



Surface Water Management Plan

Cherry Orchard Point – Phase 3 of Proposed Development at
Sites 4 and 5, Park West Avenue, Dublin 10

September 2026

Waterman Moylan Consulting Engineers Limited

Block S, East Point Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie

Client Name: The Land Development Agency
Document Reference: 22-010r.049 Surface Water Management Plan Phase 3
Project Number: 22-010

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015 and BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
No. 1	15 September 2026	C. Maher	P. Ingle	
No. 2	17 September 2026	P. Ingle	I. Worrell	

Comments

Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care, and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client, and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Content

1.	Introduction	1
1.1	Context	1
2.	Masterplan Lands	2
2.1	Cherry Orchard Point Site Location and Description	2
2.2	Indicative Phasing	3
2.3	Proposed Masterplan Development.....	3
2.4	Topographical Details	4
3.	Proposed Development	6
3.1	Development Description	6
3.2	Site Investigation Details and Infiltration Rates	6
3.3	Proposed Construction Works	7
4.	Mitigation Measures	8
5.	Construction Stage	10
5.1	Roles and Responsibilities	10
5.1.1	Main Contractor.....	10
5.2	Pre-Construction Plan	11
5.2.1	Designated Storage Area & Site Compound	11
5.3	Construction Plan.....	11
5.3.1	Vehicle Washdown.....	11
5.3.2	Surface Water Run-off	11
5.3.3	Surface Water Monitoring Parameters.....	12
6.	Operational Stage	13
6.1	SuDS	13
6.2	Proposed Surface Water Network and SuDS Strategy	14
6.2.1	Surface Water Catchments & Allowable Discharge Rates	14
6.2.2	SuDS Treatment Train (Subject Development)	17
6.2.3	Source Control	17
6.2.4	Site Control	20
6.3	SuDS Maintenance Regime.....	21
6.4	Interception of Treatment Storage and Attenuation Storage	23
6.4.1	Criterion 1: River Water Quality Protection	23
6.4.2	Criterion 2: River Regime Protection	24
6.4.3	Criterion 3: Levels of Service	25
6.4.4	Criterion 4: River Flood Protection.....	26

6.5	Surface Water - General	26
6.6	Flood Risk Assessment	26

Figures

Figure 2-1: Site Location Map (Source: Google Maps)	2
Figure 2-2: Indicative Masterplan Development Phasing Layout	3
Figure 2-3: Existing Site Topography of the Subject Site Lands	5
Figure 6-1: Indicative Layout of Surface Water Catchments on Site 4 and Site 5	14
Figure 6-2: Subject Site Surface Water Sub-Catchments	16
Figure 6-3: Typical Blue-Green Roof Buildup Details	18
Figure 6-4: Illustration of Permeable Paving Buildup and Installation	19
Figure 6-5: Illustration of SuDS Tree Pit Buildup Detail and Installation	19
Figure 6-6: Illustration of Rain Garden Buildup Detail and Installation	20
Figure 6-7: Image of a Detention Basin in Dublin 24	21
Figure 6-8: Regular Maintenance Requirements for SuDS	22
Figure 6-9: Further Maintenance Requirements for SuDS	23

Tables

Table 4-1: Schedule of Surface Water Mitigation Measures	8
Table 5-1: Monitoring Guidelines (Fresh Water Quality Regulations)	12
Table 6-1: Allowable Outflow Rates for the Masterplan Lands Surface Water Catchments	15
Table 6-2: Allowable Outflow Rates for the Subject Development	16
Table 6-3: Interception Calculation	24
Table 6-4: Required and Provided Attenuation Storage for the Subject Development	25

1. Introduction

1.1 Context

This engineering assessment report has been prepared by Waterman Moylan as part of the planning documentation for the Proposed Phase 3 development of the Cherry Orchard Point Masterplan development at Sites 4 and 5, Park West Avenue, Dublin 10.

The report sets out to demonstrate how pollution of watercourses both during the construction stage and after the construction period, during the operational stage will be prevented and/or mitigated. This is in accordance with SI25 of the DCC Development Plan 2022-28, which requires *“the preparation of a Surface Water management Plan as part of all new developments in accordance with the requirements of Appendix 13 – The Council’s Surface Water Management Guidance.”*. This is required for 2 or more residential units or commercial space of 100m² or greater, both of which are applicable to the proposed development.

While preparing this report, Waterman Moylan will make reference to the following documents:

- Dublin City Council Development Plan (2022-2028).
- Park West & Cherry Orchard LAP (2019).
- Ground investigation details as per the Site Investigation Reports.
- Site Specific Topographic Survey.
- Uisce Éireann existing foul infrastructure maps.
- Uisce Éireann existing watermain infrastructure maps.
- Uisce Éireann Confirmation of Feasibility Letter.
- Uisce Éireann Code of Practice for Wastewater (August 2025 Rev 3).
- Uisce Éireann Code of Practice for Water Infrastructure (August 2025 Rev 3).
- Uisce Éireann Wastewater Standard Details.
- Uisce Éireann Water Standard Details.
- Building Regulations Technical Guidance Document Part H.
- Dublin City Council’s Sustainable Drainage Design and Evaluation Guide (2021).
- Dublin City Council’s Green and Blue Roof Guide (2021).
- Dublin City Council’s SuDS Property Level Guide (2023).
- CIRIA The SuDS Manual (2015 Version 5).
- DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management.
- Greater Dublin Regional Code of Practice for Drainage Works (Version Draft 6.0)
- Greater Dublin Strategic Drainage Study, Regional Drainage Policies Technical Volume, Volume II New Developments (March 2005).

2. Masterplan Lands

2.1 Cherry Orchard Point Site Location and Description

The subject masterplan development is comprised of two sites. Site 4 & Site 5 are bisected by Park West Avenue and lie to the west and east of this roadway respectively. Site 4 is shown as per the blue shaded area of the masterplan development indicated on Figure 2-1: Site Location Map (Source: Google Maps). The proposed Phase 3 subject site is located within Site 5: Barnville of the masterplan development, which is shown within the redline boundary in the below figure. Site 5 is accessed via a secured gate from Cedar Brook Way.

The proposed Phase 3 development is bound by Park West Avenue to the west, the realigned Cedar Brook Way (completed under the Approved Phase 1 development with ref. ABP-318607-23 which is currently under construction) to the north, Cherry Orchard Green (previously Barnville Park) to the east, and Barnville Park, residential dwellings, and the Dublin-Kildare Rail Line to the south.

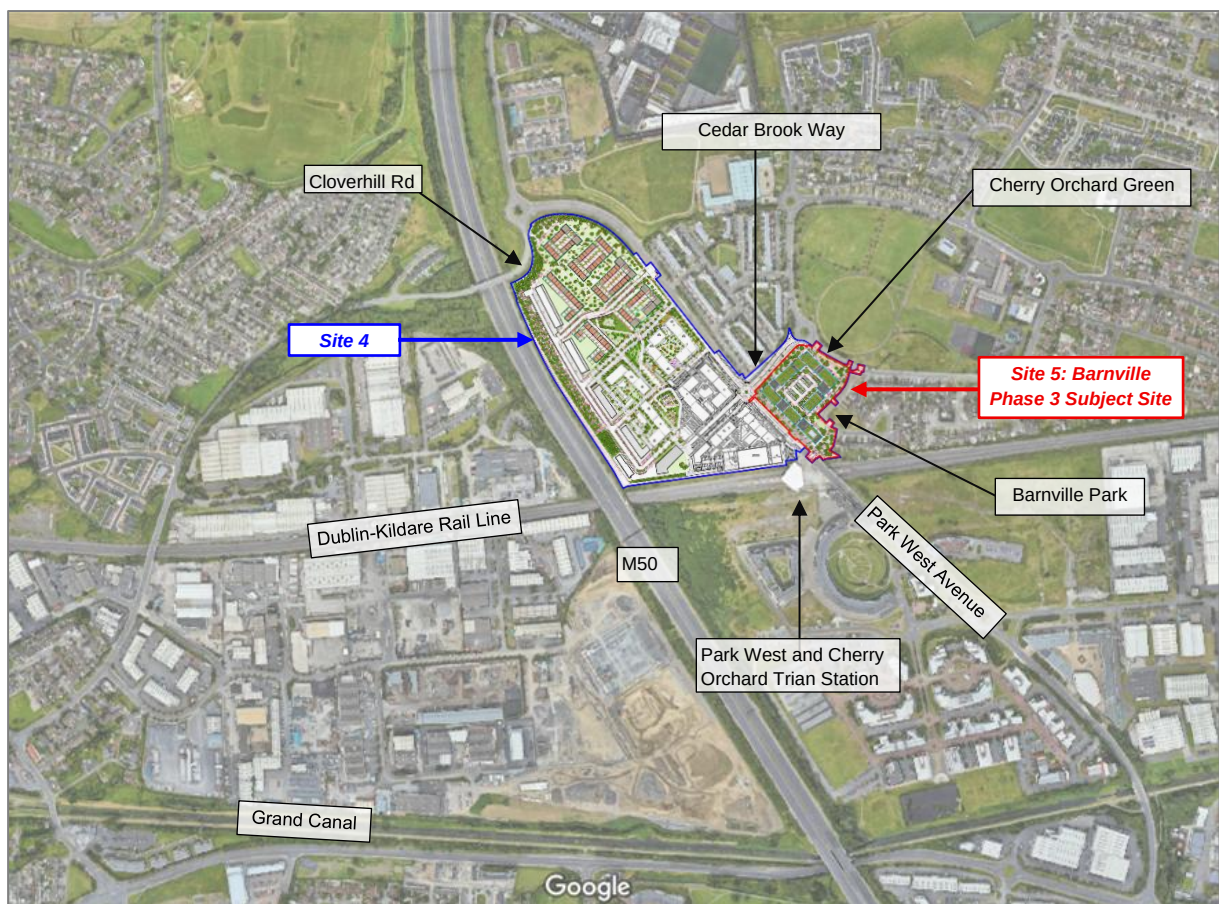


Figure 2-1: Site Location Map (Source: Google Maps)

The overall masterplan development area as per the blue line boundaries is c. 14.24 ha, with Site 5 being c. 1.72 ha. The area of the subject application indicated by the redline boundary in the above figure, including for works in the public domain, is 1.72 ha.

2.2 Indicative Phasing

The indicative phasing of the 4-phase masterplan development is illustrated in Figure 2-2: Indicative Masterplan Development Phasing Layout, below.

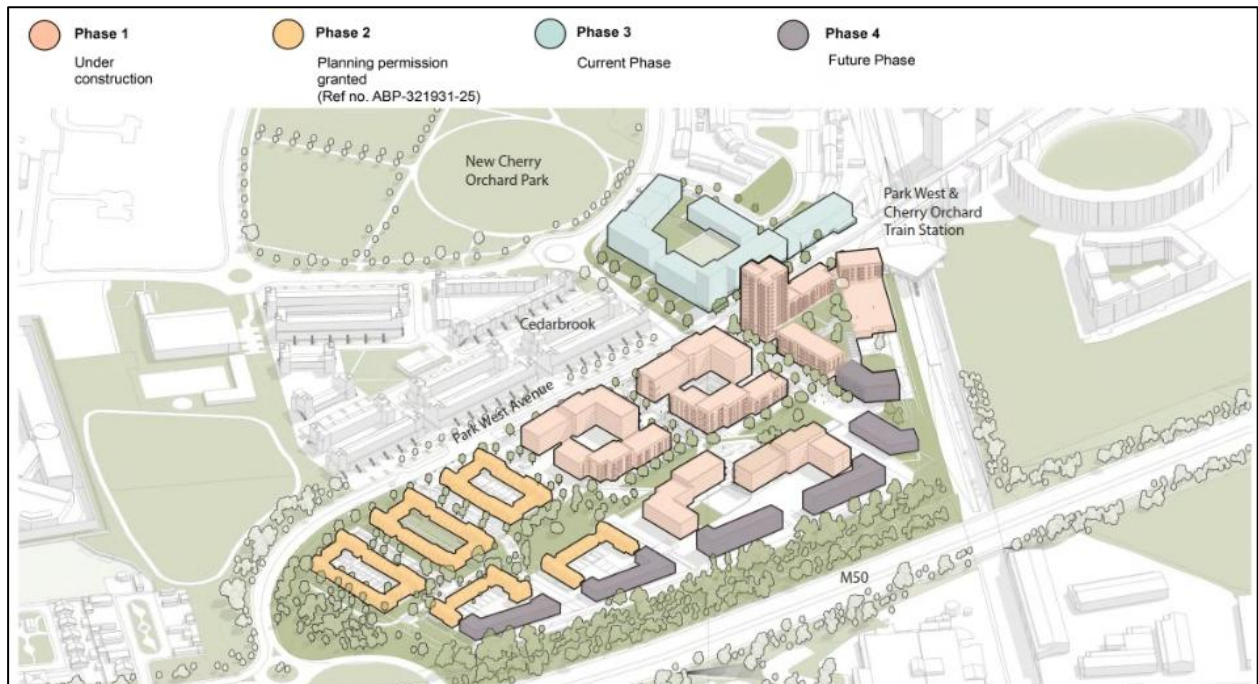


Figure 2-2: Indicative Masterplan Development Phasing Layout

2.3 Proposed Masterplan Development

A description of each of the 4-Phases is included below:

Approved Phase 1 (Under Construction)

Is a medium and high-density area located on Site 4 which will provide a total of 708 no. residential units ranging in size from studio to 3-bed apartments, a 2,523m² supermarket, a combined area of 373m² for retail over 7 units, a 672m² creche and 1,222m² of community spaces over 13 buildings. It is noted that the trunk foul and surface water drainage, including attenuation storage, to serve phases 2, 3, & 4 are part-provided under the planning application submission for Phase 1.

Phase 1 of Cherry Orchard Point was approved in July 2024 under ABP Ref. 318607-23 and is currently under construction.

Approved Phase 2 (Under Construction)

Is a low-density housing area located to the north of Site 4 and is proposed to contain 137 no. residential units comprising a mix of apartment/duplex units and houses.

Phase 2 of Cherry Orchard Point was granted planning permission in September 2025 under ABP Ref. 321931-25 and had recently commenced construction at the time of writing this report.

Phase 3 (Subject Site)

The subject development, Cherry Orchard Point - Phase 3, Is located on Site 5, and comprises 312 residential units, local retail and commercial units, and landscaped public and communal open space.

The subject development, Cherry Orchard Point – Phase 3 will be referred to as the “proposed Phase 3 development” or “subject site” within this report.

Proposed Phase 4 (Future Development)

Phase 4 of the masterplan lands Is located along the western edge of Site 4 and will consist of the construction of commercial office space over 6 blocks.

2.4 Topographical Details

The Phase 3 subject site is located within Site 5 of the masterplan development (refer to Figure 2-1).

The latest Site Investigation Report undertaken by Ground Investigations Ireland (GII) in August of 2024, included as an appendix to the Preliminary Construction Environmental Management Plan submitted under a separate cover, has determined that Site 5 is predominantly a brownfield site, with fill material found.

For Site 4, the topographic survey of the area indicates that the low point of the site has a level of 55.70m OD. This is located on the eastern site boundary approximately 140m north of the junction of Park West Avenue and Cedar Brook Way. The remainder of the site generally slopes to this location owing to the embankments and subsequent site grading from the Dublin-Kildare Rail line to the south, M50 to the west, and approach road to the overpass on the M50 to the north. A local high point of the site has a level of 62.65m OD located at the northeast of Site 4.

Site 5 has a central high point with a level of 58.04m OD in the centre of the site and isolated high points at the southwest of the site. Generally, the site slopes from the centre outwards to all boundaries. The boundaries of Site 5 typically have levels between 54.55m and 60.78m, with the highest of these levels being located at the southwest of Site 5, adjacent to the retaining wall of the Park West Avenue Bridge over the rail lines.

Refer to Figure 2-3: Existing Site Topography of the Subject Site Lands for an extract of the topographical survey of the development showing spot elevations throughout Sites 4 and 5.

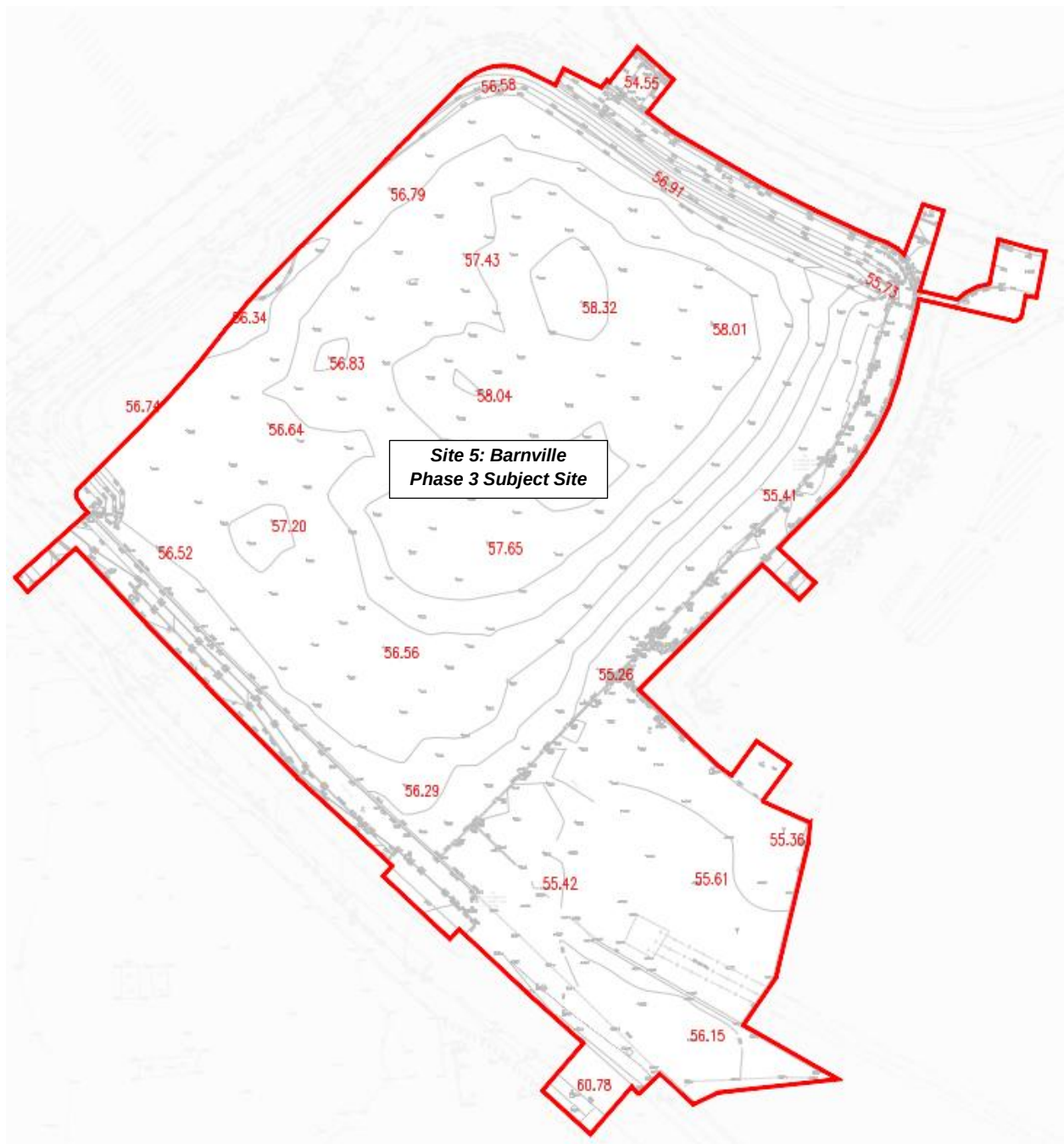


Figure 2-3: Existing Site Topography of the Subject Site Lands

3. Proposed Development

3.1 Development Description

The proposed development will consist of the construction of a residential led mixed-use scheme containing 312no. residential apartments comprising 244no. cost rental and 68no. social units, 8no. local retail and commercial units, landscaped public and communal open space. The proposed development includes a new principal access via Barnville Park to the south, providing entry to an internal undercroft parking court, upgraded pedestrian and cycle footpaths, Barnville link connecting the Park West Avenue and Cherry Orchard railway station and all associated site and public realm works. The proposed development represents Phase 3 of the overall planned development at Cherry Orchard Pointe for Development Sites 4 and 5 of the LAP lands. Phase 1 of the overall planned development was granted permission in July 2024 (ACP Case Ref: 318607-23) and Phase 2 was granted in September 2025 (ACP Ref. 31-395-2025). The proposed development comprises the works to be undertaken on Site 5: Barnville, which forms the subject of this planning application.

The proposed development (Total GFA c. 28,413 sq.m) involves construction of 312no. residential apartments (c. 24,556 sq.m), across 7 blocks consisting of 4 to 10 floors, comprising 16no. studio units, 146no. one-bed units, 139no. two-bed units (15no. two-bed three-person and 124no. two-bed four person), 9no. 3-bed units (three four-person) and 2no. 4-bed units (one four-bed seven-person) together with 8no. Local Retail and Commercial units (c. 1,441 sq.m GFA), and all ancillary and sundry accommodation (c. 2,416sq.m total GFA). The proposed development also includes the provision of landscaped public open space of 1691 sq.m and 6519sq.m of communal open space. The communal open space has been designed to provide a high-quality amenity area, incorporating a community garden seating and play areas and fitness facilities, and associated landscaping. The scheme also provides private open space for all residential units.

The proposed development will involve the provision of car parking (including accessible and EV car parking spaces), car sharing spaces, bicycle parking spaces, motorbike spaces, motorcycle parking spaces, and loading bays. The scheme includes a Barnville link to the south of the site connecting Barnville Park with Park West Avenue and providing direct pedestrian access to the railway station, along with over 40no. pedestrian crossing points connecting Park West Avenue, Barnville Park and New Cherry Orchard Park.

The development will also provide for all associated ancillary site development infrastructure including site clearance, boundary treatment, associated public lighting, internal roads and pathways, substations, switch room, water tank rooms, storage room, rainwater/surface water attenuation, stormwater, bin storage, bicycle stores, hard and soft landscaping, play equipment, boundary walls, attenuation area, green and blue roof systems, photovoltaic panels and all associated works and infrastructure to facilitate the development including connection to foul and surface water drainage and water supply.

Refer to the enclosed statutory notices for a full description of development as part of this planning application.

3.2 Site Investigation Details and Infiltration Rates

Multiple site investigations have been undertaken at the subject lands over a number of years, between 2018 and 2026. These investigations have been carried out at various stages to inform the assessment and development of the masterplan lands.

It can be concluded from the above Site Investigation Reports that the Masterplan Lands (Sites 4 and 5) do not contain soils that provide adequate infiltration rates for surface water management features relying solely on infiltration. However, localised infiltration within Sustainable Urban Drainage Systems (SuDS) can be incorporated into the design where features such as engineered rain gardens, swales, or bioretention tree pits are designed with appropriate overflow mechanisms and positive drainage connections to the main surface water network.

For further details on the Site Investigation findings, refer to the Engineering Assessment Report and the Preliminary Construction Environmental Management Plan.

3.3 Proposed Construction Works

Construction timelines for the Proposed Phase 3 development and the future Phase 4 development will be subject to obtaining planning approval from An Coimisiún Pleanála.

The Proposed Phase 3 development is currently anticipated to commence construction in Q3 2028, with the construction programme expected to take at least 24 months. Completion is currently earmarked, subject to change, for Q3 2030.

Working hours for the site will be set out in the conditions of planning approval and would typically be 08.00 to 19.00 from Monday to Friday and 08.00 to 14.00 on Saturday. No Sunday or Bank Holiday work will generally be permitted. The above working hours are typical; however, special construction operations may need to be carried out outside these hours in order to minimise disruption to the surrounding area.

The proposed work will consist of the following:

- Site preparation;
- Erection of security fencing/perimeter fencing;
- Setting up a secure site compound including wash down area;
- Site clearance including topsoil stripping;
- Construction of infrastructure including roads, drainage, and services;
- Provision of road upgrades and pedestrian links;
- Construction of residential and commercial units.
- Reinstatement landscaping.

4. Mitigation Measures

The sites have no direct hydrological connectivity to natural watercourses or surface water networks. There may be an indirect link from surface water runoff which may have the potential to run off the site boundary to the surface water gullies on the adjacent road networks. These networks outfall to the Blackditch Stream.

The following Mitigation Measures are to address potential impacts to water quality and are required to protect the Blackditch Stream, and the Camac River which has an ultimate outfall to the River Liffey at Heuston. All works will be undertaken with reference to the following guidelines:

- CIRIA C532: Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al., 2001);
- CIRIA C692: Environmental Good Practice on Site, (Audus et al., 2010)
- BPGCS005: Oil Storage Guidelines;
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Technical Guidance (Murnane et al., 2006a)
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane et al., 2006a)
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016)
- Guidelines for Planning Authorities – Architectural Heritage Protection – Guidance on Part IV of the Planning and Development Act 2000. (Part 2, Chapter 7) and ICOMOS Principles.

The schedule of mitigation presented within the table below summarises measures that will be undertaken in order to reduce impacts on ecological receptors within the zone of influence of the proposed development.

Table 4-1: Schedule of Surface Water Mitigation Measures

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
1	Hydrocarbons from carparking area entering the drainage network.	Water quality impacts.	Petrol interceptor to be installed on drainage network prior to outfall to public surface water network.	Prevents hydrocarbons from entering the public surface water network.
2	Pollutants from site compound areas entering the drainage network or contaminating soils.	Water quality impacts. Soil quality impacts. Groundwater impacts.	Materials to be stored appropriately in designated areas (discussed below). Temporary foul water connection to be obtained from Uisce Eireann to serve site compound welfare facilities.	Prevents contamination of public surface water network, soil, and groundwater.

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
3	Pollutants from material storage areas entering the watercourse or contaminating soils.	Water quality impacts. Soil quality impacts. Groundwater impacts.	Fuels, oils, greases, and other potentially polluting chemicals will be stored in roofed and bunded compounds at the Contractor's compound. Storage area to be located over 50m away to ensure no direct pathway to the surface water network. Bunds are to be provided with 110% capacity of storage container. Spill kits will be kept on site at all times and all staff trained in their appropriate use. Method statements for dealing with accidental spillages will be provided the Contractor for review by the Employer's Representative.	Prevents contamination of public surface water network, soil, and groundwater.
4	Concrete/ cementitious materials entering the drainage network.	Water quality impacts	A designated wash down area within the Contractor's compound will be used for cleaning of any equipment or plant, with the safe disposal of any contaminated water.	Prevents contamination of public surface water network. Ensures invasive species material is not transported off site as muck.
5	Leaching of contaminated soil into groundwater.	Groundwater quality impacts	Spill kits will contain 10 hr terrestrial oil booms (80mm diameter x 1000mm) and a plastic sheet, upon which contaminated soil can be placed to prevent leaching to ground water.	Prevents contamination of groundwater.
6	Pollutants from equipment storage/ refuelling area entering the drainage network.	Water quality impacts	Any refuelling and maintenance of equipment will be done at designated bunded areas with full attendance of plant operative(s) within contained areas. Discharge licence (where required) pollutant limits to be monitored and adhered to. The site is located at least 50m from any direct pathway to the surface water drainage network.	Prevents contamination of public surface water network.
7	Runoff from exposed work areas and excavated material storage areas entering the drainage network.	Water quality impacts due to silt entering the network.	Provision of silt entrapment facilities such as; straw bales, silt fencing, silt barriers, diversion drains, settlement tank(s), & settlement pond(s), as appropriate and as outlined below.	Prevents contamination of public surface water network.

5. Construction Stage

The proposed potential pollution mitigation measures outlined below will be implemented in accordance with 'CIRIA C532 – Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors' – CIRIA-2001.

5.1 Roles and Responsibilities

5.1.1 Main Contractor

The Main Contractor will have overall responsibility for the implementation of the project Construction Surface Water Management Plan (CSWMP) during the construction phase. The appointed person from the Main Contractors team will be appropriately trained and assigned the authority to instruct all site personnel to comply with the specific provisions of the CSWMP. At the operational level, a designated person from each sub-contractor on the site shall be assigned the direct responsibility to ensure that the operations stated in the CSWMP are performed on an on-going basis.

Copies of the Construction Surface Water Management Plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the CSWMP and informed of the responsibilities which fall upon them because of its provisions.

The responsibilities of the appointed person will be as follows;

- Updating the CSWMP as necessary to reflect activities on site.
- Advise site management (including, but not limited to, the site Construction Manager) on environmental matters.
- Ensure pre-construction checks for protected species, if any, are undertaken.
- Review method statement of the sub-contractors to ensure that it incorporates all aspects of CSWMP.
- Provide toolbox talks and other training, and ensure understanding by all involved of all mitigation measures.
- Assess effectiveness of mitigation, check weather forecast and site conditions where trigger levels are required.
- Ensure adherence to the specific measures listed in the Planning Conditions.
- Advise upon the production of written method statements and site environmental rules and on the arrangements to bring these to the attention of the workforce.
- Investigate incidents of significant, potential, or actual environmental damage, ensure corrective actions are carried out and recommend means to prevent recurrence; and,
- Be responsible for maintaining all environmental related documentation.
- Ensure plant suggested is environmentally suited to the task in hand.
- Co-ordinate environmental planning of the construction activities to comply with environmental authorities' requirements and with minimal risk to the environment. Give contractors precise

instructions as to their responsibility to ensure correct working methods where risk of environmental damage exists.

5.2 Pre-Construction Plan

5.2.1 Designated Storage Area & Site Compound

A site compound(s) including offices and welfare facilities will be set up by the main contractor in locations to be decided within the subject site by the appointed contractor.

The main contractor will be required to schedule delivery of materials daily. The main contractor will be required to provide a site compound on the site for the secure storage of materials.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and surrounding watercourses from oil and petrol leakages and significant siltation. Suitable bunded areas will be installed for oil and petrol storage tanks. Designated fuel filling points will be put in place with appropriate oil and petrol interceptors to provide protection from accidental spills. Spill kits will be provided by the Contractor to cater for any other spills.

5.3 Construction Plan

5.3.1 Vehicle Washdown

Where possible, and subject to licence, the permanent connection to the public foul sewer will be used temporarily for construction phase. Vehicle wash down water will discharge directly, via suitable pollution control and attenuation, to the foul sewer system. If this connection is not permitted, then wastewater generated will be required to be stored for collection and treatment off-site at a suitable waste disposal facility.

5.3.2 Surface Water Run-off

On-site treatment measures will be installed to treat surface water run-off from the site prior to discharge to the receiving surface water sewer on Barnville Park and Cherry Orchard Green. This treatment will be achieved by the construction of settlement tanks/ponds, in conjunction with the installation of proprietary surface water treatment systems including class 1 full retention petrol interceptors, and spill protection control measures. Settlement tanks/ponds will be sized to deal with surface run-off and any groundwater encountered.

A sampling chamber with shut down valve will be installed downstream of the settlement pond/tank and water quality monitoring will be carried out here prior to discharge to the surface water sewer.

It is likely that the surface water run-off from the site will be discharged to the existing public surface water network, post treatment. This will need to be confirmed between the Contractor and Local Authority, as well as any further conditions such as the permitted levels of contamination as well as frequency for testing, as part of the Contractor's application for a discharge licence.

5.3.3 Surface Water Monitoring Parameters

In addition to daily visual inspections, a surface water monitoring programme, as outlined in the table below must be followed during construction in order to ensure maintenance of water quality protection. This is in line with Transport Infrastructure Ireland (TII)'s 'Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan'. It is considered that the parameter limit values (Guide/Mandatory) defined in the Fresh Water Quality Regulations (EU Directive 2006/44/EEC) should act as a trigger value for the monitoring of Surface Water.

Table 5-1: Monitoring Guidelines (Fresh Water Quality Regulations)

Parameter	Limit		Frequency and Manner of Samplings
	Limit Value	Guide/Mandatory	
Temperature	1.5°C	Mandatory Limit	Weekly, and at appropriate intervals where the works activities associated with the scheme have the potential to alter the temperature of the waters.
Dissolved oxygen	50% of Samples $\geq$ 9 (mg/l O ₂) 100% of Samples $\geq$ 7 (mg/l O ₂)	Guide Limit	Weekly, minimum one sample representative of flow oxygen conditions of the day of sampling
pH	6 to 9	Mandatory Limit	Weekly
Nitrites	≤ 0.01 (mg/l N ₀₂)	Guide Limit	Monthly
Suspended Solids	≤ 25 (mg/l)	Guide Limit	Monthly
BOD ₅	≤ 3 (mg/l)	Guide Limit	Monthly
Phenolic Compounds	-	-	Monthly where the presence of phenolic compounds is presumed (An examination by test)
Petroleum Hydrocarbons	5 (mg/l)	Guide Limit	Monthly (visual)
Non-Ionized Ammonia	≤ 0.005 (mg/l NH ₃)	Guide Limit	Monthly
Total Ammonium	≤ 0.004 (mg/l NH ₄)	Guide Limit	Monthly
Total Residual Chlorine	≤ 0.005 (mg/l HOCl)	Mandatory Limit	At appropriate intervals where works activities associated with the scheme have the potential to alter the Total residual Chlorine of the waters
Electrical Conductivity	-	-	Weekly

6. Operational Stage

The design of the surface water network is discussed in full in the Engineering Assessment Report, submitted under a separate cover. This report, however, discusses the surface water management plan as a whole, with an emphasis on describing the rationale for the selection of proposed SuDS, and calculations for attenuation volumes, discharged water quality enhancement, and the further enhancement of amenity and biodiversity values. The following sections may be considered as the “*SuDS Design statement*” as required under Section 9.11 of the Council’s SuDS Design & Evaluation Guide.

6.1 SuDS

The Council’s SuDS Design & Evaluation Guide advises that: “*Sustainable Drainage or SuDS is a way of managing rainfall that minimises the negative impacts on the quantity and quality of runoff while maximising the benefits of amenity and biodiversity for people and the environments.*”. These Sustainable Drainage System (SuDS) are considered a collection of water management practices that aim to align modern drainage systems with natural water processes.

Sustainable Drainage System (SuDS) are a collection of water management practices that aim to align modern drainage systems with natural water processes.

SuDS facilities are designed to prevent pollution of streams and rivers and to slow down runoff from sites, therefore helping to prevent downstream flooding and improve water quality. This closely mimics natural catchment behaviour where rainfall either infiltrates through the soil or runs off slowly over the ground surface to the nearest watercourse. This is known as the “treatment train” approach. SuDS devices should be placed at source, site, and regional levels. SuDS can also provide amenity benefits to local communities and benefits for biodiversity simultaneously.

Dublin City Council’s Development Plan (2022-2028) has identified SuDS as the preferred method of managing rainfall from new developments. The proposed SuDS for the subject application have been incorporated and designed in accordance with Dublin City Council’s SuDS Design and Evaluation Guide and also in accordance with their Green and Blue Roof Guide.

In the following sections of the it will be outlined in detail how SuDS devices have been utilised and incorporated as an integral part of the overall plan for the proposed development, and how their inclusion will mitigate the risk of localised and downstream flooding, while also promoting residential amenity and biodiversity.

The proposed SuDS measures have been assessed for suitability, designed, and incorporated in accordance with CIRIA Report C753 The SuDS Manual, and Dublin City Council’s SuDS Design and Evaluation Guide, and Green & Blue Roof Guide, in order to develop a nature-based approach to surface water management for the proposed development.

6.2 Proposed Surface Water Network and SuDS Strategy

6.2.1 Surface Water Catchments & Allowable Discharge Rates

Masterplan Development

For stormwater management purposes, the Masterplan Lands (Site 4 and Site 5) have been divided into five separate catchments, as shown in Figure 6-1, below. As can be seen from the Figure, Site 4 consists of surface water Catchments 1A, 1B, 2, and 4.

The overall catchment area for the Subject Site, located on Site 5, has an approximately area of 1.61 ha and is indicatively shown in Figure 6-2. The subject site is further sub-divided into two catchments, namely, Catchment A and Catchment B. Details on these two catchments are discussed in the section to follow, Section 5.3.2.

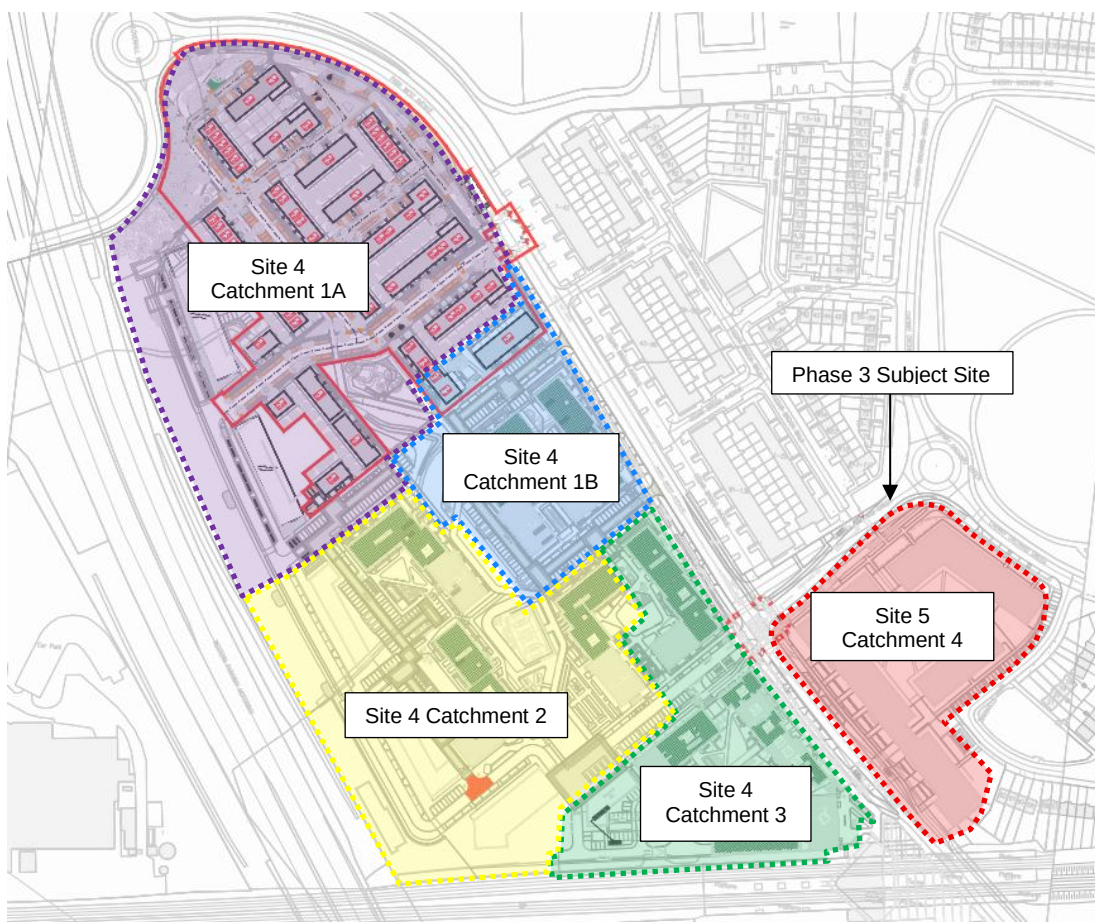


Figure 6-1: Indicative Layout of Surface Water Catchments on Site 4 and Site 5

In line with DCC requirements the attenuation calculations undertaken have limited the outflow rate to a maximum of 2.0 l/s/ha. This is in accordance with Dublin City Council's "SuDS Design and Evaluation

Guide”, which instructs in their Flow Control Discharge Limits Table (page 43), that the 1-in-100-year maximum outflow rate shall be limited to 2 l/s/ha.

The allowable outflow rate for each surface water catchment within the masterplan lands is shown in the below table.

Table 6-1: Allowable Outflow Rates for the Masterplan Lands Surface Water Catchments

Catchment	Location / Phases Included	Area (Ha)	Allowable Discharge Rate
Site 4			
Catchment 1A	North of Site 4	4.58 ha	8.60 l/s
Catchment 1B	Centrally-east of Site 4	1.36 ha	3.20 l/s
Catchment 2	South-west of Site 4	3.79 ha	7.55 l/s
Catchment 3	South of Site 4	1.67 ha	3.33 l/s
Site 5 (Subject Site)			
Catchment 4	Site 5	1.61 ha *	3.20 l/s

* The redline boundary of the proposed Phase 3 development is 1.72 ha; however, the effective surface water catchment for the proposed development is 1.61 ha.

Subject Development

The proposed Phase 3 development is divided into two principal surface water catchments. Catchment A discharges to the existing 225mm diameter surface water sewer within Park West Avenue at the northwest of the site. Catchment B discharges to the proposed 300mm diameter surface water sewer, which comprises the relocated section of the existing 300mm diameter surface water sewer currently located beneath the parking bays along Barnville Park, with the ultimate outfall connection point of Catchment B into the public network is at the existing 450mm surface water network in Cherry Orchard Green, to the east of the subject site.

Each surface water sub-catchment will collect, attenuation, and restrict surface water runoff to the required allowable outfall rate, 2 l/s/ha, with a flow control device proposed at each sub-catchment outfall location. Refer to Figure 6-2 below which illustrates the proposed surface water catchments and outfall locations for each catchment within the proposed Phase 3 development. Catchment A is shown in green while Catchment B in shown in purple.



Figure 6-2: Subject Site Surface Water Sub-Catchments

The allowable outflow rate for each surface water sub-catchment within the proposed Phase 3 development is shown in the below table.

Table 6-2: Allowable Outflow Rates for the Subject Development

Catchment	Area of Catchment (m ²)	Allowable Discharge Rate (rounded up to nearest decimal)
Catchment A	2,640	0.5 l/s
Catchment B	13,430	2.7 l/s
Total	16,070	3.20 l/s

Storm water from each catchment will be attenuated and discharge at a controlled rate, limited to a maximum of 2 l/s/ha, to ultimately outfall to the existing surface water networks at Park West Avenue and Cherry Orchard Green.

6.2.2 SuDS Treatment Train (Subject Development)

In accordance with the CIRIA SuDS Manual (C753), the proposed drainage strategy adopts the principles of the SuDS management train or “treatment train” by incorporating a range of interconnected SuDS features throughout the development. These features collectively provide runoff control, attenuation, water quality treatment and conveyance, with each component contributing to the overall performance of the drainage system.

The treatment train is typically described in three stages:

- Source Control – managing runoff as close to source as possible (e.g. green blue roofs, permeable paving, rain gardens, bio-retention systems)
- Site Control – managing runoff from larger areas (e.g. swales, detention basins, ponds).
- Regional Control – managing runoff from multiple sites or catchments (e.g. wetlands, large attenuation ponds).

The proposed drainage strategy adopts a source control approach throughout the development, with runoff managed as close as practicable to where it is generated through the use of distributed SuDS features. This approach aligns with the management train principles set out in the CIRIA SuDS Manual (C753) and represents current best practice in sustainable surface water management.

The SuDS features proposed at each treatment train stage are discussed below.

6.2.3 Source Control

Blue and Blue Green Roofs

Blue roofs are roof-based attenuation systems designed to temporarily store rainfall at roof level and release it at a controlled rate to the downstream drainage network. By attenuating runoff at source, blue roofs reduce peak discharge rates, lower downstream attenuation requirements, and contribute to the overall SuDS strategy.

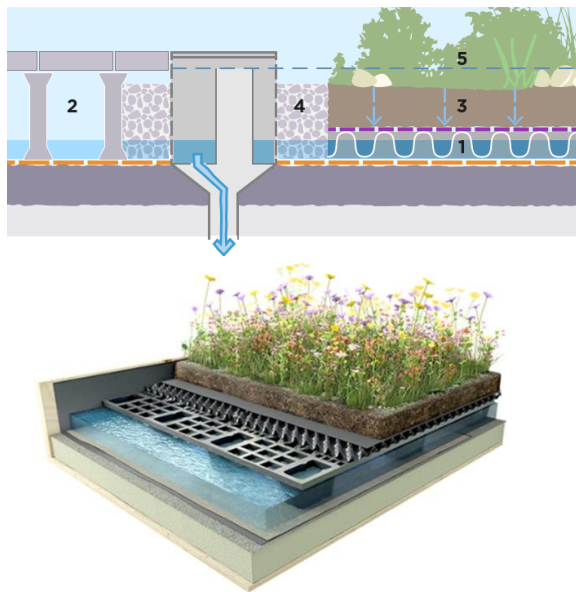
A total blue roof area of 1,065 m² is proposed over the net roof area of all blocks and a blue drainage board is proposed at podium level covering a total area of 3000 m².

Blue-green roofs combine the temporary attenuation function of a blue roof with the environmental benefits of a vegetated green roof. In addition to providing controlled storage and release of rainfall, blue-green roofs incorporate a growing medium and vegetation that promote interception, evapotranspiration, biodiversity, urban cooling, and water quality improvements, while reducing peak runoff rates.

A total blue-green roof area of 3,595 m² is proposed over the net roof area of all blocks.

The proposed building cores / blocks and podium level will attenuate the full surface water storage requirement for these hardstanding surfaces at roof and podium level.

Refer to Figure 6-4 for an extract of a blue-green roof buildup detail taken from the DCC Sustainable Drainage Design & Evaluation Guide (2021).



1. Drainage board / Reservoirs – assume reservoirs are full for purposes of attenuation storage calculation (50% voids)
2. Storage layer provided by geocellular structures or pedestals – as per manufacturers specification (90-95% voids)
3. Growing medium layer (15-25% voids)
4. Stone (30% voids)
5. Where flows are stored above the vegetation layer (100% voids), the designer should confirm that:
 - the growing medium will not be subject to flotation
 - surface ponding on the roof will only come into effect during extreme rainfall and any ponding will dissipate after a short time period

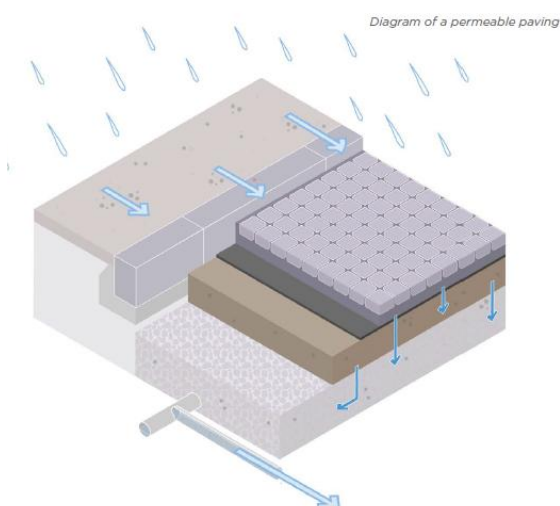
Figure 6-3: Typical Blue-Green Roof Buildup Details

Permeable Paving

It is proposed to introduce permeable paving below all parking spaces, cycle parking and strategically chosen hardstanding spaces within open green space areas.

The goal of permeable paving is to control stormwater at the source to reduce runoff. In addition to reducing surface runoff, permeable paving has the dual benefit of improving water quality by trapping suspended solids and filtering pollutants in the substrata layers.

Refer to Figure 6-4 for an extract of a permeable paving buildup detail and installed permeable paving taken from the DCC Sustainable Drainage Design & Evaluation Guide (2021).



Permeable pavement (installed 2008) Finglas



Figure 6-4: Illustration of Permeable Paving Buildup and Installation

Bio-retention Tree Pits

It is proposed to provide roadside bio-retention tree pits and tree pits adjacent to hardstanding areas such as public footpaths and cycle tracks throughout the development. Trees can help control storm water runoff because their leaves, stems, and roots slow rain from reaching the ground and capture and store rainfall to be released later. Trees help to attenuate flows, trap silts and pollutants, promote infiltration, and prevent erosion. Incorporating tree planting offers multiple benefits, including attractive planting features, improved air quality and increased biodiversity whilst helping to ensure adaptation to climate change.

Refer to Figure 6-5 for an extract of a tree pit buildup detail and an installed roadside tree pit taken from the DCC Sustainable Drainage Design & Evaluation Guide (2021).



Figure 6-5: Illustration of SuDS Tree Pit Buildup Detail and Installation

Bio-retention Raingarden Systems

Bio-retention planted areas are proposed within the subject site adjacent to the building footprint within defensive areas and within the open green space area on the south of the proposed development.

The bio-retention rain gardens adjacent to the building will intercept, collect, treat, and slow runoff from adjacent private hardstanding areas and may also collect runoff from emergency overflow pipes from the roofs. The bio-retention rain gardens in open green space areas will collect surface water runoff from adjacent public hardstanding areas such as footpaths and green areas.

Refer to Figure 6-6 for an extract of a rain garden detail taken from the DCC Sustainable Drainage Design & Evaluation Guide (2021).

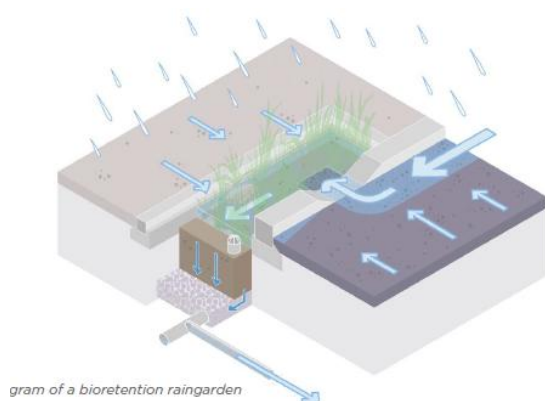


Figure 6-6: Illustration of Rain Garden Buildup Detail and Installation

6.2.4 Site Control

Detention Basin

A landscaped surface storage feature that temporarily attenuates stormwater runoff and releases it at a controlled rate, reducing peak flows to the receiving drainage network. In addition to their hydraulic function, detention basins provide a range of wider SuDS benefits. They encourage settlement of suspended sediments and associated pollutants, improving the quality of runoff prior to discharge. Where appropriately landscaped, they can create valuable habitat, enhance biodiversity, and contribute to the ecological value of the development. Detention basins also provide visual amenity by integrating drainage infrastructure into open green spaces, offering an attractive landscape feature rather than relying solely on below-ground infrastructure.

The detention basin is proposed to collect runoff from the surrounding green space area and public footpaths proposed on the south of the development. The basin is designed with a below ground stone void area that will assist with temporary attenuation storage during storm events.

Refer to Figure 6-7 for an extract of a rain garden detail taken from the Department of Housing, Local Government and Heritage (2022), Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas.



A well-established and well-maintained detention basin adds amenity (The Way, Citywest Avenue, Citywest, Dublin 24)

Figure 6-7: Image of a Detention Basin in Dublin 24

Petrol Interceptor

A petrol interceptor provides water quality treatment by removing hydrocarbons and other light liquid pollutants from surface water runoff prior to discharge, reducing the risk of pollution to downstream drainage infrastructure and receiving waters. It is typically provided where runoff is generated from areas with a heightened risk of hydrocarbon contamination, such as vehicle parking and service areas.

The site is proposed to include blue and blue-green roof systems, bio-retention rain gardens, bio-retention tree pits, permeable paving, and a detention basin with below ground stone void storage. If required by the Local Authority, the additional of petrol interceptors can be included in the design, installed upstream of the catchment outfalls.

6.3 SuDS Maintenance Regime

Surface SuDS features can typically be maintained as part of the regular maintenance of the landscape, incorporating litter picking, grass cutting, and inspections. Figure 6-8: Regular Maintenance Requirements for SuDS, is an extract taken from Section 12.3 of the SuDS Design & Evaluation Guide and generally describes the regular maintenance aspect for the SuDS.

Type	Activity	Normal site care (Site) or SuDS-specific maintenance (SuDS)	Suggested frequency
Regular Maintenance			
Litter	Pick up all litter in SUDS Landscape areas along with remainder of the site – remove from site	Site	1 visit monthly
Grass	Mow all grass verges, paths and amenity grass at 35-50mm with 75mm max. Leaving cuttings in situ	Site	As required or 1 visit monthly
Grass	Mow all dry swales, dry SUDS basins and margins to low flow channels and other SUDS features at 100mm with 150mm max. Cut wet swales or basins annually as wildflower areas – 1st and last cuts to be collected	Site	4-8 visits per year or as required
Grass	Wildflower areas strimmed to 100mm in Sept or at end of school holidays – all cuttings removed Or Wildflower areas strimmed to 100mm on 3 year rotation – 30% each year – all cuttings removed	Site	1 visit annually 1 visit annually
Inlets & outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	SuDS	1 visit monthly
Permeable paving	Sweep all paving regularly to keep surface tidy	Site	1 visit annually or as required

Figure 6-8: Regular Maintenance Requirements for SuDS

There will still be a remaining requirement for more intensive maintenance tasks to be undertaken however, the severity of these tasks can be reduced by regular inspections and proactive responses being incorporated as a part of the regular maintenance regime discussed above. A table showing the typical requirements for the occasional maintenance tasks and remedial works is extracted from the SuDS Design & Evaluation Guide to Figure 6-9: Further Maintenance Requirements for SuDS.

Occasional Tasks			
Permeable paving	Sweep and suction brush permeable paving when ponding occurs	SuDS	As required - estimate 10-15 year intervals
Flow controls	Annual inspection of control chambers - remove silt and check free flow	SuDS	1 visit annually
Wetland & pond	Wetland vegetation to be cut at 100mm on 3 - 5 year rotation or 30% each year. All cuttings to be removed to wildlife piles or from site.	Site	As required
Silt	Inspect swales, ponds, wetlands annually for silt accumulation	Site & SuDS	1 visit annually
Silt	Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows. Spread, rake and overseed.	Site & SuDS	As required
Native planting	Remove lower branches where necessary to ensure good ground cover to protect soil profile from erosion.	SuDS	1 visit annually
Remedial Work			
General SuDS	Inspect SuDS system to check for damage or failure when carrying out other tasks.	SuDS	Monthly
	Undertake remedial work as required.		As required

Figure 6-9: Further Maintenance Requirements for SuDS

6.4 Interception of Treatment Storage and Attenuation Storage

As noted above, the methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS). DCC's SuDS Design and Evaluation Guide 2021, and in the CIRIA Report C753 The SuDS Manual. Appendix E of the Greater Dublin Strategic Drainage Study (GDSDS) sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long-term storage at a development site. These calculations are summarised below.

6.4.1 Criterion 1: River Water Quality Protection

Water Quality Standard 1: Interception

The Greater Dublin Strategic Drainage Study (GDSDS) states that approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall yields the following:

Table 6-3: Interception Calculation

Paved surfaces connected to drainage system	$16,982 \text{ m}^2 \times 0.65 \times 1.0 =$ 11,038.30 m²	<i>138,311m² site area</i> <i>65% of the site is paved</i> <i>100% of the paved area</i>
Volume of Interception Storage	$11,038.3 \text{ m}^2 \times 5\text{mm} \times 0.8 =$ 44.15 m³	<i>Paved area directly drained</i> <i>5mm rainfall depth</i> <i>80% paved runoff factor</i>

This is further in line with Section 4.2.2 of the CIRIA Report C753 The SuDS Manual, which identifies Water Quality Criterion 1 as required to “*Support the management of water quality in receiving waters and groundwaters*”. The section further lists methods whereby this can be achieved: Pollution Prevention, Interception, Treatment, & Maintenance and remedial work. Section 4.3.1 of the same document discusses the requirements for provided sufficient interception methods via the introduction of Green Roofs, Pervious Surfaces, & Vegetated SuDS.

It has been calculated that the interception volume as noted above will be provided through the introduction of nature-based SuDS to the design as follows:

Permeable paving is proposed in private driveways and parking courts and accounts for a total cumulative area of c. 650 m². Assuming a subbase depth of 0.4-0.55m with 30% voids, this yields a treatment volume of 88 m³.

The permeable paving locations can be seen on drawing number COP-WMC-PH3-00-DR-C-P0205 - Proposed SuDS Layout.

Bio-retention raingardens, permeable surfaces, and tree pits provide further treatment volume.

These SuDS features provide ample treatment volume to meet the volumetric interception requirement of 44.15 m³.

6.4.2 Criterion 2: River Regime Protection

Attenuation storage is provided to limit the discharge rate from the site into receiving waters. As per the GDSDS, the required attenuation volume is calculated assuming 80% runoff from paved areas and has been calculated for the 1-in-100-year critical storm event with 30% climate change allowance. Refer to the Engineering Assessment Report for further details on the climate change allowance factor used for the subject development.

A breakdown of the required and provided attenuation storage volumes for each surface water catchment is included in the table below. Required attenuation storage for each catchment, as mentioned, is calculated using the industry standard software, FLOW (Causeway). Refer to Appendix B of the Engineering Assessment Report for a copy of the FLOW model for the Subject Site.

It should be noted that the attenuation storage reported by the hydraulic model represents the activated (or utilised) storage volume required within a SuDS feature during the design storm event. This differs from the total storage capacity physically provided by the SuDS feature, which reflects the maximum available storage volume. As a result, the activated storage identified by the hydraulic model is typically less than the

total storage capacity provided, with the remaining volume acting as additional resilience and accommodating uncertainties associated with future operational conditions or more extreme rainfall events.

Refer to Table 6-4 below for a summary of the required (activated) and overall provided attenuation storage for the proposed Phase 3 development.

Table 6-4: Required and Provided Attenuation Storage for the Subject Development

Catchment	Area (m ²)	Attenuation Storage Volume	
		Required & Activated (m ³)	Provided (m ³)
Catchment A	2,640	208	226
Catchment B	13,430	1,353	1,474
Site 5 Total	16,070 m ²	1,561 m ³	1,700 m ³

As can be seen from the above table, each sub-catchment has been designed to provide above the attenuation storage requirement.

A total of 1,561 m³ of surface water storage is required for the proposed Phase 3 development with a total of 1,700 m³ storage provided using various nature-based sustainable urban drainage systems. The additional

The provided attenuation storage for the Site 5 subject development is considered acceptable as it meets the required volume of storage of 1,561 m³ with the remaining volume of 139 m³ acting as additional resilience and accommodating uncertainties associated with future operational conditions or more extreme rainfall events.

These calculations are based on the 1-in-100-year extreme storm event with 30% climate change allowance and an allowable outflow rate of 2 l/s/ha.

6.4.3 Criterion 3: Levels of Service

There are four criteria for levels of service. These are:

- Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).
- Criterion 3.2: No internal flooding (100-year high intensity rainfall event).
- Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).
- Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed in the Flood Risk Assessment report which accompanies this Engineering Assessment Report. The Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009 and identifies the subject development at low risk of coastal, fluvial, and pluvial flooding.

6.4.4 Criterion 4: River Flood Protection

The long-term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

Of the three methods described in the GDSDS for establishing River Flood Protection by comparison of the pre- and post-development runoff volumes, (Criteria 4.1, 4.2 and 4.3 respectively), Criteria 4.3 is selected for use as the most practical criteria at this stage in the design.

The Criteria 4.3 approach is for all runoff to be limited to either Q_{BAR} or to 2 l/s/ha, whichever is the greater. However, DCC policy instructs that a max outflow rate of 2 l/s/ha is permitted. The proposed drainage system includes flow control devices at the outfall for each catchment to ensure that the discharge rate is limited to the permitted outflow rate, and ample attenuation is provided for the 1-in-100 year storm, accounting for a 30% increase due to climate change.

The extra runoff volume of the development runoff over greenfield runoff, Vol_{xs} , has been calculated for each of the sub-catchments. Note that as stated in the GDSDS, this volume is not additional to the attenuation storage volume but is effectively an element of it.

6.5 Surface Water - General

The proposed drainage and attenuation strategy drawings are included as part of the planning package and can be seen on drawing numbers:

- COP-WMC-PH3-00-DR-C-P0200 - Proposed Drainage Layout
- COP-WMC-PH3-00-DR-C-P0204 - Proposed Surface Water Catchments
- COP-WMC-PH3-00-DR-C-P0205 - Proposed SuDS Layout
- COP-WMC-PH3-00-DR-C-P0220 - Proposed Typical SuDS Details

Surface water sewers will generally consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6) and laid strictly in accordance with Dublin City Council requirements for taking in charge. It is intended that all sewers within the public domain will be handed over to Dublin City Council for taking in charge.

All private outfall manholes will be built in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. No private drainage will be located within public areas.

Drains will be laid in accordance with the requirements of the Building Regulations, Technical Guidance Document H.

All SuDS and surface water drainage networks proposed in the public domain will be constructed to the standards required for Taking in Charge.

of the various utility provides such as in respect to separation distance between utilities etc.

6.6 Flood Risk Assessment

A site-specific Flood Risk Assessment has been carried out for the proposed Phase 3 development and accompanies this submission under a separate cover.

This report has identified that the site lies within Flood Zone C and is separated from sites identified as being in Flood zone A & B both topographically and with sufficient separation distance. The subject site is a suitable location for the proposed development. Thusly, justification tests are not required to be undertaken. There are currently no floodplains identified on-site nor are any proposed as part of the subject development design.

The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low, and accordingly all four of the above criteria have been met.

UK and Ireland Office Locations

