 8:7 there are several permitted and proposed planning applications that may have a cumulative effect on the water, when combined with the proposed development.

Figure 8:7 – Planning Applications within 1km of the site.

8.7.1 Watermain

The developments in the area will increase the total demand on the existing water supply in the area. By issuing their "Confirmation of Feasibility" letter, Irish Water have confirmed that the surrounding network will have the capacity to serve the development.

8.7.2 Foul Water Drainage

The developments in the area will increase the total demand on the existing foul water drainage and treatment system in the area. By issuing their "Confirmation of Feasibility" letter, Irish Water have confirmed that the surrounding network will have the capacity to serve the development. Any sizeable developments would require upgrades to the sewer network.

8.7.3 Surface Water

The site proposals to treat surface water will aim to replicate greenfield flow rates via a suite of SuDS measures and therefore it is not likely to give rise to any significant effects cumulatively or, in combination with, other developments in the area.

8.8 Do Nothing Scenario

In the absence of the proposed development being constructed, the permitted development (D17A/0337/PL06D.249248) would likely be implemented. The seven large, detached houses on large plots fronting Leopardstown Road (i.e. the part of the site added subsequent to the granting of the above permission) would remain in use as individual dwellings. Due to these factors, there would be a lesser increase in demand on the existing water supply and foul water (wastewater) systems. There would be a lesser charge to the surface water drainage from the site.

8.9 Risks to Human Health

8.9.1 Construction Phase

Due to the nature of the construction process, there is a potential for the groundwater system to be contaminated during the construction works. There is a non-exhaustive list of mitigation measures included in this chapter, as well as local and national guidelines which should be implemented by the contractor during the construction phase. With these implemented, the risk to human health is considered low, long term and negative.

8.9.2 Operational Phase

The water services (Surface water, Foul Water and Water supply) systems will all be installed as per the latest relevant guidelines. These guidelines have been developed over time and aim to reduce and minimize the possibility of failures of the system and also to ensure that there are no or limited risks to Human Health. In the unlikely event that one of these systems to fail, there would be limited exposure to the general public to the sources of the failure, with trained professionals carrying out any repairs. Therefore, the risk to Human Health is considered low, short-term and negative.

8.10 Mitigation Measures

8.10.1 Construction Stage

A project-specific Construction Environmental Management Plan (CEMP) has been prepared and submitted with this planning application. It will be maintained by the Contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

In addition, the following site-specific measures will be implemented:

- Any excess surface water on site to be discharged to the ground via soakaways or discharged to the network system.
- Designated impermeable cement washout areas must be provided.
- Any *in-situ* concrete work to be lined and areas bunded (where possible) to stop any accidental spillage.
- Any spoil or waste material generated from the construction process is to be temporarily stored at an approved location on site, before being removed to an accepting licensed waste disposal facility.
- All new infrastructure is to be installed and constructed to the relevant codes of practice and guidelines.
- All surface water infrastructure is to be pressure tested by an approved method during the construction phase and prior to connection to the public networks, all in accordance with Local Authority Requirements.
- Connections to the public network are be carried out to the approval and / or under the supervision of the Local Authority prior to commissioning.
- All new drains are to be inspected by CCTV survey post construction; to identify any possible physical defects for rectification prior to operational phase. All new water mains to be tested and sterilised in accordance with Irish Water requirements.
- Care will be required for the environmental management of the site to ensure that no potential contamination issues are experienced which may impact on the overall surface water quality.
- The construction of the development will be carried out in accordance with the Construction and Environmental Management Plan in order to prevent accidental onsite oil spillages and the regular maintenance of onsite plant to eliminate potential risks. A Construction & Environmental Management Plan (CEMP) is submitted with this planning application.
- Implement best practice construction methods and practices complying with relevant legislation to avoid or reduce the risk of contamination of watercourses or groundwater.

- The CEMP, incorporating the measures in the EIAR, will be developed, and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined.
- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and filter sediment laden runoff prior to, as approved, discharge to a temporary soakaway or the surface water sewer system network.
- Weather conditions and seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations, with an objective of minimizing soil erosion.
- The extent of sub-soil and topsoil stripping to be minimised to reduce the rate and volume of the run-off during construction until the topsoil and vegetation are replaced.
- Concrete batching will take place off site or in a designated area with an impermeable surface.
- Concrete wash down and wash out of concrete trucks will take place off site or in an appropriate facility.
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds/soakaways.
- Oil and fuel stored on site for construction should be stored in designated areas. These areas shall be bunded and should be located away from surface water drainage and features.
- Refuelling of construction machinery shall be undertaken in designated areas away from surface water drainage to minimise potential contamination of the water environment. Spill kits shall be kept in these areas in the event of spillages.
- Hazardous construction materials shall be stored appropriately to prevent contamination of watercourses or groundwater.
- Spill kits should be kept in designated areas for re-fuelling of construction machinery.
- Dewatering measures should only be employed where necessary.

8.10.2 Operational Stage

Sustainable Urban Drainage Systems (SuDS) will be incorporated fully into the development, in order to improve the quality of the surface water discharging from site and reduce the runoff volume and rate. The surface water drainage design, for this development, was designed in accordance with the Local Authority requirements. All SuDS measures will be provided in accordance with the Greater Dublin Strategic Drainage Study Regional Drainage Policy Volume 2 - New Development (GDSDS-RDP Volume 2). Specific design requirements for SuDS systems are established by the Construction Industry Research and Information Association's publication CIRIA C753 – The SuDS Manual.

Following best practice, the potential for the storm water to become polluted via oil spills will be reduced as far as is practical (e.g., using a Klargester Bypass Interceptor for basement drainage) or similar approved to take run off from carparking areas and passing through same prior to disposal to the on-site surface water system.

As such this type of development would not increase the risk to surface water or downstream flooding. All surface water discharges to soakaways in close approximation of the existing greenfield runoff/drainage regime. All surface waters are to pass through an oil separator prior to out falling into the proposed new storm sewer.

The following measures will be employed:

- Surface water runoff from the development will be collected by an appropriately designed system with contaminants removed prior to discharge via SuDS measures and a petrol interceptor.
- Foul water will be drained to a fully separate system.
- A regular maintenance and inspection programme of the flow control devices, soakaway storage facilities, gullies and petrol interceptor will be implemented during the Operational Phase to ensure the proper working of the development's networks and discharges.
- Operational refuse will be removed from site using licenced waste management contractors.

8.11 Monitoring

8.11.1 Construction Stage

Proposed monitoring during the construction phase in relation to the water and hydrogeological environment are as follows:

- Adherence to the 'Construction and Environmental Management Plan'. If construction works are found to be not in accordance with the plan, then the developer will ensure that measures are put in place to ensure compliance.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and vehicle wheel wash facilities. If these measures are found to be inadequate or inadequately implemented, then the developer will ensure that measures are put in place to remedy this.
- Monitoring of run-off from the site including pumping / dewatering. If these measures are found to be inadequate or inadequately implemented, then the developer will ensure that measures are put in place to remedy this.
- Monitoring sediment control measures (sediment retention ponds, surface water inlet protection etc.) If these measures are found to be inadequate or inadequately implemented, then the developer will ensure that measures are put in place to remedy this.
- Monitoring of discharge from sediment retention ponds (e.g. pH, sediment content). If these measures are found to be inadequate or inadequately implemented, then the developer will ensure that measures are put in place to remedy this.
- A dust management programme will be implemented during the construction phase of the development. If these measures are found to be inadequate or inadequately implemented, then the developer will ensure that measures are put in place to remedy this.

8.11.2 Operational Stage

Proposed monitoring during the operational phase in relation to the water and hydrogeological environment are as follows:

- A management company on site will ensure the system is regularly inspected and maintained. Areas of the site with significant SuDS features will remain in the charge of this company.
- The performance of all SuDS features will be monitored by the management company during the life of the development.
- Monitoring of the installed gullies will be required to prevent contamination and increased runoff from the site.

8.12 Reinstatement

Minor reinstatement works would be required in respect of pipe laying

8.13 Interactions

There are interactions between water, land and soils and material assets and built assets.

There are interactions between water and land and soils, with changes in depth and type of overburden impacting the protection provided to aquifers. The likely impact will be neutral, permanent and slight.

There are interactions between water and land and soils, with some surface water conveyed and stored in SuDS features such as soakaways and discharging to the ground where possible, replicating the existing greenfield site drainage as closely as possible. The likely impact will be permanent, slight and neutral.

8.14 Difficulties Encountered

No difficulties were encountered while developing this report, the range and scope of desk top data.