School St / Thomas Court Bawn Estate Renewal

Stage 2 Infrastructure Report

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Quality information

Prepared by	Checked by	Verified by	Approved by
			
Nicholas Orr Graduate Civil Engineer	Marc O'Dowd Principal Civil Engineer	Laura Shaughnessy Associate Director	Laura Shaughnessy Associate Director

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Prepared for:

Dublin City Council

Prepared by:

Nicholas Orr
Graduate Civil Engineer
M: 085-833-9104
E: Nicholas.Orr@aecom.com

AECOM Ireland Limited
4th Floor
One Burling Plaza
Burlington Road
Dublin 4, D04 HH21,
Co.Dublin, Ireland

T: +353 1 696 6220
aecom.com

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1. Introduction

This report outlines the stage 2b civil engineering infrastructure design for the proposed new residential scheme at School Street, Dublin 8. The report will detail the existing and proposed surface water, foul and watermain infrastructure for the site within the stage 2b design strategy remit. It will also include a stage 1 flood risk assessment for the site.

The existing site is located in the Liberties, Dublin 8, and is bound by School Street to the north, Taylor's Lane to the west and Marrowbone Lane to the southeast of the site. It is a brownfield site with two existing residential apartment blocks, as shown in Figure 1.1.

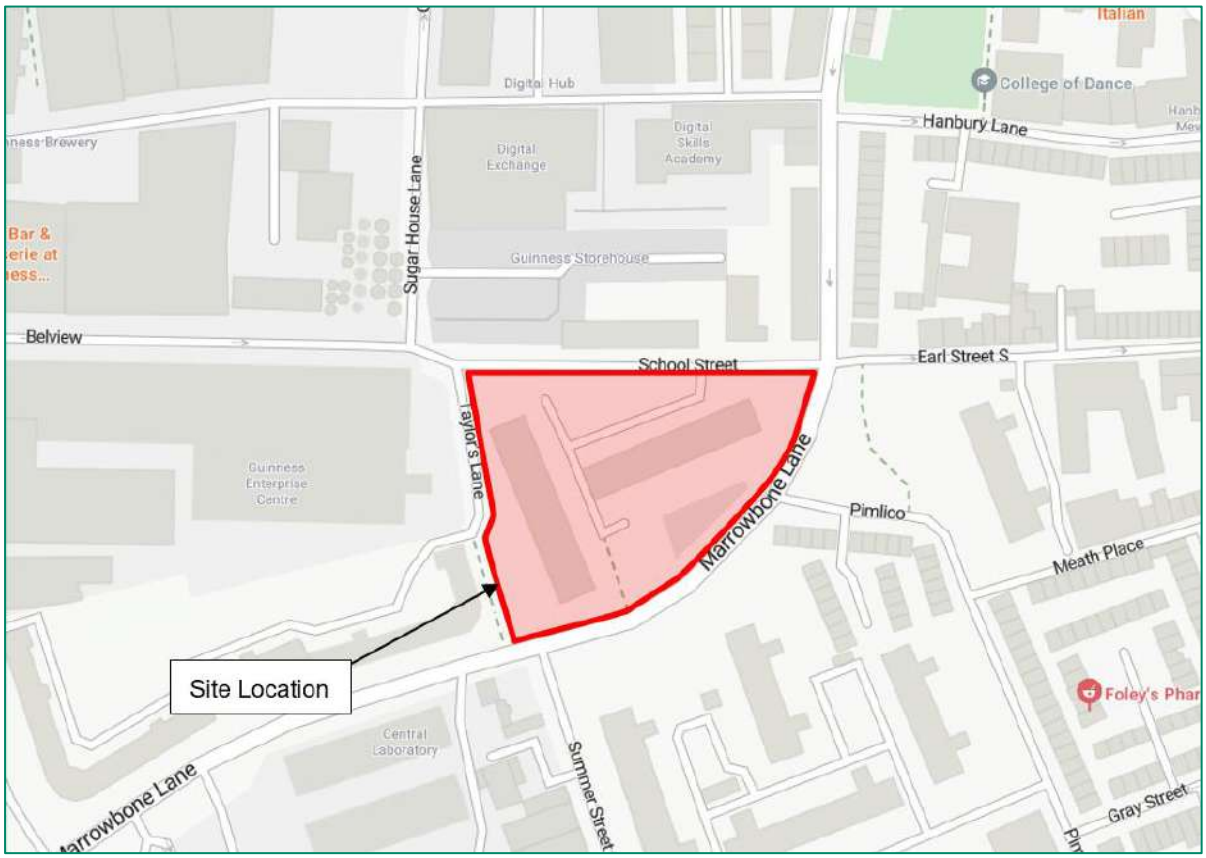

Figure 1.1: Existing Site Location (Source: Google Maps)

1.1 Proposed Development

The proposed redevelopment is for the existing School St / Thomas Court Bawn Estate and construction of 124 apartments at School Street/Thomas Court Bawn Estate, Dublin 8. The site is bounded by School Street, Taylor's Lane, Marrowbone Lane and Thomas Court Bawn (opposite Anne Devlin Park), Dublin 8. The existing 0.653 hectare site currently comprises of 2 no. five-storey housing blocks (School Street Flats (including 38 homes and a community facility at first floor) and Thomas Court Bawn (including 40 homes).

The proposed development, which will be managed by Dublin City Council, comprises of:

- The demolition of the existing Thomas Court Bawn block, ancillary structures, boundary walls/railings and site clearance works and the renovation of the existing School Street Flats block.
- Construction of 124 apartment units in 3 no. apartment blocks (Block A, Block B and Block C) comprising 41 no. 1 bed apartments, 65 no. 2 bed apartments, 18 no. 3 bed apartments.
  – Block A1 (facing School Street and Thomas Court Bawn) is 7 storeys with 27 units (27 no. 2-bed units) o
  Block A2 (facing School Street and Thomas Court Bawn) is 10 storeys with 35 units (10 no. 1-bed, 16 no. 2-bed & 9 no. 3-bed)

  - Block B (facing Thomas Court Bawn/Marrowbone Lane) is 5 storeys with 18 units (3 no. 1-bed, 6 no. 2-bed, 9 no. 3-bed)
  - Block C (facing Taylor's Lane) is 6 storeys comprising Deep retrofit and extension to the existing School Street Flats block to include an additional floor and modifications to all elevations with 44 units (28 no. 1-bed, 16 no. 2-bed)
- Provision of a multi-use community facility (including childcare facility) of 151 sq.m. at ground floor of Block A2 with an outdoor play area of 111 sq.m.
- 218 long stay bicycle parking spaces, and 72 short stay bicycle parking spaces
- 9 no. residential car parking spaces on Taylor's Lane and 1 no. motorcycle space; Provision of public and private open spaces with boundary treatments, landscaping, pavements, revision to pedestrian access, public lighting, new public realm connection running north-south along Taylors Lane; upgrade of public realm and street frontage improvements on School Street and Marrowbone Lane/Thomas Court Bawn and 1044 sq.m of communal open space in the new central courtyard;
- Construction of new ESB substation and meter rooms, stores, bin and cycle storage, plant rooms, ancillary structures; and
- All ancillary roads, site services, development works and necessary enabling works above and below ground.

The proposed architectural site layout is illustrated in Figure 1.2.

Figure 1.2: Proposed Development at School Street Dublin 8

The proposed scheme involves retrofitting the existing west block and demolishing the east block to develop 124 new residential units in place of the current 78 no. unit residential site. It is also proposed to provide a multi-use childcare facility and all associated site infrastructure and landscaping.

1.3 Ground Investigation

Ground Investigations Ireland Ltd. have undertaken a site investigation between May and July 2024 at the site of the proposed development at School Street, Co. Dublin.

The site investigations comprise of 7no. trial pits, 6no. boreholes, 9no. slit trenches, 4no. foundation inspection pits, 3no. infiltration tests and 5no. CBR tests. Made ground deposits were encountered either from ground level or beneath the topsoil/surfacing. The cohesive deposits below this are typically 'brown slightly sandy slightly gravelly clay with low cobble content overlying a dark grey slightly sandy gravelly clay with low cobbles content.'

Refer to Ground Investigation Report dated 18th November 2024 by Ground Investigations Ireland Ltd for further details.

1.4 Ground Penetrating Radar (GPR) Survey

Murphy Geospatial Ltd. have undertaken a Ground Penetrating Radar (GPR) Survey within the proposed site and the adjacent public roads. This GPR survey has scanned and mapped the existing sub-surface utilities and services which has been used in the preparation of the proposals within this report.

The results of the GPR survey are illustrated in Appendix A of this report.

1.5 Topographic Survey

A Topographic Survey has been received from Murphy Geospatial Ltd. for the existing site and adjacent public roads. The received survey shows that existing levels within the site vary from a high point of 19.94mOD to a low point of 16.70mOD.

1.6 Site Clearance

As part of the proposals, some of the existing structures and underground services will be demolished and removed from the site prior to the start of the proposed works.

In order to support the proposals, AECOM have prepared a supplementary drawing showing the existing surface water, wastewater, and water supply infrastructure within the site that are to be made redundant and removed/diverted. These proposals are illustrated in AECOM drawing 60719103-ACM-XX-00-DR-CE-0200.

2. Flood Risk Assessment

2.1 Introduction

This Stage 1 Flood Risk Assessment (FRA) has been prepared as part of the Stage 2b report for the proposed development and is in line with the requirements of "The Planning System & Flood Risk Management Guidelines for Planning Authorities" (Guidelines) as published in November 2009, and the particular requirements of a site-specific Flood Risk Assessment as outlined in Appendix 4A of the Technical Appendices to those Guidelines.

In September 2008 "The Planning System and Flood Risk Management" Guidelines (Guidelines) were published by the Department of the Environment, Heritage and Local Government in Draft format. In November 2009, the adopted version of the document was published.

The Flood Risk Management Guidelines give guidance on flood risk and development. The guidelines recommend a precautionary approach when considering flood risk management in the planning system. The core principle of the guidelines is to adopt a risk based sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for river and coastal flooding.

The objective of a Site-Specific Flood Risk Assessment (FRA) is to assess all types of flood risk to a development. The assessment should investigate potential sources of flood risk and include for the effects of climate change. The assessment is required to examine the impact of the development, and the effectiveness of flood mitigation and management procedures proposed. It should also present the residual risks that remain after those measures are put in place.

As set out in the Flood Risk Management Guidelines, the assessment of flood risk "requires an understanding of where the water comes from (i.e., the source), how and where it flows (i.e., the pathways) and the people and assets affected by it (i.e., the receptors)".

This approach is based on the identification of flood zones for river and coastal flooding. "Flood Zones" are geographical areas used to identify areas at various levels of flood risk. It should be noted that these do not consider the presence of flood defences, as risks remain of overtopping and breach of the defences. There are three flood zones defined:

- **Zone A** (high probability of flooding) is for lands where the probability of flooding is greatest (greater than 1% or the 1 in 100 for river flooding and 0.5% or 1 in 200 for coastal flooding).
- **Zone B** (moderate probability of flooding) refers to lands where the probability of flooding is moderate (between 0.1% or 1 in 1,000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1,000 and 0.5% or 1 in 200 for coastal flooding).
- **Zone C** (low probability of flooding) refers to lands where the probability of flooding is low (less than 0.1% or 1 in 1,000 for both river and coastal flooding).

Once a flood zone has been identified, the guidelines set out the different types of development appropriate to each zone. Exceptions to the restriction of development due to potential flood risks are provided for using the **Justification Test**, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated. This recognises that there will be a need for future development in existing towns and urban centres that lie within flood risk zones, and that the avoidance of all future development in these areas would be unsustainable. We also note that the current Dublin County Council Development Plan (2016-2022) was adopted following the publication of the Flood Risk Management Guidelines.

The Guidelines set out a staged approach to assessment. The stages of assessment are:

- **Flood Risk Identification (Stage 1)** - Identification of any issues relating to the site that will require further investigation through a Flood Risk Assessment.
- **Initial Flood Risk Assessment (Stage 2)** - Involves establishment of the sources of flooding, the extent of the flood risk, potential impacts of the development and possible mitigation measures.
- **Detailed Flood Risk Assessment (Stage 3)** - Assess flood risk issues in sufficient detail to provide quantitative appraisal of potential flood risk of the development, impacts of the flooding elsewhere and the effectiveness of any proposed mitigation measures.

2.2 Flood Risk Identification

As part of the overall exercise to establish the potential flood risk to the development site, AECOM carried out a review of available and recorded information with regard to flooding in the area. The following sources were consulted as part of the review:

- OPW Flood Records
- OPW PFRA Mapping
- CFRAM Predictive Mapping
- Strategic Flood Risk Assessment of the Dublin City Council 2022 – 2028
- GSI Groundwater Vulnerability Maps

2.2.1 OPW Flood Hazard Mapping

The Office of Public Works (OPW) collates available reports of flooding from all sources (e.g., fluvial, pluvial, coastal, etc.) on a nationwide basis. The OPW's website (https://www.floodinfo.ie/) was consulted to obtain reports of recorded flooding within and surrounding the site. Figure 2.1 is an extract of the information available for the area surrounding the development site, marked with a red 'X' in the image. There is one reported instance of flooding on Marrowbone Lane, approximately 0.15km away from the development site where a number of floods occurred in the 1940's resulting in the installation of defence assets by the Local Authority in order to prevent any future flood events.

Several other past flooding events are noted within 1km of the development site. Please refer to Appendix B for the OPW Historical Flood Report Summary.

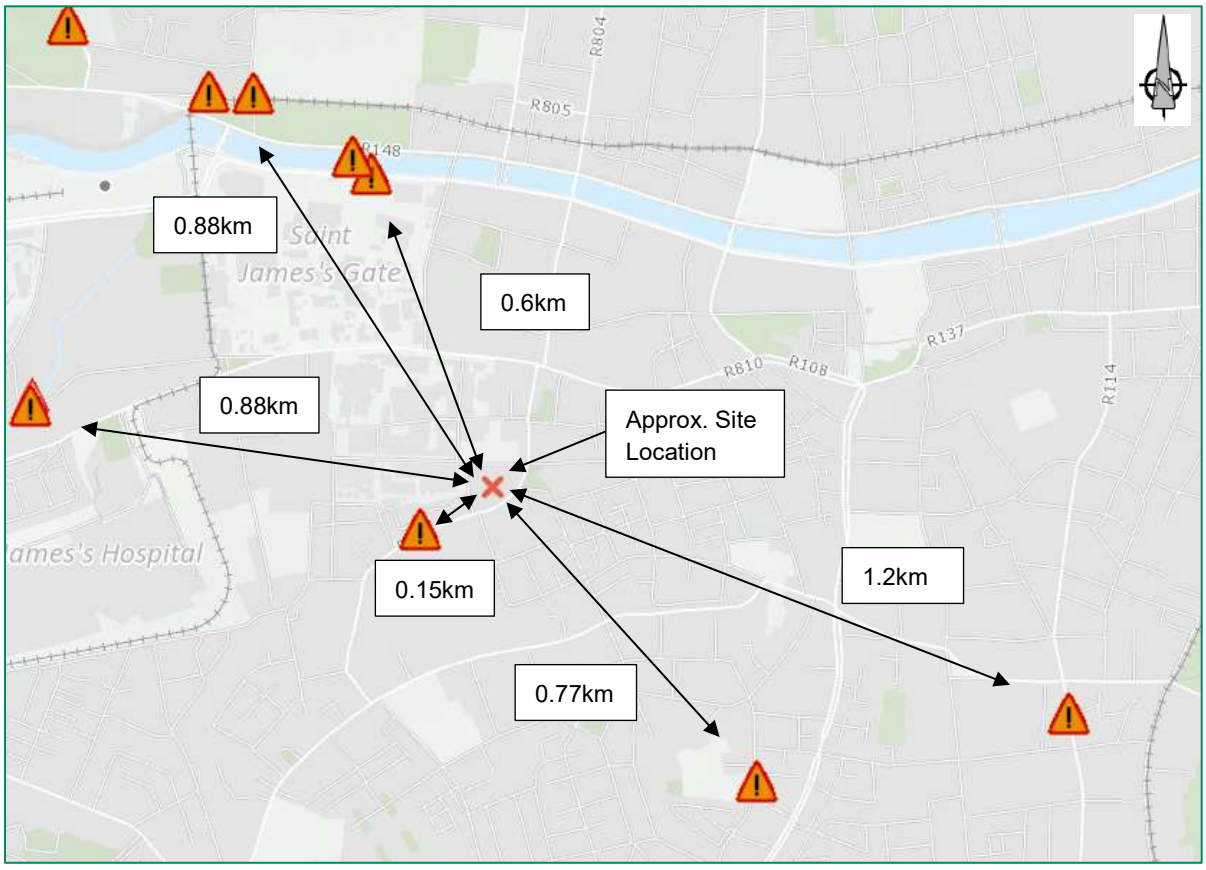

Figure 2.1: Historic Flood Events in Vicinity of the Subject Site (Source: OPW)

2.2.2 OPW PFRA Mapping

The CFRAM (Catchment Flood Risk Assessment and Management) programme is a national programme which produced a series of Preliminary Flood Risk Assessment (PFRA) which cover the entire county. This assessment was carried out based on readily available information to identify areas where there may be a significant risk of flooding. The objective of the PFRA is to identify areas where the risks associated with flooding might be significant.

The PFRA was undertaken by:

- Reviewing records of floods that have happened in the past;
- Undertaking analysis to determine which areas might flood in the future, and what the impacts might be; and
- Consulting with Local Authorities and other Government departments and agencies.

The objective of the PFRA was to identify areas where the risk associated with flooding might be significant. These areas, which are referred to as 'Areas for Further Assessment' or AFAs, are where a more detailed assessment was then undertaken to accurately assess the extent and degree of flood risk.

The CFRAM predictive flood risk mapping was based on the output of hydraulic modelling carried out as part of the study. The hydraulic model predicts the water levels for three coastal and fluvial flood events at given nodes. Based on the predicted water levels at these nodes, the flood extents associated with the 10% AEP event, 1% AEP event (Flood Zone A), and the 0.1% AEP event (Flood Zone B) are mapped.

It should be noted the Pluvial Flood mapping was only carried out for the Dublin City area and includes the flood extents associated with the 10% AEP event, 1% AEP event, and the 0.5% AEP event.

The Eastern CFRAM study provides predictive flooding within areas of further assessment from Coastal/Tidal, Fluvial and Pluvial sources.

2.2.3 CFRAM Coastal Mapping

Coastal flooding results from sea levels which are higher than normal and result in sea water overflowing onto the land. Coastal flooding is influence by the following three factors which often work in combination: high tide level, storm surges and wave action.

Upon reviewing the available information for the site and surrounding area it was noted that the site is located sufficiently outside the flood extents for the present-day Coastal flooding and the Mid-Range and High-End Future Scenarios, with the nearest coastal flood source located at Saint James's Gate, 450 metres from the site. The future scenario events assume a 20% increase in rainfall and 0.5m rise in sea levels, and a 30% increase in rainfall and a 1m rise in sea levels respectively.

Therefore, the site is located within Flood Zone C for Coastal Flooding.

2.2.4 CFRAM Fluvial Mapping

Fluvial flooding is the result of a river exceeding its capacity and excess water spilling out onto the adjacent floodplain.

Upon reviewing the available information for the site and surrounding area it was noted that the site is located sufficiently outside the flood extents for the present-day Fluvial flooding and the Mid-Range and High-End Future Scenarios, with the nearest fluvial flood source located 240 metres away on Ardee Street. The future scenario events assume the same increases as set out above.

Based on the above information the site is located within Flood Zone C for Fluvial Flooding.

2.2.5 Pluvial Flooding

Pluvial flooding occurs when the amount of rainfall exceeds the capacity of urban storm water drainage systems or the ground to absorb it. This excess water flows overland, ponding in natural or man-made hollows and low-lying areas or behind obstructions.

With regards to Pluvial Flooding the site appears to be impacted by this source of flooding for each of the AEP events (10%, 1% & 0.5%). The Pluvial Flood map was published as part of the Dublin Pluvial Study project in

August 2016. An extract from the Pluvial Flood Map No. E09DCC_EXPCD_F0_03 is illustrated in Figure 2.2, please refer to Appendix C for the full Pluvial Extent Map and associated flood depth maps.

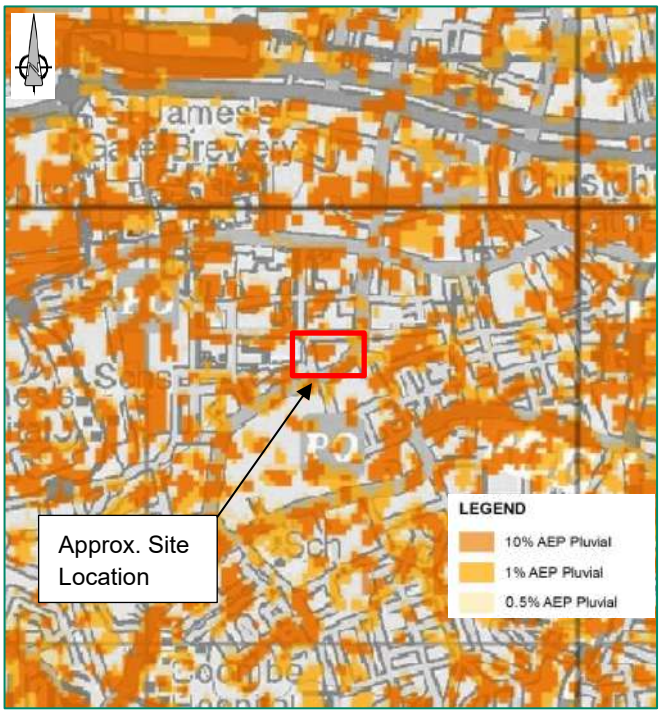

Figure 2.2: Extract from Pluvial Flood Extents Map (Source: OPW)

As can be seen in Figure 2.2, the site is located within the flood events. To reduce this pluvial flood risk, the local surface water network should be designed with sufficient factors applied for climate change and urban creep.

2.2.6 Groundwater Vulnerability Maps

Ground Investigations Ireland Ltd. have undertaken a site investigation between May and July 2024 at the site of the proposed development at School Street. A soakaway test was undertaken, which failed, indicating poor infiltration on the site. Made ground deposits were encountered either from ground level or beneath the topsoil/surfacing. The cohesive deposits below this are typically 'brown slightly sandy slightly gravelly clay with low cobble content overlying a dark grey slightly sandy gravelly clay with low cobbles content.' Refer to Ground Investigation Report dated 18th November 2024 by Ground Investigations Ireland Ltd for further details.

Based on the Geological Survey of Ireland (GSI) data viewer for groundwater vulnerability and subsoil permeability, the proposed site is classified as having a low groundwater vulnerability (refer to Figure 2.3) and low subsoil permeability (refer to Figure 2.4). This can be seen as an indicative estimate on the possible conditions within the site.

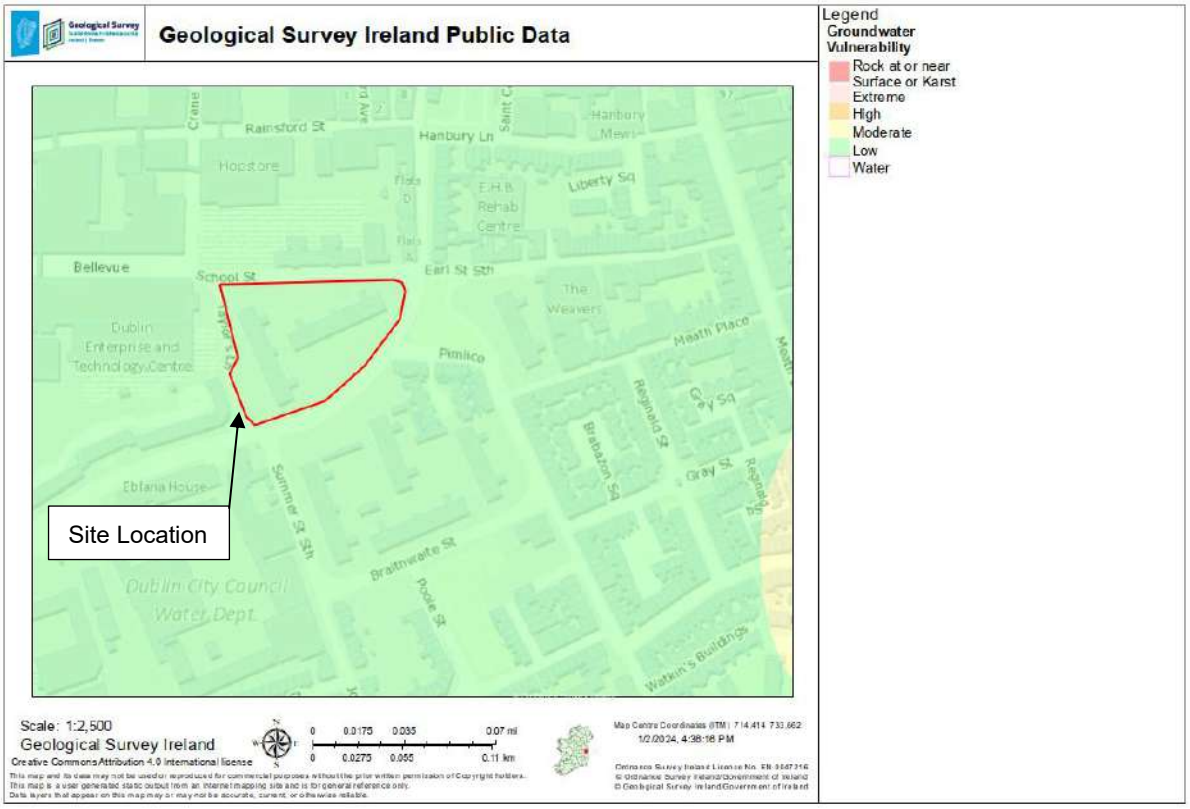

Figure 2.3: GSI Data Report for Groundwater Vulnerability

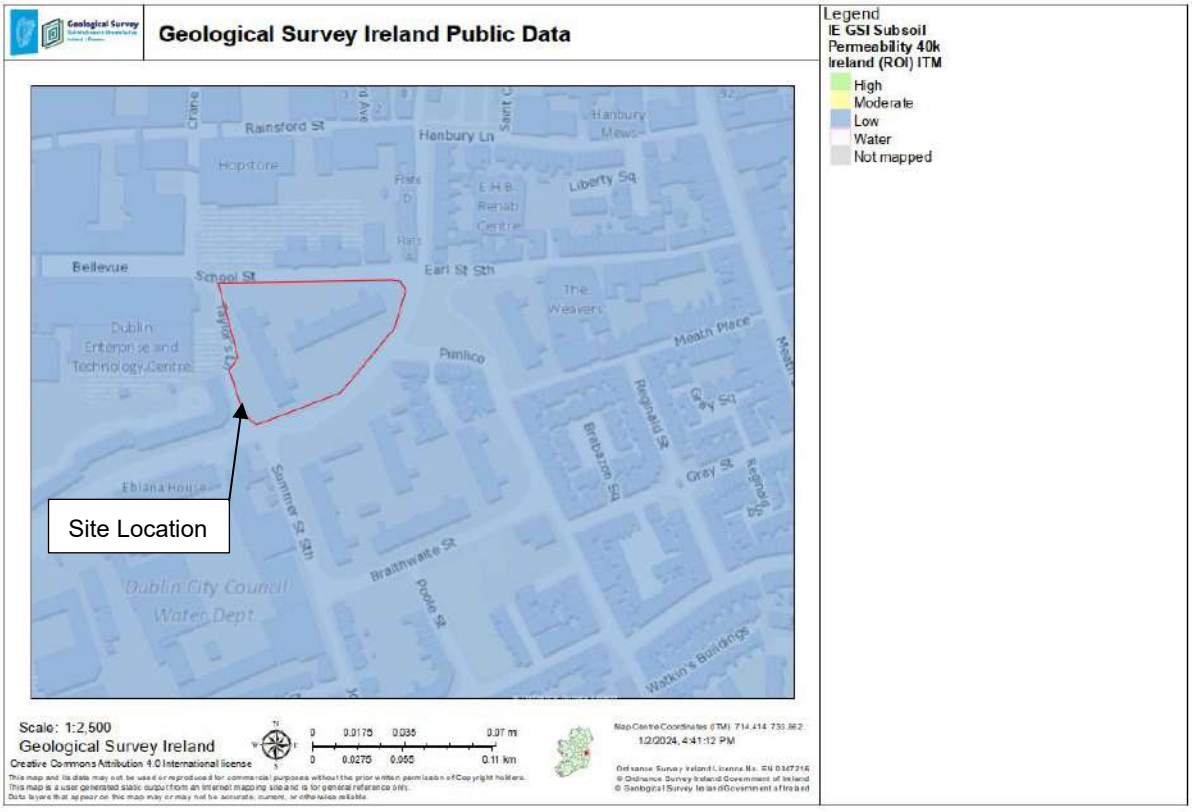

Figure 2.4: GSI Data Report for Subsoil Permeability

2.3 Conclusion

As part of this assessment, the risk of flooding has been reviewed from a number of possible sources including coastal, fluvial, pluvial and groundwater. Flooding from coastal and fluvial sources is not considered to be of significance to the site as the nearest coastal and fluvial flood sources are at an adequate distance from the development site.

The main risk to the site is through pluvial sources of flooding which appears to be impacted by each of the flood events. Based on the information reviewed the following comments apply:

- The Topographic survey received indicates that existing levels within the site vary from a high point of 19.94mOD to a low point of 16.70mOD. According to the CFRAM maps, the site is located sufficiently higher than the worst case predicted flood level of 8.49mOD at River Camac when compared to the other surrounding rivers; River Liffey and River Poddle. A suitable drainage and flood exceedance route strategy should be prepared to ensure any potential flooding within the site is diverted away from the buildings.
- The drainage network should be designed with sufficient climate change and urban creep factors applied to ensure the site is protected against flooding from the drainage network.
- The ground investigation received from Ground Investigations Ireland Ltd. indicates poor infiltration on the site.

3. Surface Water Drainage

3.1 Surface Water Criteria

This chapter contains an outline of the conceptual philosophy and design criteria for surface water in the School Street scheme. It is AECOM's intention that the proposed surface water drainage system will be designed in accordance with the following:

- Greater Dublin Strategic Drainage Study (GDSDS)
- Greater Dublin Regional Code of Practice for Drainage Works
- Dublin City Development Plan 2022-2028 Chapter 9 – Sustainable Environmental Infrastructure and Flood Risk
- Dublin City Development Plan 2022-2028 Chapter 10 – Green Infrastructure and Recreation
- Dublin City Council Green and Blue Roof Guide Document (2021)
- Department of Housing, Local Government and Heritage (DoHLGH) Water Sensitive Urban Design Best Practice Interim Guidance Document
- Building Regulations Technical Guidance Document H: 2010 – Drainage and Water
- Department of the Environment, Heritage and Local Government 'Recommendations for Site Development Works'
- BS EN 752: Part 4: Drain and Sewer systems outside buildings: hydraulic design and environmental considerations
- CIRIA Document C753: 2015 – The SuDS Manual
- CIRIA C768: 2017 – Guidance on the Construction of SuDS

3.2 Existing Surface Water

There are several existing surface water (SW) and combined sewer (CS) assets present throughout the site and the surrounding areas. The existing Uisce Eireann record map shown in Figure 3.1 illustrates the existing services, and the GPR verified surface water sewer layout is illustrated in AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-10-0501.

Please refer to Appendix D for the full Uisce Éireann existing record map and Appendix A for the GPR survey.

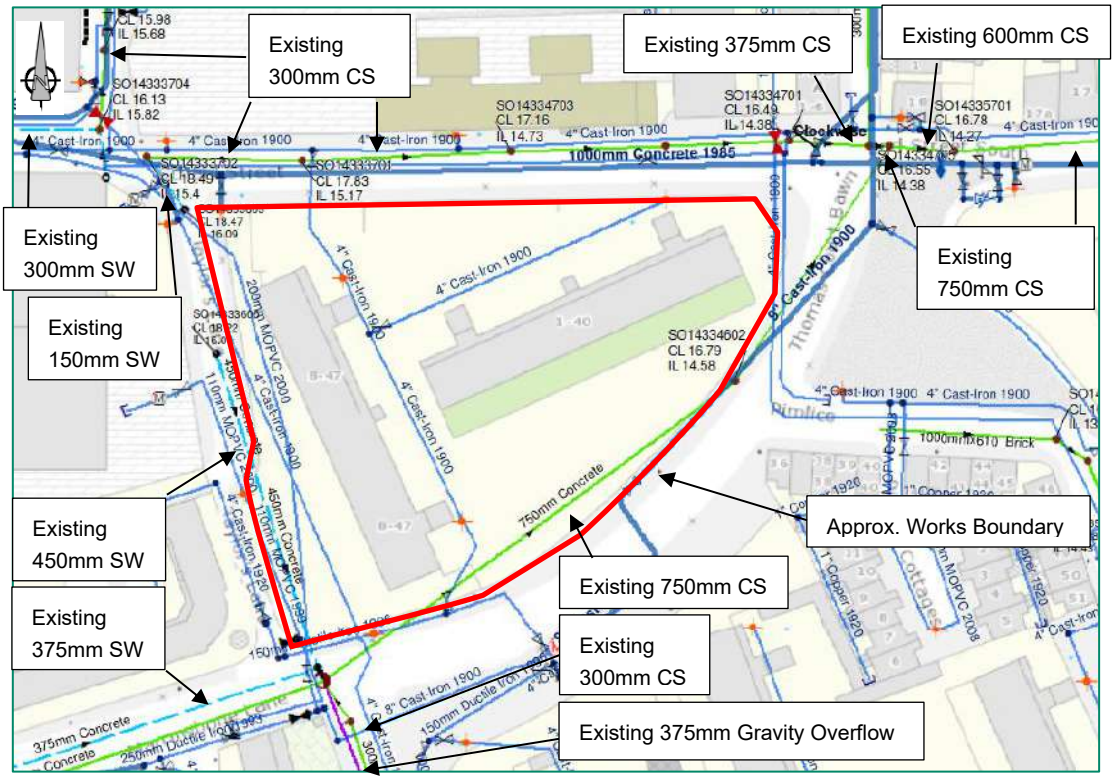

Figure 3.1: Existing Uisce Eireann Drainage Records

3.2.1 Historic Watercourses

An archaeological assessment carried out by Heritage solutions in September 2020 outlined that Marrowbone Lane follows the course of one of the diverted waterways of the Poddle River. A bridge is recorded here on the Friends of Medi-eval Dublin map (1978) (RMP files). Given the historic presence of the Poddle River in the area, the design team are aware that there may be historic culverts within the vicinity of the site boundary.

During the site investigations undertaken by Ground Investigations Ireland Ltd. May and July 2024, no observation or findings were made that suggest historic culverts exist within the site boundary.

3.3 Proposed Surface Water Drainage Strategy

It is currently proposed to utilise the existing outfall connection from the existing site which is a 225mm diameter connection into the existing combined sewer asset located to the northeast corner of the proposed site. The existing 225mm combined sewer outfall pipe will need to be intercepted, and a new manhole is to be constructed to provide a discharge point from the proposed development at this location. As the proposed surface water network is to connect to a combined sewer asset, a ‘Type H’ Manhole with Interceptor Trap is required in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

The location of the proposed connection and the proposed drainage layout is illustrated in AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-00-0501. The surface water drainage network has been designed in accordance with the 4 design criteria outlined in Figure 3.2 and Figure 3.3, taken from the GDSDS.

Criteria	Sub-criterion	Return Period (Years)	Design Objective
Criterion 1 River water quality protection	1.1	<1	Interception storage of at least 5mm, and preferably 10mm, of rainfall where runoff to the receiving water can be prevented.
	1.2	<1	Where initial runoff from at least 5mm of rainfall cannot be intercepted, treatment of runoff (treatment volume) is required. Retention pond (if used) to have minimum pool volume equivalent to 15mm rainfall.
Criterion 2 River regime protection	2.1	1	Discharge rate equal to 1 year greenfield site peak runoff rate or 2l/s/ha, whichever is the greater. Site critical duration storm to be used to assess attenuation storage volume.
	2.2	100	Discharge rate equal to 1 in 100 year greenfield site peak runoff rate. Site critical duration storm to be used to assess attenuation storage volume.
Criterion 3 Level of service (flooding) for the site	3.1	30	No flooding on site except where specifically planned flooding is approved. Summer design storm of 15 or 30 minutes are normally critical.
	3.2	100	No internal property flooding. Planned flood routing and temporary flood storage accommodated on site for short high intensity storms. Site critical duration events.
	3.3	100	No internal property flooding. Floor levels at least 500mm above maximum river level and adjacent on-site storage retention.
	3.4	100	No flooding of adjacent urban areas. Overland flooding managed within the development.

Figure 3.2: Criteria for New Development Drainage (pt. 1) (Source: Table 6.3 of the GDSDS)

Criteria	Sub-criterion	Return Period (Years)	Design Objective
Criterion 4 River flood protection (criterion 4.1, or 4.2 or 4.3 to be applied)	4.1	100	"Long-term" floodwater accommodated on site for development runoff volume which is in excess of the greenfield runoff volume. Temporary flood storage drained by infiltration on a designated flooding area brought into operation by extreme events only. 100 year, 6 hour duration storm to be used for assessment of the additional volume of runoff.
	4.2	100	Infiltration storage provided equal in volume to "long term" storage. Usually designed to operate for all events. 100year, 6 hour duration storm to be used for assessment of the additional volume of runoff.
	4.3	100	Maximum discharge rate of QBAR or 2 l/s/ha, whichever is the greater, for all attenuation storage where separate "long term" storage cannot be provided.

Table 6.3 Criteria for New Development Drainage

Figure 3.3: Criteria for New Development Drainage (pt. 2) (Source: Table 6.3 of the GDSDS)

3.4 Attenuation Storage Requirements and Network Design

AECOM have designed the proposed on-site surface water drainage network, in order to ensure that the discharge will be restricted to the associated greenfield runoff rate and that sufficient attenuation storage will be provided to achieve this.

3.4.1 Qbar

In accordance with the Dublin City Councils Sustainable Drainage Design and Evaluation Guide, for a proposed connection into an existing combined sewer network, the surface water discharge rate from the site shall be restricted to 2 l/s.

3.4.2 Surface Water Network Modelling

The proposed surface water drainage network has been designed using Innovyze InfoDrainage software in accordance with the GDSDS design parameters. A model has been developed with an M5-60 of 16.3mm, a ratio R of 0.278 taken from Met-Eireann modelled rainfall depths for the area (see Appendix E for Met Eireann rainfall data). A cap on rainfall intensity of 50 mm/hr was used for pipe sizing and additionally pipes downstream of hydrobrake manholes have been set to a design flow of that matching the upstream hydrobrake which prevents downstream pipes from being oversized. A return period of 5 years has been used throughout for pipeline design. A breakdown of the design criteria outlined above is summarised in Table 3.1 below.

Design Criterion	Value
M5-60*	16.3mm
Ratio R*	0.278
Pipe Design Return Period	5 Years
Pipe Design Rainfall Cap	50mm
100% Impervious Surfaces	Roofs, Roads and Hardstanding Paths
0% Impervious Surfaces	Landscaped Areas with Soft Finish

**Based on Met Eireann Rainfall Data*

Table 3.1: Design Criteria for Storm Design

A simulation for the surface water network has been undertaken and all runoff from roofs, blue roof systems, roads and other impermeable surfaces have been taken as 100% impermeable, while soft landscaping has been taken as 0% impermeable as per GDSDS Table 6.4. The site outfall has been limited to the QBar as presented in Table 3.2. This simulation has been completed with an additional 20% increase on rainfall data to account for climate change impacts and the proposed attenuation tank have been designed such that no flooding will occur within the 1 in 100 return period event and this is in compliance with GDSDS Sub-Criterion 2.2 and 4.3 as per Figure 3.2 and Figure 3.3. Refer to Appendix F for the surface water network calculations.

Additionally, all proposed building FFL's have been designed with a minimum of 500mm freeboard above the proposed attenuation top water level for the 1 in 100-year return period event as per GDSDS Sub-Criterion 3.3. The associated resulting attenuation storage volume is outlined in Table 3.2 below.

Discharge Rate (l/s)	Total Site Area (ha)	Impermeable Area (ha)	Attenuation Storage Volume (m^3)
2.0	0.628	0.435	85.56

Source: Innovyze InfoDrainage

**Based on 20% allowance for climate change.*

Table 3.2: Indicative Proposed Development Attenuation Volume

It is proposed to attenuate a portion of the site's stormwater with 4 no. blue roofs. Some blue roof areas will drain to others and so, there will be a total for 2 no. outfalls from the blue roof systems, together they will have an overall outflow of 0.74 l/s. The outflows from each of the 2 no. outfalls will be entered as 2 separate base flows into the drainage model. The model incorporates these base flows in place of impermeable areas being attenuated by the blue roof area attenuation.

The outfall from the blue roof system will drain to the below ground drainage network. It is proposed to meet the remaining storage requirements by the provision of a 89.70m^3 Stormtech attenuation tank. Refer to Appendix G for the proposed attenuation tank configuration and details.

3.4.2.1 Infiltration Tests

3no. Infiltration Tests were carried out on site to estimate the permeability of the soil in May 2024. At all infiltration test locations, the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate and therefore the test locations were deemed unsuitable for soakaway design and construction.

3.5 Flood Exceedance Route

Section 2.2.5 of the Flood Risk Assessment highlights that the proposed development is impacted by pluvial flooding for each of the AEP events (10%, 1% & 0.5%). To reduce this pluvial flood risk, the proposed surface water network has been designed with sufficient factors applied for climate change and urban creep. Further, the proposed site levels have been designed to ensure that surface water can drain away from buildings and the site in the event of 100% blockage of all proposed surface water measures.

Refer to AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-10-0620 for the Proposed Flood Exceedance Route.

3.6 SuDS Strategy

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS) in accordance with the guidelines of the GDSDS and the SuDS CIRIA Manual C753. The aim of the proposed drainage system is to replicate the natural characteristics of greenfield rainfall run-off, minimising the environmental impact from rainfall events by reducing the run-off leaving the site for small rainfall events.

SuDS are designed to manage water quantity reducing/preventing the likelihood of flooding from the proposed development and to maximise the opportunities and benefits from surface water management.

In accordance with the GDSDS Table 6.3 Criterion 1, in order to ensure sufficient river quality protection, either a minimum volume of interception storage equalling 5mm of runoff or 15mm of treatment storage over 80% of all impermeable surfaces is needed. The SuDS features that are considered suitable based on the current site layout are as follows:

- Intensive Green Roof;
- Intensive Blue Roof;
- Permeable Paving / Porous Asphalt;
- Bio-Retention Raingardens.

The proposed SuDS features will be designed in accordance with the CIRIA C753 SuDS Manual, providing interception and treatment volume on site. Refer to Table 3.3 for SuDS measures proposed for each of the different surface types.

Surface Type	Proposed SuDS Measures
Roofs	Green-Blue Roofs, Bio-Retention Raingardens
Car Park	Permeable Paving / Porous Asphalt
Hardstanding	Permeable Paving, Bio-Retention Raingardens

Table 3.3: SuDS Measures Proposed by Surface Type

An assessment has been undertaken to quantify the volume of treatment storage that is currently being proposed and that which is required to provide a minimum of 15mm as per Sub-Criterion 1.2. The proposed treatment volumes are outlined in Table 3.4.

SuDS Feature	Area (m^2)	Treatment Storage Required (m^3)	Treatment Storage Provided (m^3)
Treatment Storage Required*	3480.0	**41.76**	
Proposed Green Roof**	888.2		4.44
Proposed Blue Roof***	982.5		233.34
Bio-Retention****	190.3		77.50
Permeable Paving*****	307.3		59.92
Porous Asphalt*****	92.7		18.08
Attenuation Tank†			89.70
Treatment Provision			**482.98**

Table 3.4: Proposed Treatment Storage Volumes

**Based on 15mm over 80% of the Impermeable Area as per GDSDS Appendix E E1.1.5*
***Assuming an Extensive Green Roof providing 5mm of storage per m^2*
****Assuming an Intensive Blue Roof providing 250mm of storage per m^2 with 95% porosity*
*****Assuming a typical 0.675m deep pit with a planting soil conductivity of 0.146m/hr and a 0.3m drainage layer with a void ratio of 0.30 (30%)*
****** Assuming a 0.65m deep stone media with a void ratio of 0.30 (30%)*
† Attenuation Tank Interception provision based on the volume of stone provided below the tank structure (area of the stone on the bottom with a sub-base depth of 230mm and a porosity of 40%)

The proposed SuDS drainage layout is illustrated in AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-00-0520.

3.6.1 Green Roofs

Green roofs are areas of living vegetation, installed on the top of building, for a range of reasons including visual benefit, ecological value, enhanced building performance, and the reduction of surface water run-off. They comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping. The roof is likely to consist of an impermeable layer, a substrate or growing medium and a drainage layer (although not all green roofs require a drainage layer).

Green roofs are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.

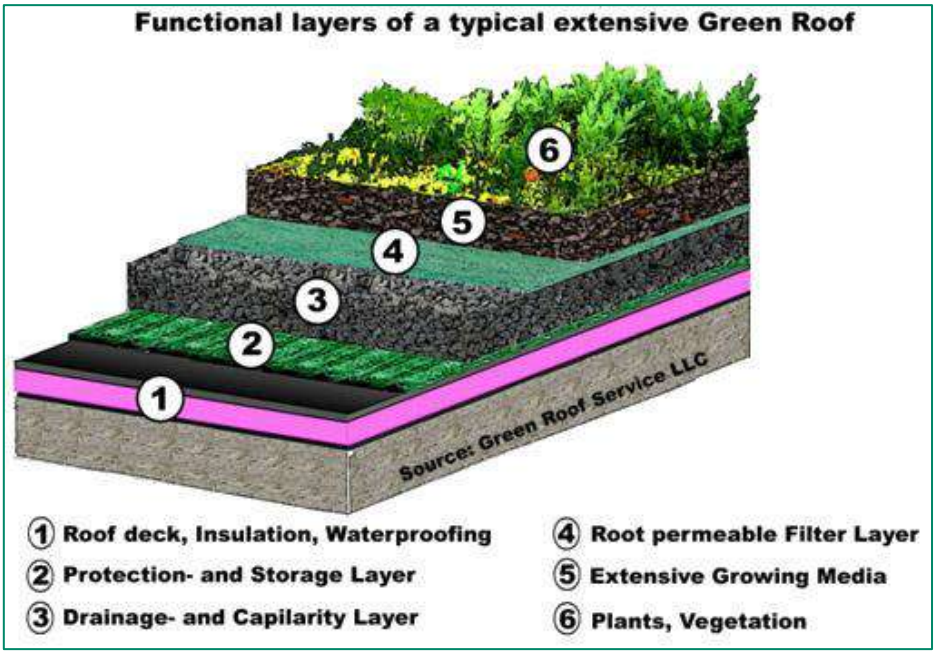

Figure 3.4: Green Roof Build-up

Figure 3.5: Green Roof (Source: DCC Green & Blue Roof Guide 2021)

3.6.2 Blue Roofs

A blue roof is a roof that is designed to control and provide temporary attenuation of surface water during periods of heavy rainfall, before releasing it at a controlled rate back into the environment or site. The benefits of a blue roof system include:

- Reduces land take
- Cost effective
- Reduces earth works requirements
- Sustainable
- Helps Achieve LEED and BREEAM Points
- Easy to install and maintain
- Controls surface water run-off

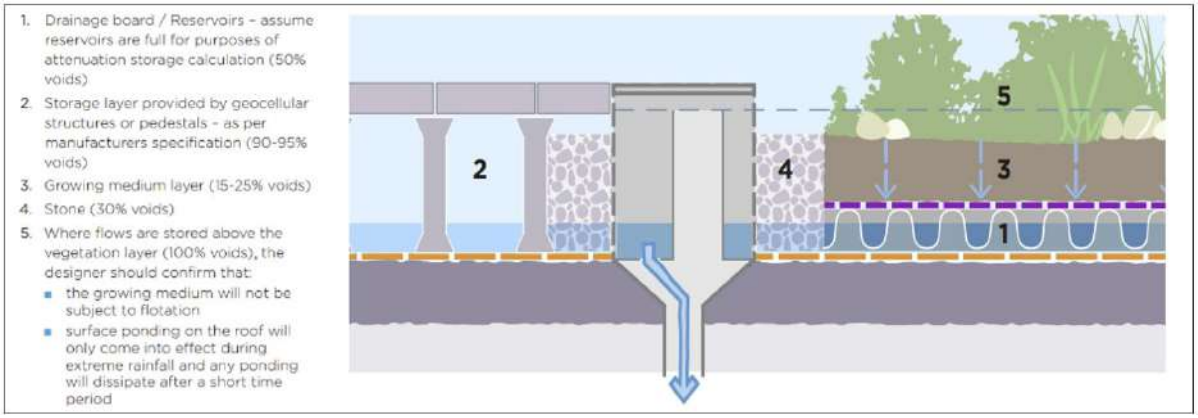

Figure 3.6: Blue Roof (Source: DCC Green & Blue Roof Guide 2021)

3.6.3 Permeable Paving

Permeable paving is proposed for the new car park which will treat rainwater, at source, and allow infiltration through to an underlying porous subbase where water can be stored within the voids of the subbase before being slowly released to the drainage collection system through natural flow via the porous medium.

This system will provide a form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from this area in small rainfall events. As well as reducing the amount of run-off from the surface, the permeable paving will slow down the rate of runoff from the pavement in extreme rainfall events contributing to attenuation of flows.

In addition, the permeable paving will increase the quality of water which is intercepted by the system through filtration, biodegradation, pollutant adsorption and settlement and retention of solids, also the reduction in peak flows to the outfall will enhance settlement and biodegradation of pollutants. Refer to Figure 3.7 for typical permeable systems.

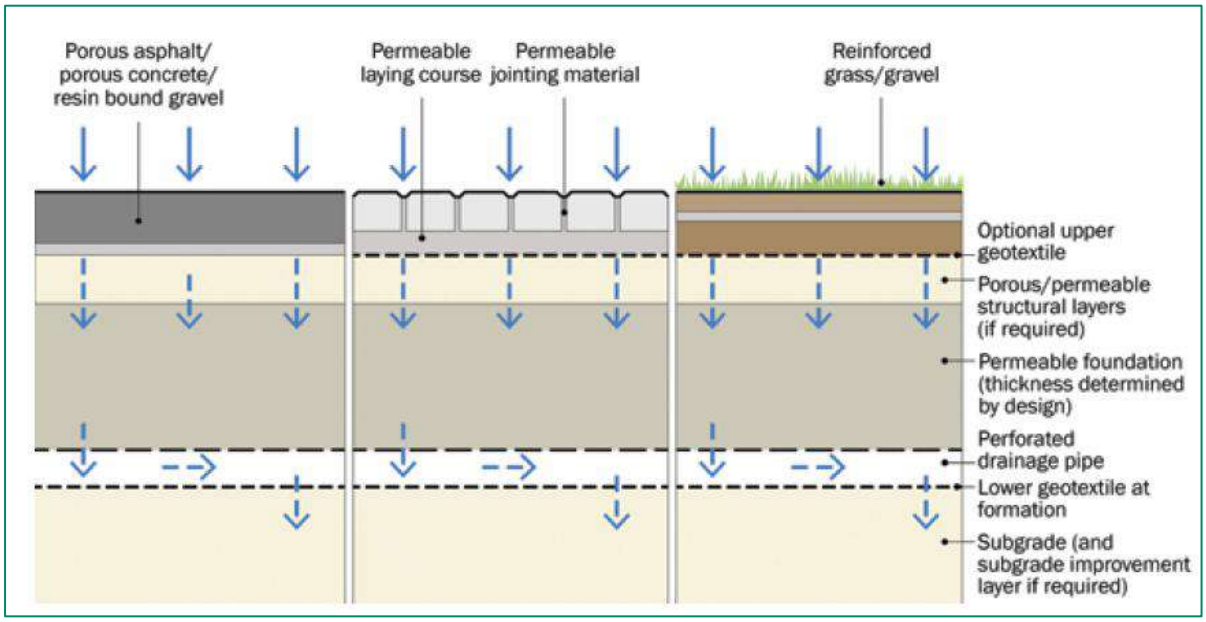

Figure 3.7: Permeable Paving System – Partial Infiltration (Source: Ciria C753 The SuDS Manual)

3.6.4 Bio-retention Raingardens

Bioretention Raingardens are shallow planted depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils for collection or infiltration. The Bio-Retention proposals will provide suitable at-source interception and treatment to roof runoff. Figure 3.8 illustrates a typical bio-retention section for use adjacent to building structures.

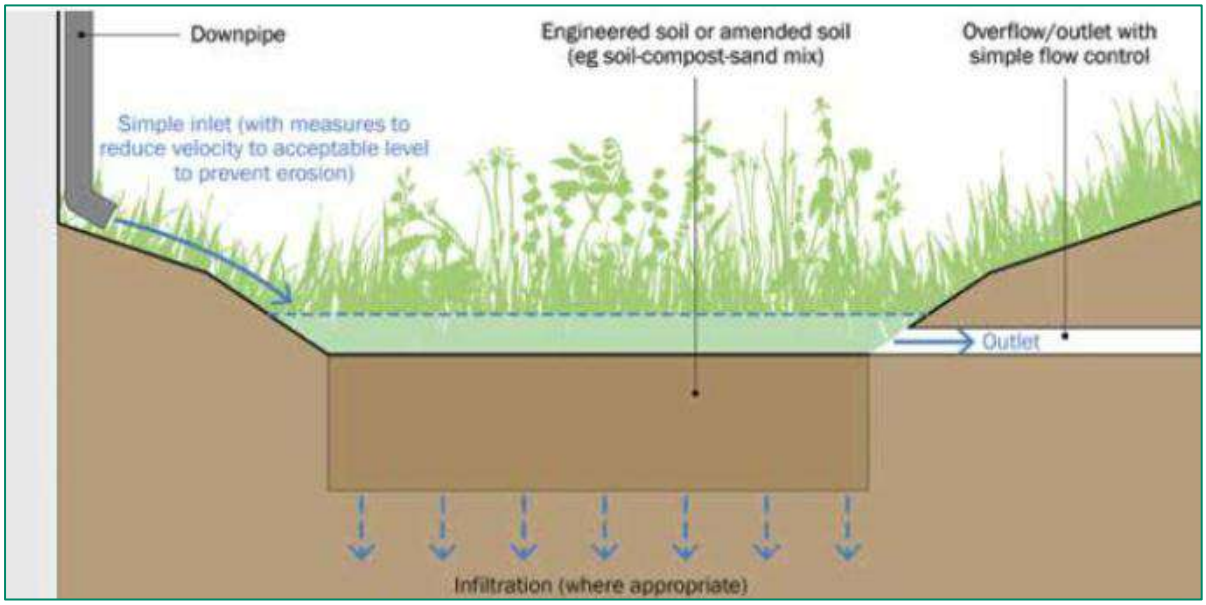

Figure 3.8: Typical Bio-Retention Section (Source: Ciria C753 The SuDS Manual)

3.7 Drainage Maintenance Inspection Checklist

Refer to Appendix F for a typical SuDS Maintenance Inspection Checklist which includes the typical operation and maintenance requirements for the proposed SuDS measures discussed in the previous sub-sections, this is sourced from the CIRIA SuDS Manual C753.

4. Foul Water Drainage

4.1 Existing Foul Water Drainage

There is a 300mm concrete combined sewer asset located at the southwest of the site collecting the wastewater flow from Summer Street (south of the site), connecting to an existing 750mm diameter concrete combined sewer located to the south of the Thomas Court Bawn block draining north-eastwards.

The records also identify an existing 300mm combined sewer, increasing to a 375mm combined sewer in School Street flowing eastwards which drains to the existing 750mm concrete combined sewer asset to the northeast corner of the site. Refer to Figure 4.1 for an extract of the Uisce Eireann records map showing the existing foul water drainage network in the vicinity of the development site and AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-10-0501 for the current drainage information based on a GPR survey.

Please refer to Appendix D for the full Uisce Éireann existing record map and Appendix A for the GPR survey.

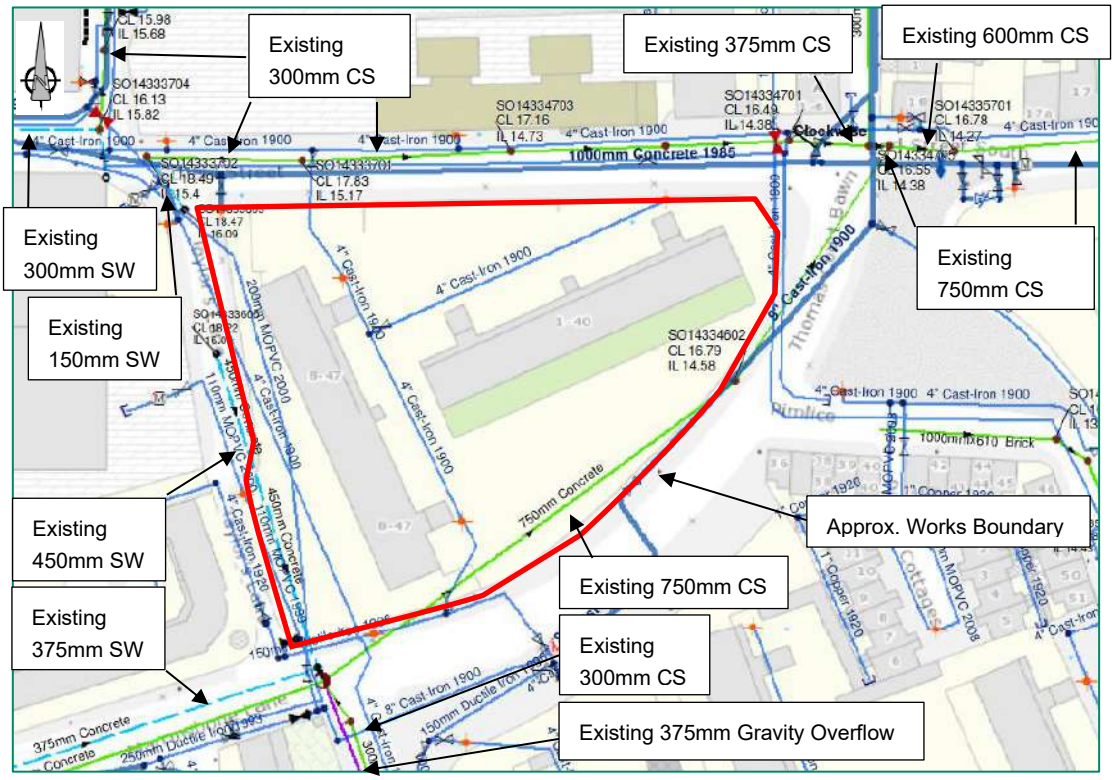

Figure 4.1: Existing Uisce Eireann Drainage Records

4.2 Proposed Foul Water Drainage Strategy

It is currently proposed to provide a new foul water outfall location to the existing 300mm diameter combined sewer asset located in School Street for the foul water drainage network proposed to serve the residential development. Refer to AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-10-0501 for the proposed foul water drainage design.

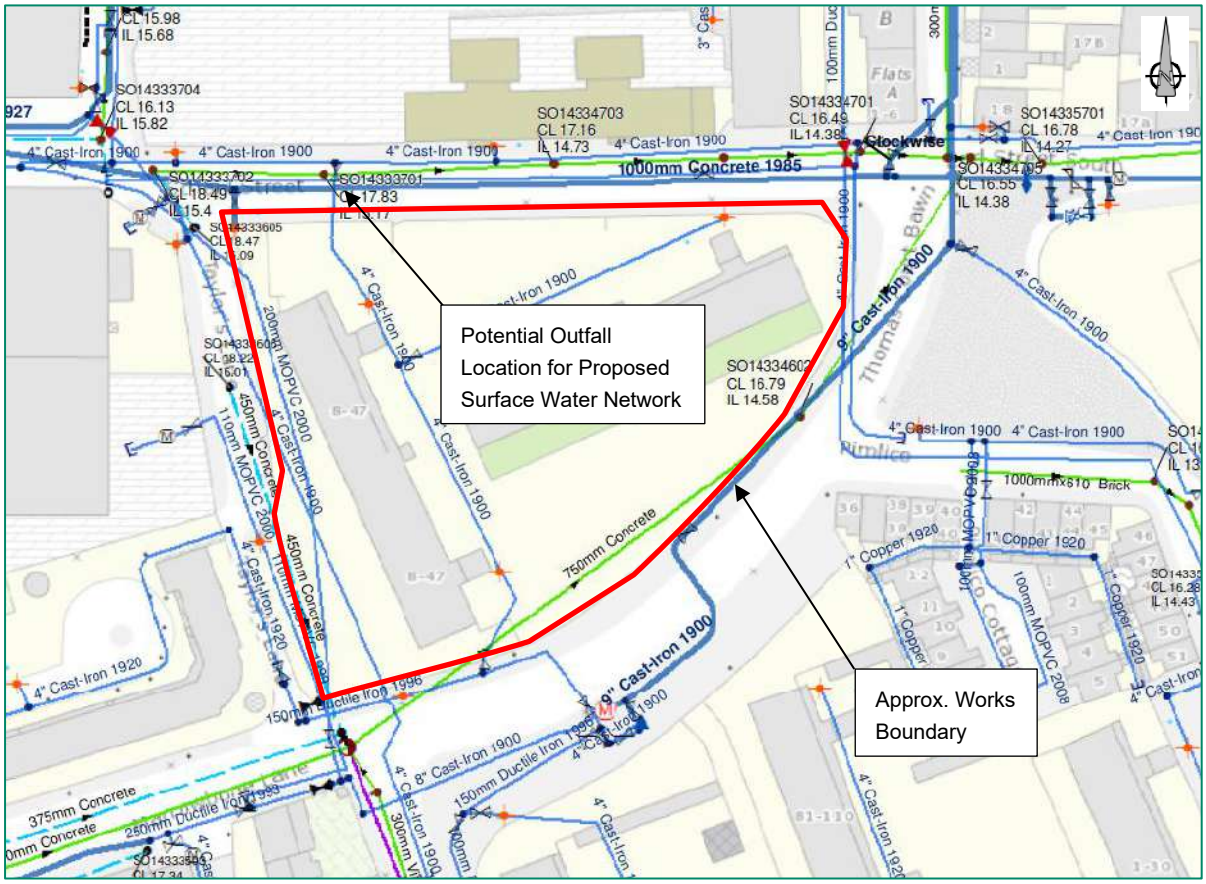

Figure 4.2: Existing Uisce Eireann Drainage Records

A Confirmation of Feasibility (CoF) (Ref: CDS24005215) was received from Uisce Éireann on the 19th of August 2024 for the proposed development works. It is noted within the CoF that infrastructure upgrades are not required to connect the proposed development to Uisce Éireann's foul network. Refer to Appendix I for the CoF.

4.3 Proposed Foul Loading

The estimated wastewater discharge associated with the proposed development has been based on Uisce Eireann's Code of Practice for Wastewater Infrastructure. The design foul loading is outlined in Table 4.1 below. When considering the below table, it is shown that a residential unit increase from 79 to 124 units leads to foul water loading increases, in both foul discharge and peak flow, of 0.64 l/s and 3.84 l/s, respectively. The proposed creche will increase the overall foul discharge and peak flow by 0.07 l/s and 0.20 l/s, respectively.

Use	Proposed No. Residential Units	Associated Population	Peaking Factor	Foul Discharge (l/d) **	Foul Discharge (l/s)	Peak Flow (l/s) ***
Residential (pre-development)	79	213*	6	35,195	0.41	2.44
Residential (post-development)	124	335*	6	55,242	0.64	3.84
Creche	-	59†	3	5,874	0.07	0.20

Table 4.1: Estimated Foul Water Loading

* Based on a national average of 2.7 persons/house (Uisce Eireann Code of Practice)
** Based on foul loading 150 l/p/d, allowing 10% infiltration, as per Uisce Eireann requirements
*** Based on peak factor of 6 as per Uisce Eireann requirements (population between 0 - 750)
† Based on 3m^2 per child, with an addition of 4 creche staff.

5. Watermain Infrastructure

5.1 Existing Watermain Infrastructure

Based on the Uisce Eireann watermain records, there is an existing 4" (100mm) Cast-Iron watermain located within the site boundary and the surrounding areas, and an existing 9" Cast-Iron watermain to the southeast of the site and a 1000mm diameter watermain along the north of the site. The existing Uisce Éireann records are shown in Figure 5.1 below and AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-10-2701 illustrates the current watermain infrastructure based on a GPR survey.

Refer to Appendix D for the full Uisce Eireann record map and Appendix A for the GPR survey.

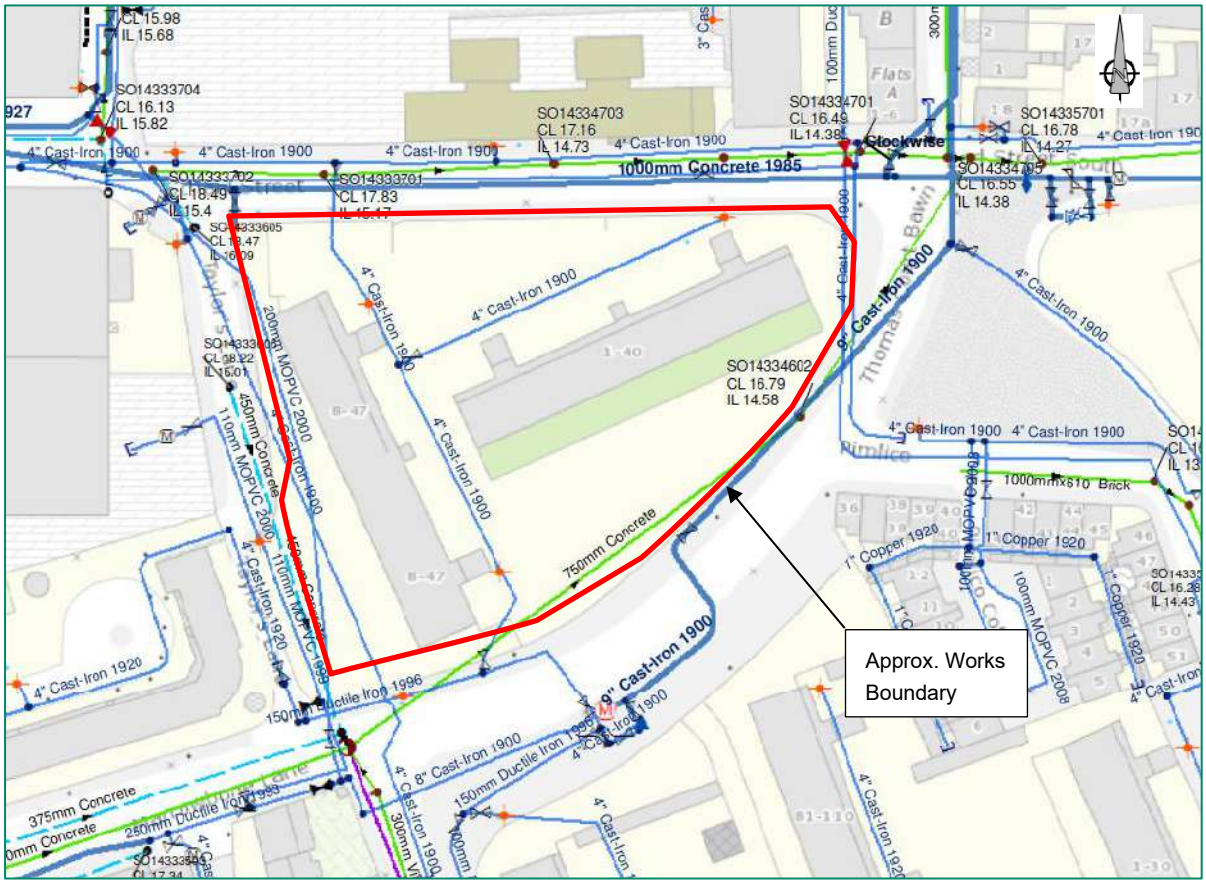

Figure 5.1: Existing Uisce Eireann Drainage Records & Watermain Connection Point

5.2 Proposed Watermain Infrastructure

Based on the proposal to demolish the existing Thomas Court Bawn block, the existing 100mm diameter watermain asset located immediately along the north of this block will need to be removed and a new watermain connection shall be provided to the 2no. proposed residential blocks. These new connections have been arranged to match the current phasing strategy for the scheme and to meet the requirements of the current Uisce Éireann Code of Practice. Refer to AECOM Drawing No. 60719103-ACM-XX-00-DR-CE-20-2701 for the proposed water supply network design.

A Confirmation of Feasibility (CoF) (Ref: CDS24005215) was received from Uisce Éireann on the 19th of August 2024 for the proposed development works. It is noted within the CoF that infrastructure upgrades are not required to connect the proposed development to Uisce Éireann's water network. Refer to Appendix I for the CoF.

5.3 Proposed Water Demand

The estimated water demand associated with the proposed development was based on Uisce Éireann's Code of Practice for Water Infrastructure. The design demand is outlined in Table 5.1 below. Similar to Section 5.3, when considering the below table, it is shown that a residential unit increase from 79 to 114 units leads to water supply loading increases, in both average water demand and peak demand, of 0.73 l/s and 3.63 l/s, respectively. The proposed creche will increase the average water demand and peak demand by 0.13 l/s and 0.64 l/s, respectively.

Use	Proposed No. Residential Units	Associated Population	Average Water Demand (l/d) **	Average Day/Peak Week Demand (l/s) ***	Peak Demand (l/s) ***
Residential (pre-development)	79	213*	31,995	0.46	2.31
Residential (post-development)	124	335*	50,220	0.73	3.63
Creche	-	59†	8,900	0.13	0.64

Table 5.1: Estimated Water Supply Loading

* Based on a national average of 2.7 persons/house (Uisce Eireann Code of Practice)

** Based on per-capita consumption of 150 l/p/d, as per Uisce Eireann requirements

**** Peak Demand is 5 times the average peak demand (1.25 x Average demand), for sizing of the pipe network, as per Uisce Eireann requirements

† Based on $3m^2$ per child, with an addition of 4 creche staff