

## 10.0 WATER AND HYDROLOGY

### 10.1 Introduction

The Water and Hydrology Chapter of this EIAR has been prepared by Brendan Keogh (BA BAI PGradDip CEng MIEI) of DBFL Consulting Engineers. Brendan Keogh is a Chartered Professional Engineer with over 15 years experience in the design and construction of civil engineering projects. Projects have included works associated with the commercial, industrial, energy, residential and public infrastructure sectors.

This chapter of the EIAR comprises of an assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments (including flood risk, surface water drainage, foul drainage and water supply) as well as identifying proposed mitigation measures to minimise any impacts.

In summary, the proposed development ("the site") comprises of the demolition of all existing structures on site and construction of 590 No. residential dwellings (480 No. Build-to-Rent Apartments and 110 No. Build-to-Sell Duplexes) on a 6.05 Ha site.

The development will also consist of the provision of an ancillary amenity block within the central open space which comprises a gymnasium, lobby, kitchenette and lounge at ground floor level and lounge at first floor level in addition to a roof terrace (to serve the Build-to-Rent residents only); a two storey retail/café/restaurant building; a creche and a management suite.

The proposed development will also include the following associated engineering infrastructure:

- Upgrade of existing traffic signals on Scholarstown Road to facilitate the primary vehicle access to the site (including provision of formal signalised crossings for the benefit of both pedestrians and cyclists).
- Upgrading existing pedestrian and cycle facilities along Scholarstown Road.
- Provision of internal site roads including associated footpaths.
- Provision of surface water drainage, foul drainage and water supply infrastructure.
- Upsizing the existing 6" cast iron watermain along the northern side of Scholarstown Road to 200mm diameter for approximately 395m.

The proposed surface water drainage network accords with SUDS principles, divides the site into three drainage catchments and discharges to an existing 1200mm diameter surface water drain (which runs along the site's eastern boundary) at a controlled greenfield runoff rate of 2.5 l/sec/ha.

DBFL have engaged with Irish Water regarding required network upgrade projects to facilitate the proposed development. Part of this upgrade project includes construction of a 450mm diameter foul sewer through the proposed development (refer to Irish Water Upgrade Plan included in Appendix 10.4). DBFL and Irish Water have co-ordinated the route of the proposed 450mm diameter foul sewer with the proposed site layout. Irish Water's proposed 450mm diameter foul sewer will provide a suitable foul drainage outfall for the proposed development.

An existing 6" cast iron watermain runs along the northern side of Scholarstown Road (immediately adjacent to the site's southern boundary, refer to Irish Water's Network Plan as included in Appendix 10.1). Irish Water have confirmed that new connections to the existing network are feasible subject to network upgrade (i.e. upsizing the existing 6" cast iron watermain noted above to 200mm diameter for approximately 395m).

## 10.2 Methodology

Assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments included the following activities:

- Site inspection / walkover
- Review of existing topographic survey information
- Review of Irish Water utility plans (surface water drainage, foul drainage and water supply). Refer to Appendix 10.1.
- Ground investigations including trial pits, infiltration testing and environmental testing (RIALT waste acceptance criteria for landfills)
- Review of information available on the Environmental Protection Agency (EPA) online mapping service
- Review of information available on the Geological Survey of Ireland (GSI) online mapping service
- Review of Office of Public Works (OPW) National Flood Hazard Mapping and CFRAM Studies (Catchment Flood Risk Assessment and Management Studies)
- Consultation with South Dublin County Council's Water Services Section
- Consultation with Irish Water
- Submission of a Pre-Connection Enquiry Application to Irish Water
- Obtaining a Statement of Design Acceptance from Irish Water

As part of assessing the likely impact of the proposed development, surface water runoff, foul drainage discharge and water usage calculations were carried out in accordance with the following guidelines:

- Greater Dublin Strategic Drainage Study (GDSDS)
- Method outlined in Irish Water's Pre-Connection Enquiry Application (water demand and foul drainage discharge)

## 10.3 Receiving Environment

### 10.3.1 Hydrology

The primary hydrological features in the vicinity of the site are the Orlagh Stream (approx. 1.0km to the west), the Owendoher Stream (approx. 950m to the east) and the Dodder River (approx. 1.2km to the north). Refer to Figure 10.1 for the location of the hydrological features noted above.

As noted previously, an existing 1200 diameter surface water drain runs along the site's eastern boundary, out-falling towards the site's north-eastern corner (refer to Figure 10.2).

As the site generally falls from south-west to north-east, the existing 1200 diameter surface water drain noted above will provide a suitable surface water outfall for the proposed development.

The existing 1200 diameter surface water drain noted above ultimately discharges to the River Dodder.

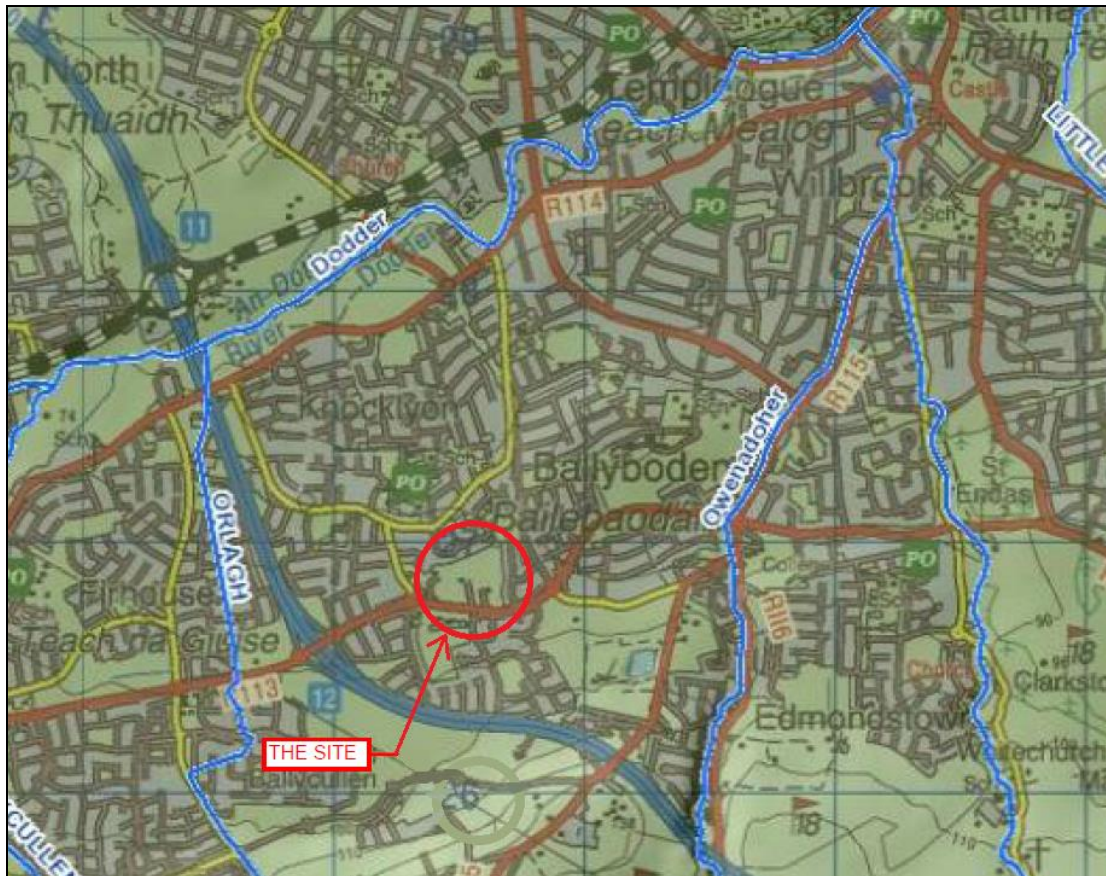


Figure 10.1: Extract from EPA Online Mapping Service

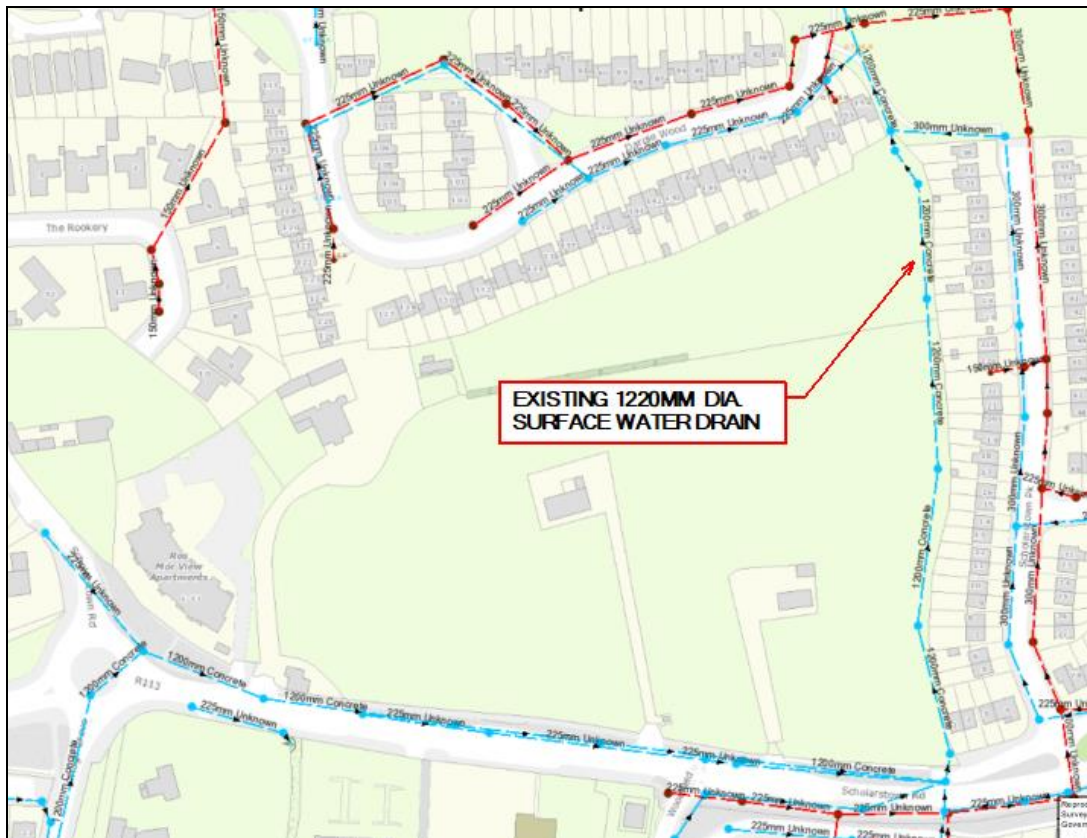


Figure 10.2: Extract from Irish Water Network Plan

### 10.3.2 Hydrogeology

GSI's Groundwater Data Viewer indicates that the site is located partially within the "Kilcullen" Groundwater Body and partially within the "Dublin" Groundwater Body. The underlying bedrock aquifer is classified as "Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones". Refer to Figure 10.3 below.

GSI also classify the site's groundwater vulnerability as "Low". Refer to Figure 10.4 below.

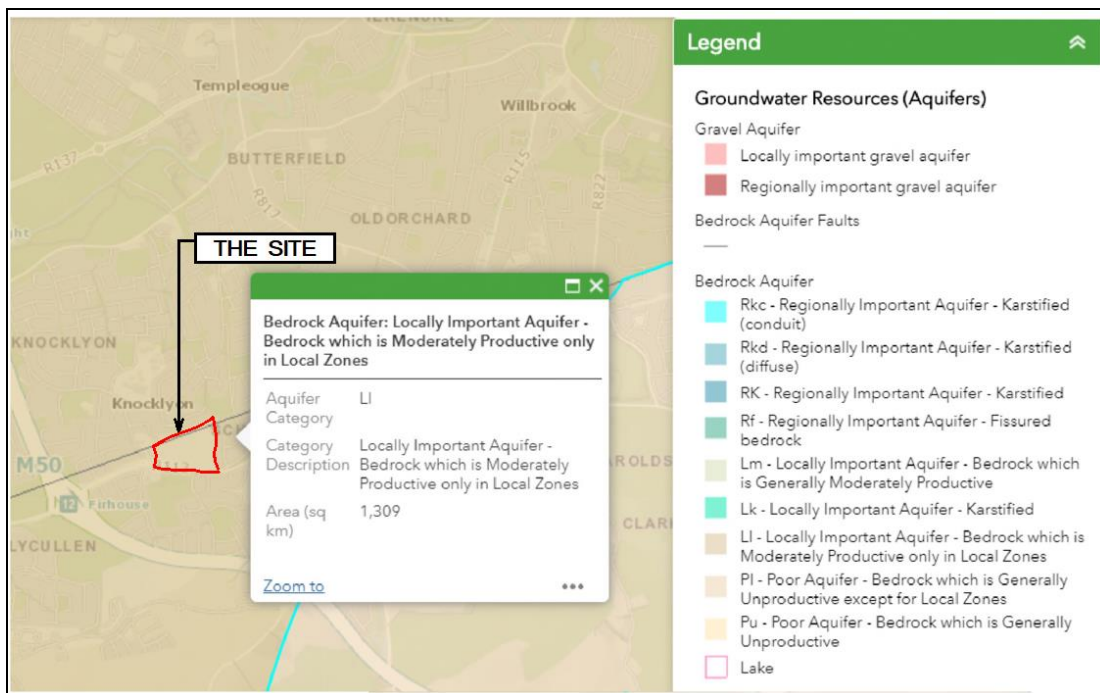


Figure 10.3: Extract from GSI Online Mapping Service – Groundwater Aquifers

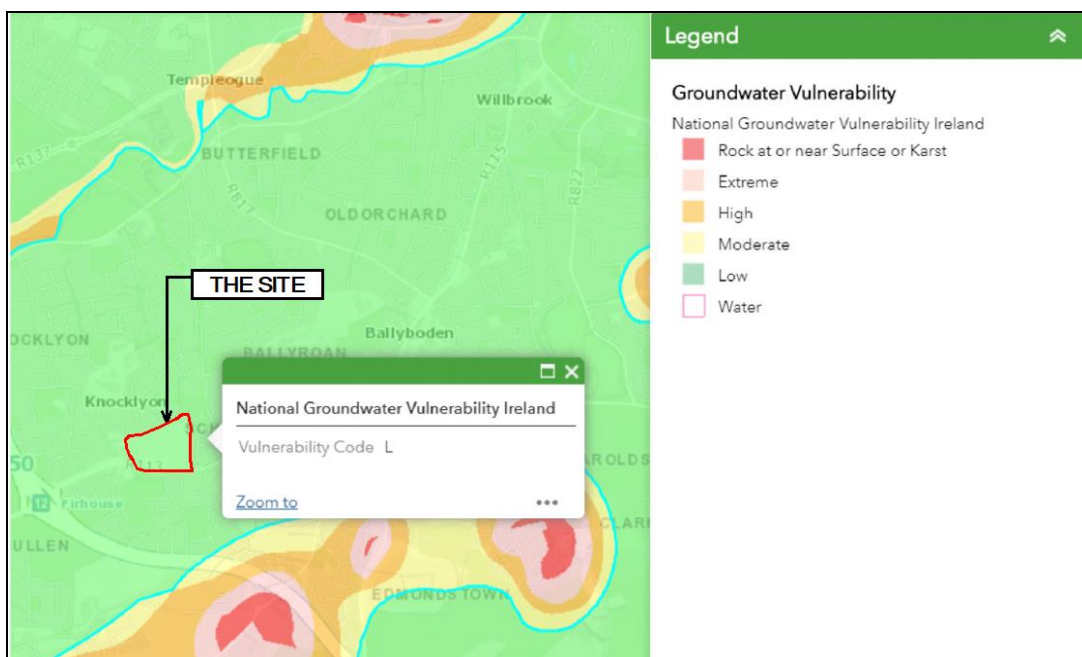


Figure 10.4: Extract from GSI Online Mapping Service – Groundwater Vulnerability

### 10.3.3 Flood Risk

A flood hazard assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping ([www.floods.ie](http://www.floods.ie)) and the Eastern CFRAM Study.

This assessment has been carried out in accordance with the procedures for a "Flood Risk Assessment" as outlined in the OPW's Guidelines for Planning Authorities – The Planning System and Flood Management (November 2009).

#### OPW Flood Hazard Mapping

OPW's Summary Local Area Report is included in Appendix 10.2 (Flood Hazard Information).

This report is sourced from the OPW website ([www.floodmaps.ie](http://www.floodmaps.ie)) and summarises all flood events within 2.5 km of the site. No flood events are noted in the immediate vicinity of the site.

Also, no benefitting lands are identified in the vicinity of the site. Benefitting lands are lands that might benefit from implementation of a major drainage scheme or lands subject to flooding or poor drainage.

#### Eastern CFRAM Study

Extracts from the Dodder Catchment Flood Risk Assessment and Management Study are included in Appendix 10.2 (Flood Hazard Information) which indicates the extent of fluvial flooding in the vicinity of the site.

The closest modelled node to the site is located on the Owendoher River (approx. 950 m east of the site). No fluvial flooding is indicated in the vicinity of the site.

### 10.3.4 Foul Drainage

Existing public foul drainage infrastructure is located to the north-east of the site (refer to the Irish Water Network Plan included in Appendix 10.1).

The location of existing private foul drainage infrastructure within the site has been confirmed by CCTV survey (refer to Appendix 10.3). This infrastructure outfalls to the existing public foul drainage infrastructure noted above and includes a connection to an adjacent dwelling (south-west of the site). It is proposed to accommodate this existing connection within the proposed foul drainage network within the site.

An existing 225mm private foul sewer is located along the site's eastern boundary which will become redundant upon construction of the proposed 450mm diameter foul sewer through the proposed development.

Pre-connection enquiry feedback has been received from Irish Water which advises that new connections to the existing network are feasible subject to network upgrade (upgrade project is scheduled to be completed in 2021). Refer to Appendix 10.5.

As previously noted, part of this upgrade project includes construction of a 450mm diameter foul sewer through the proposed development (refer to Irish Water Upgrade Plan included in Appendix 10.4). DBFL and Irish Water have co-ordinated the route of the proposed 450mm diameter foul sewer with the proposed site layout. Irish Water's proposed 450mm diameter foul sewer will provide a suitable foul drainage outfall for the proposed development (also refer to DBFL Technical Note 170232-TN-05, Response to ABP Opinion).

### **10.3.5 Surface Water Drainage**

An existing 1200mm diameter surface water drain runs along the site's eastern boundary (falling towards the site's north-east corner). Refer to Irish Water's Network Plan included in Appendix 10.1 and Figure 10.2. This surface water drain ultimately discharges to the River Dodder.

It is proposed to discharge attenuated flows from the site to this existing 1200mm diameter surface water drain.

The proposed site layout has been arranged in such a way as to allow this pipeline to remain in place (i.e. it will be located in fully accessible communal open space to the rear of duplex units located along the site's eastern boundary with appropriate set backs as required by the GDSDS).

The site currently drains via natural means, infiltration rates were observed during Soakaway Testing carried out by IGSL were found to be negligible.

### **10.3.6 Water Supply**

The locations of the existing public water mains are shown on Irish Water's Service Plan (refer to Appendix 10.1).

An existing 6" cast iron watermain runs along the northern side of Scholarstown Road (immediately adjacent to the site's southern boundary). A 300mm diameter ductile iron watermain is also located adjacent to the south-east corner of the site.

Irish Water have confirmed that new connections to the existing network are feasible subject to network upgrade (i.e. upsizing the existing 6" cast iron watermain noted above to 200mm diameter for approximately 395m).

## 10.4 Characteristics of the Proposed Development

### 10.4.1 Hydrology

The proposed development is located a minimum distance of approx. 950m from the primary hydrological features in the vicinity of the site (Orlagh Stream, Owendoher Stream and the Dodder River).

No adverse effects on surrounding hydrology is anticipated as surface water flows are attenuated to greenfield runoff rates in conjunction with implementation of SUDS strategies such as permeable paving, green roofs and installation of a Class 1 full retention fuel / oil separator. Refer to DBFL's Infrastructure Design Report (170232-rep-001) for full details of the proposed SUDS methodologies.

### 10.4.2 Hydrogeology

During construction, the deepest excavations are expected to be required for installation of the attenuation tanks and basement construction (up to approximately 4.0m below existing ground level).

Groundwater ingress was confined to two borehole locations (at 8.4m and 2.4m below existing ground level respectively).

It is not envisaged that the proposed development works will have any direct impact on the underlying hydrogeology.

### 10.4.3 Flood Risk

A Site-Specific Flood Risk Assessment for proposed development was undertaken in accordance with the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices.

Following the Flood Risk Assessment, it was determined that the site is located in Flood Zone C as defined by the Guidelines. It concluded that the;

- The proposed development is appropriate for the site's flood zone category.
- The sequential approach outlined in the Guidelines has been adhered to and that the 'Avoid' principal has been achieved.

The proposed development is considered to have the required level of flood protection up to and including the 1% AEP flood event. Overland flow paths have been identified for pluvial flooding exceeding the capacity of the surface water drainage network.



#### 10.4.4 Foul Drainage

The Topography of the site generally falls from the South-West corner of the site towards the North-East corner at gradients ranging from 1/35 to 1/80 i.e. foul drainage flows by gravity towards the site's North-Eastern corner.

The foul drainage will connect by gravity into the upgraded 450mm foul sewer in the North-East corner of the site.

The proposed foul drainage network comprises of a network of 225mm diameter pipes with individual units being serviced by individual 100mm diameter connections.

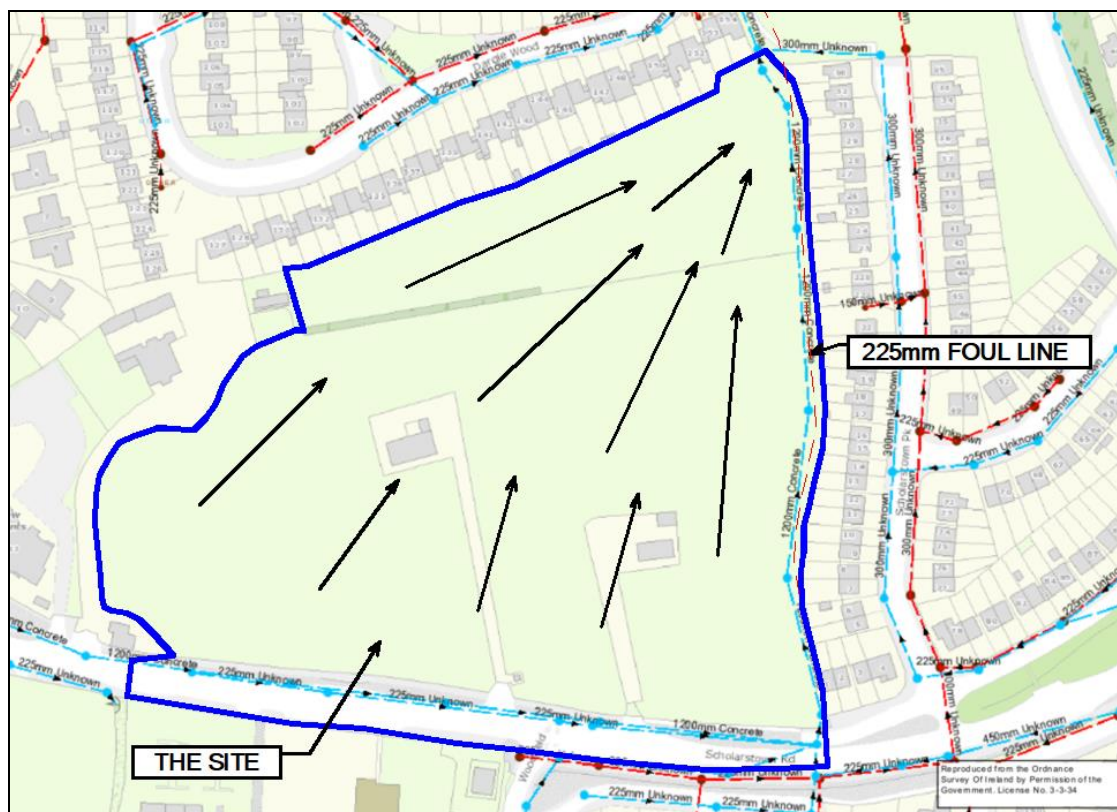


Figure 10.5: Extract from Irish Water Network Plan (Site Boundary Indicative Only)

The foul drainage network for the proposed development has been designed in accordance with the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal", BS EN 752: 2008 Drain and Sewer Systems Outside Buildings, IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings and BS 8301:1985 Building Drainage.

A daily foul discharge volume of 275m<sup>3</sup> has been calculated as per the Irish Water Code of Practice for Wastewater Infrastructure.

### 10.4.5 Surface Water Drainage

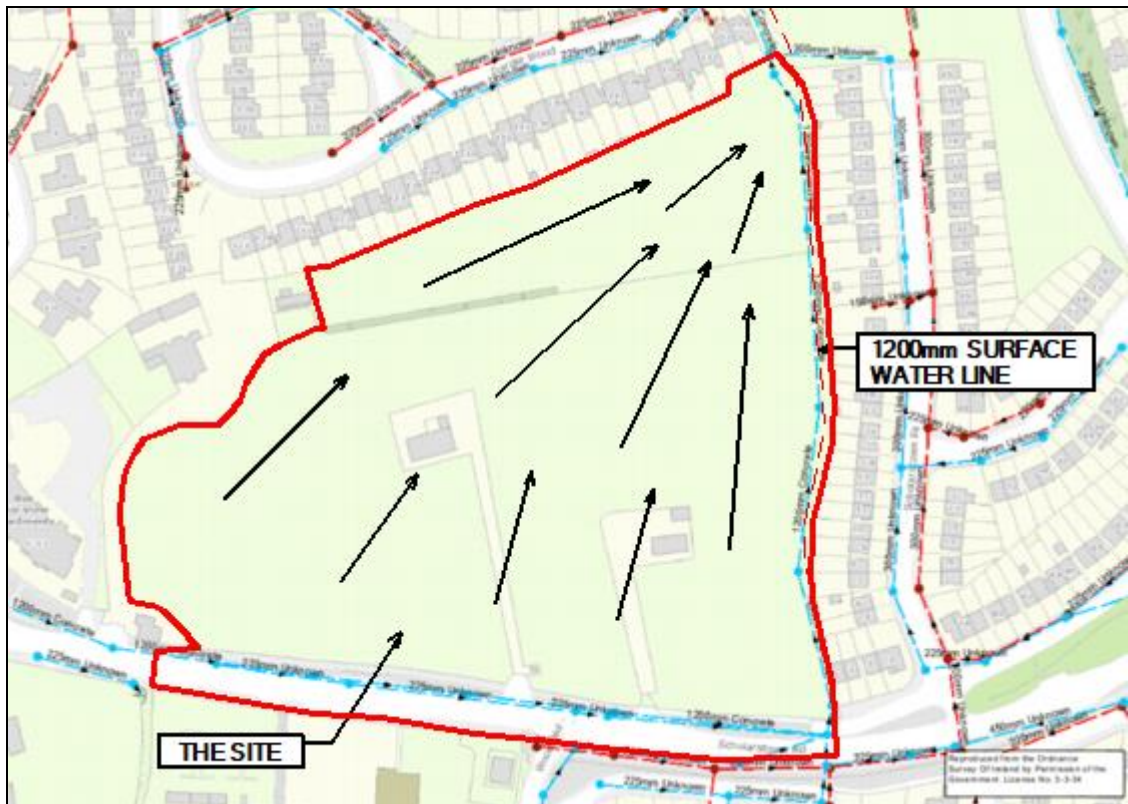


Figure 10.6: Extract from Irish Water Network Plan (Site Boundary Indicative Only)

It is proposed to construct a surface water outfall from the site to the 1200mm Surface Water drain in North-East corner of the site which ultimately discharges to the Dodder river.

Surface water runoff from the site's road network directed to tree pits via conventional road gullies (with high level overflow to the piped surface water network) while surface water runoff from on street parking areas will be captured by permeable paving.

Surface water runoff from roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved parking areas (providing an additional element of attenuation), while apartment roofs will employ a green roof system (reducing roof runoff while increasing biodiversity).

While the site does represent a single surface water catchment, for internal management of the surface water, it has been split into three sub catchments, Each sub catchment has been assessed separately in relation to surface water attenuation. Surface water discharge rates from the proposed surface water drainage network will be controlled by a Hydrobrake type flow control device and associated underground attenuation tanks (Stormtech Chambers). Surface water discharge will also pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site) before leaving the site. Refer to DBFL's Infrastructure Design Report (170232-rep-001) for full details of the proposed SUDS methodologies.

Surface water calculations are based on an allowable outflow / greenfield runoff rate of 2.5 l/sec/ha resulting in a total attenuation volume for the 3 no. Catchments of 1,304 m<sup>3</sup> discharging through a single point.

Proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GSDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.

#### **10.4.6 Water Supply**

Upon upsizing of the existing 6" Cast Iron watermain with a 200mm line, it is proposed to connect this watermain (along Scholarstown Road) via a 200mm diameter looped watermain (generally along the site's arterial roads) which will service the proposed development.

All connections, valves, hydrants, meters etc. have been design and are to be installed in accordance with Irish Water's Code of Practice / Standard Details and the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety".

A post development average hour water demand of 4.0 l/sec and a post development peak hour water demand of 20.0 l/sec has been calculated as per the Irish Water Code of Practice for Water Infrastructure.

## 10.5 Potential Impact of the Proposed Development

### 10.5.1 Construction Phase

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.
- Discharge of rain water pumped from excavations may also contain increased silt levels (potential impact on existing hydrology e.g. accidental discharge to existing surface water drainage network).
- Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery and spillage during refuelling and maintenance.
- Concrete runoff, particularly discharge of wash water from concrete trucks. (potential impact on existing hydrology e.g. infiltration to ground).
- Discharge of vehicle wheel wash water (potential impact on existing hydrology e.g. discharge to existing surface water drainage infrastructure).
- Improper discharge of foul drainage from contractor's compound (impact on existing hydrology e.g. cross-contamination of existing surface water drainage.).
- Cross contamination of potable water supply to construction compound.

### 10.5.2 Operational Phase

Potential operational phase impacts are noted below:

- Increased impermeable surface area will reduce local ground water 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).
- Increased discharge to foul drainage network (Daily Foul Discharge Volume = 265 m<sup>3</sup>)
- Increased potable water consumption (Average Daily Domestic Demand = 240m<sup>3</sup>)

### 10.5.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

## 10.6 Ameliorative, Remedial or Reductive Measures

### 10.6.1 Construction Phase

The following measures are proposed during the construction phase to mitigate against risks to the surrounding hydrological environment:

- A site-specific Construction and Environment Management Plan will be developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Construction and Environment Management Plan.
- 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 treat sediment laden runoff prior to discharge to the surface water network at a controlled rate.
- Weather conditions and typical seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations with an objective of minimizing soil erosion.
- In order to mitigate against spillages contaminating the surrounding surface water and hydrogeological environments, all oils, fuels, paints and other chemicals should be stored in a secure bunded hardstand area. Refuelling and servicing of construction machinery will take place in a designated hardstand area which is also remote from any surface water inlets (where not possible to carry out such activities off site).
- Concrete batching will take place off site and wash down and wash out of concrete trucks will take place off site (at authorized concrete batching plant in full compliance with relevant planning and environmental consents).
- Discharge from any vehicle wheel wash areas is to be directed to on-site settlement ponds.
- The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be tankered off site to a licensed facility until a connection to the public foul drainage network has been established.
- The construction compound's potable water supply shall be protected from contamination by any construction activities or materials.

### 10.6.2 Operational Phase

Following the Site Specific Flood Risk Assessment, it has been determined that the proposed development is located in Flood Zone C as defined by the Guidelines i.e. proposed development is considered to have the required level of flood protection up to and including the 1% AEP flood event.

Surface water runoff from the site will be attenuated to the greenfield runoff rate as outlined in the Greater Dublin Strategic Drainage Study (GDSDS). Surface water discharge rates will be controlled by a Hydrobrake type vortex control device in conjunction with below ground attenuation storage.

The following methodologies are being implemented as part of a SuDS surface water treatment train approach:

- Permeable paving in on street parking
- Surface water runoff from duplex roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways
- Surface water runoff from apartment roofs will be captured by green roofs (sedum blanket) prior to being routed to the piped surface water drainage network
- A drainage reservoir (drainage board) is to be provided on the podium slab over basement. The podium will have a typical roof garden build up with a mix of soft landscaping and permeable hard landscaping (over a drainage board which would serve as a reservoir)
- Attenuation of the 30 and 100 year return period storms
- Installation of a Hydrobrake (limiting surface water discharge from the site to 2.5 l/sec/ha)
- Surface water discharge will also pass via a fuel / oil separator (sized in accordance with permitted discharge from the site)

A contract will be entered into with a suitably qualified contractor from maintenance of the attenuation system, Hydrobrake and full retention fuel / oil separator noted above.

No specific mitigation measures are proposed in relation to foul drainage however, all new foul drainage lines will be pressure tested and be subject to a CCTV survey in order to identify any possible defects prior to being made operational.

No specific mitigation measures are proposed in relation to water supply, however, water conservation measures such as dual flush water cisterns and low flow taps will be included in the design.

The potential impact of climate change has been allowed for as follows;

- Pluvial flood risk - attenuation storage design allows for a 10% increase in rainfall intensities.
- Pluvial flood risk - drainage system design allows for a 10% increase in flows, as recommended by the GDSDS.
- Provision of min. freeboard (500mm) from 1% AEP as required by GDSDS (mitigation against impact of climate change).

### 10.6.3 'Do Nothing' Scenario

No mitigation measures are proposed in relation to water and the hydrological environment if the development does not proceed.

## 10.7 Predicted Impact of the Proposed Development

### 10.7.1 Construction Phase

Implementation of the measures outlined in Section 10.6.1 will ensure that the potential impacts of the proposed development on water and the hydrogeological environment do not occur during the construction phase.

### 10.7.2 Operational Phase

As surface water drainage design has been carried out in accordance with the GSDS and SuDS methodologies are being implemented as part of a treatment train approach, there are no predicted impacts on the water and hydrogeological environment arising from the operational phase.

### 10.7.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

## 10.8 Monitoring

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

- Adherence to Outline Construction Management Plan
- Inspection of fuel / oil storage areas.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and vehicle wheel wash facilities.
- Monitoring sediment control measures (sediment retention ponds, surface water inlet protection etc.)
- Monitoring of discharge from sediment retention ponds (e.g. pH, sediment content)

During the operational phase an inspection and maintenance contract is to be implemented in relation to the proposed Class 1 full retention fuel / oil separators.

## 10.9 Reinstatement

Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from site and disposed of at an appropriate licenced facility. South Dublin County Council's Environmental Control Section is to be notified of the proposed destination for disposal of any liquid fuels.

All sediment control measures (e.g. sediment retention ponds) are to be decommissioned on completion of the construction phase. Such areas are to be reinstated in accordance with the landscape architects plan and engineer's drawings.

## **10.10 Interactions and Potential Cumulative Impacts**

### **10.10.1 Interactions**

#### Soils

Surface water runoff during the construction phase may lead to erosion and contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities.

Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).

Refer to the Lands and Soils Chapter for proposed mitigation measures.

### **10.10.2 Potential Cumulative Impacts**

The proposed surface water drainage infrastructure has been designed in accordance with the relevant guidelines. Any other future development in the vicinity of the site would have to be similarly designed in relation to permitted surface water discharge, surface water attenuation and SuDS, therefore, no potential cumulative impacts are anticipated in relation to surface water drainage and flooding.

No potential cumulative impacts are anticipated in relation to foul drainage and water supply (Irish Water have advised that provision of a water and wastewater connections is feasible subject to network upgrades, refer to Section 10.3.4 and Section 10.3.6).