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Client	Fingal County Council
Project Title	Proposed Housing at Mayeston, Poppintree, Dublin 11
Report Title	Surface Water Management Plan
Prepared For	O'Briain Beary Architects

Project No.	Originator	Volume	Level	Type	Role	Serial No.	Suitability
21208	DOW	00	XX	RP	CE	0005	AP

Revision	Description	Prepared	Checked	Date
P01	Preliminary Draft	AD	PD	19.09.23
C01	Updated for Section 179a Application	AD	PD	12.10.23
C02	Minor Updates	AD	PD	17.10.23
C03	Report Updated	AD		18.10.23
C04	Report Updated	AD		26.10.23

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1. INTRODUCTION

1.1 Scope

This Surface Water Management Plan (SWMP) has been prepared by Downes Associates as part of documentation to be submitted in support of a Section 179A planning application by Fingal County Council for a proposed residential development at Mayeston, Poppintree, Dublin 11. This SWMP report sets out to demonstrate how pollution of watercourses during and after the construction period will be prevented and/or mitigated. This is in accordance with Objective IUO15 of the FCC Development Plan 2023-2029, which states that new developments shall include the following:

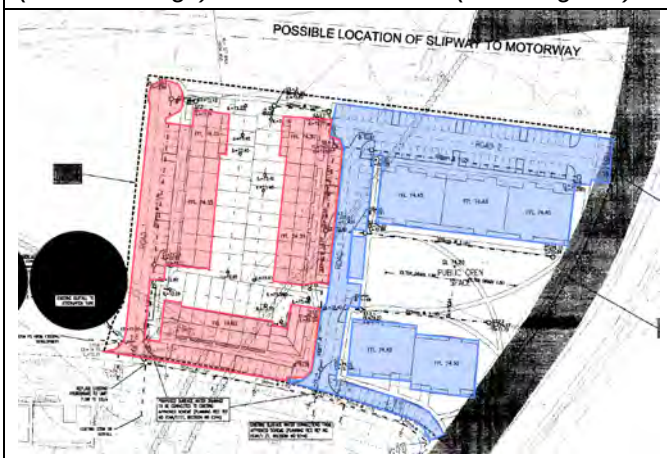
- Identify and assess the existing surface water movements through the development before considering and developing a surface water management system using SuDS, having regard to our Fingal Guidance Document "Green/ Blue Infrastructure for Development", as amended (Appendix 11).
- Incorporate SuDS along the route of the water movement to enhance the water quality effects of nature-based systems at the different stages – Treatment Train approach from source to discharge.

1.2 Description of Development

As part of its Housing Programme, Fingal County Council (Housing Department) proposes to construct a number of new dwelling units and a crèche at a site located within the Mayeston estate at Poppintree, Dublin 11. The site, which measures approximately 1.35Ha in area, is located between St Margaret's Rd to the south, the M50 to the north, existing residential development to the east, and a public park to the west (refer to Figure 1a below). The land is zoned RS-Residential: '*Provide for residential development and protect and improve residential amenity'*. The site forms part of the Mayeston estate which has been developed in recent years. The southern part of the current application site forms part of a larger 1.43Ha site for which planning permission was previously granted (planning register ref. F06A/1348) – refer to orange shaded area in Figure 1b. The northern wedge-shaped part of the current application as shaded green in Figure 1b and which measures approximately 0.59Ha did not form part of the previous planning application permitted under F06A/1348. Only the eastern part of the granted development F06A/1348 was constructed – refer to Figure 1c. The remaining site was only partially developed – concrete slabs and foundations are in place for unfinished units as can be seen in Figure 1a.

Figure 1a – Proposed site location map with site outlined in red.

Figure 1b -Site Map showing approximate extent of previous planning application F06A/1348 (shaded orange) and additional lands (shaded green) included in the current application.



F*igure 1c – Extract of planning drawing for Planning Ref. F06A/1348 showing extent of constructed development (blue) and unconstructed development (red).*

Figure 1 – Site Location Maps

The proposed development will include for the provision of 119 No. apartment units consisting of 39 No. one-bedroom apartments, 68 No. two-bedroom apartments and 12 No. 3-bedroom apartments ranging from 3-6 No. storeys and will also include for car parking, cycle parking, pedestrian and cycle links, storage, services and plant areas. Landscaping will include for high quality private open space, communal amenity areas and public open space provision.

House Type	Total Number
1-bed apartment units	39
2-bed 3-person apartment units	13
2-bed 3-person UD apartment units	20
2-bed 4-person apartment units	35
3-bed 5-person apartment units	6
3-bed 5-person duplex unit	6
Total	**119**

1.3 Existing Site & Surface Water Features

The proposed development site is located within an urban area and there are no existing watercourses on or immediately adjacent to the site. The nearest significant watercourses to the site are the Santry River approximately 1.5km to the northeast and the Ward River approximately 2.5km to the northwest - refer to Figure 2 below.

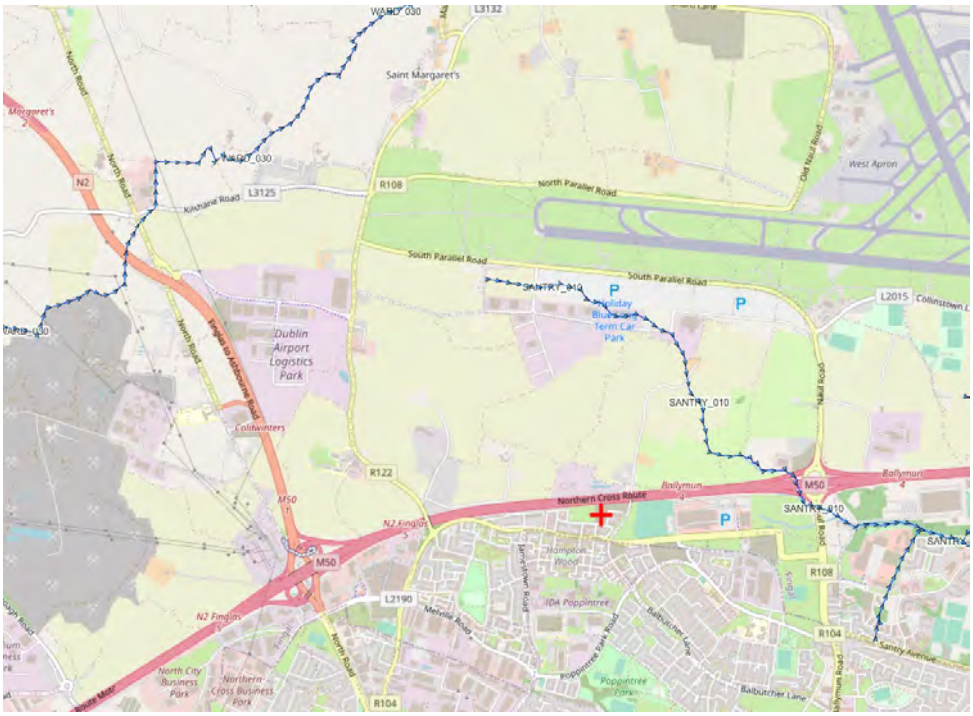


Figure 2 - Extract EPA GIS Map showing watercourses (site location marked with red cross)

The Irish Sea at Dublin Bay is approximately 6.7km southeast of the site – refer to Figure 3 below. The lowest ground level on the site is approximately 73.75m OD (Malin Head). The

Dublin Coastal Protection Project indicated that the 2002 high tide event reached 2.95m OD (Malin Head).

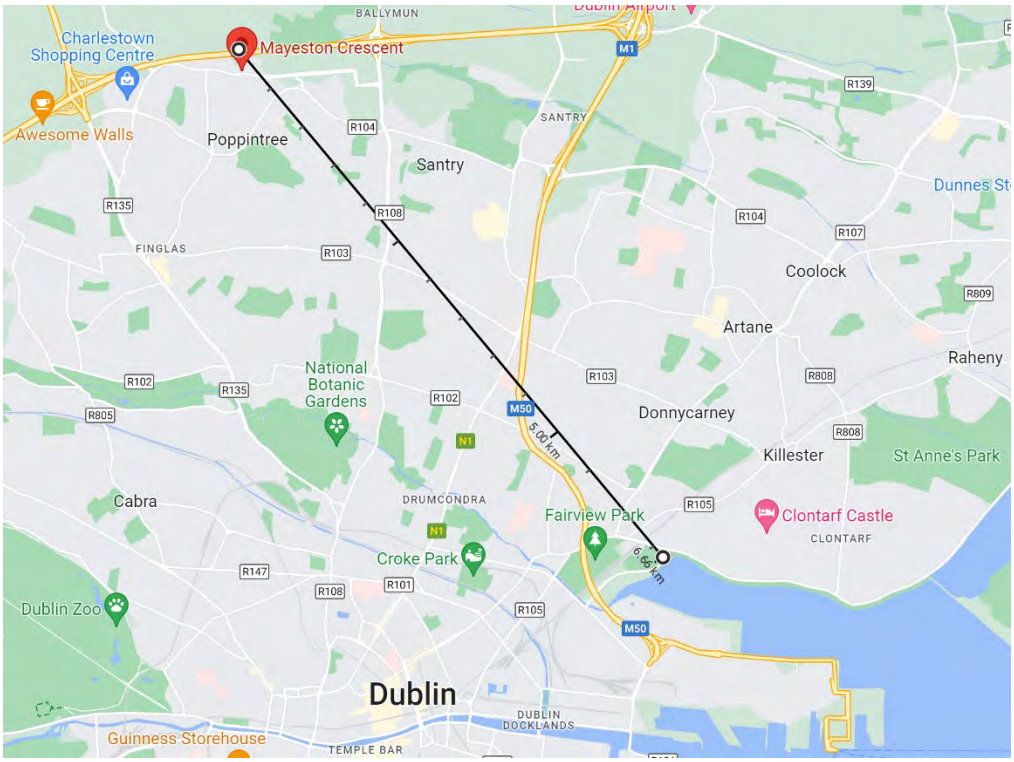


Figure 3 – Distance of current application Site from Sea

Currently, the site is a partly developed brownfield site with a relatively level topography, with a number of concrete slabs and spoil heaps associated with previously granted development. There are known existing “separate” piped water services within and adjacent to the site which were constructed as part of the Mayeston estate, and these are connected to the existing wider drainage infrastructure. Based on available information, the existing surface water drainage system within the adjacent Mayeston Estate is designed in compliance with The Greater Dublin Strategic Drainage Study (GDSDS) and includes attenuation storage within underground storage tanks located in the public open space area immediately to the west of the site as indicated in Figure 4. This attenuation storage system includes a design storage allowance for the current site. Further details of the existing piped water services infrastructure can be found in Downes Associates Infrastructure Design Report included with this application.

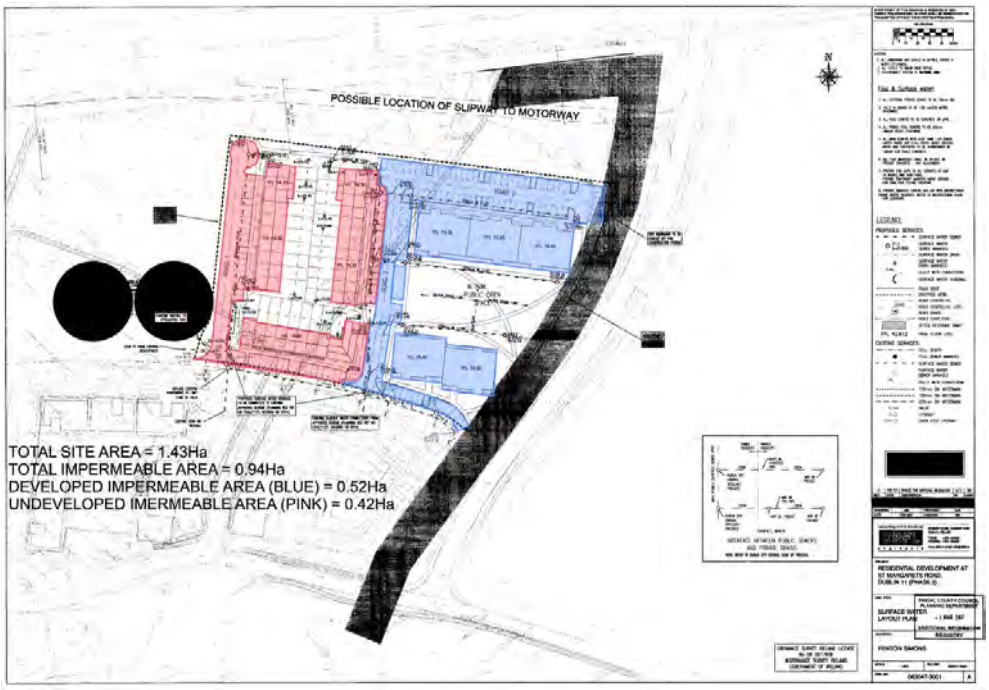


Figure 4 – Existing Attenuation Tank Contributing Areas from DBFL Drawing for F06/1348

As part of the site evaluation, a detailed geotechnical site investigation was carried out by Site Investigations Ltd to establish the characteristics of the natural subsoils. The site ground conditions were found to typically comprise MADE GROUND overlying COHESIVE DEPOSITS comprising brown and brown grey sandy gravelly silty CLAY soils, varying from firm to very stiff, becoming stiffer with depth. The MADE GROUND was encountered across the site typically 1.2m to 1.5m depth, but there are deeper spoil heaps to the north of the site. These spoil heaps will need to be removed as part of site clearance/levelling, along with the existing concrete slabs present on the site. The boreholes extended to 15m BGL, and no bedrock was encountered. No groundwater was encountered in the boreholes or trial pits. At two locations on the site, soakaway tests were carried out in accordance with BRE Special Digest 365. The soakaway tests failed the specification as the water level did not fall sufficiently enough to complete the test. The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The tests were terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation. The findings indicate that the subsoils are unsuitable for intensive infiltration solutions. However, extensive infiltration systems such as permeable pavements are considered feasible to encourage direct infiltration, subject to adequate measures being put in place for exceedance rainfall events.

1.4 Proposed Site Development & Surface Water Features

Surface water runoff from new development is to be minimised using appropriate Sustainable Urban Drainage Systems (SuDS) techniques as detailed in Downes Associates Infrastructure Design Report and drawings submitted with this application. The Infrastructure Design Report includes a detailed rationale for the selected SuDS components and the management train approach adopted. The SuDS measures to be adopted for the development include:

- Extensive green roofs
- Permeable paving systems
- Swales
- Tree pits
- Existing attenuation storage system

1.5 Surface Water Impacts During Construction

The proposed construction works shall include the following main elements:

- Site clearance including grubbing up of redundant floor slabs/foundations/water services and removal of spoil heaps.
- Erection of security fencing/perimeter fencing.
- Setting up a secure Contractor's site compound including storage and wash-down areas.
- Construction of infrastructure including roads, drainage, and services.
- Provision of public realm road/landscape upgrades and pedestrian links.
- Construction of residential units.
- Final landscaping and boundary walls/fences.

Surface water run-off from construction activities has the potential to become contaminated. The main contaminants arising from construction activities include:

- Suspended solids: typically arising from ground disturbance and excavation.
- Hydrocarbons: accidental spillage from construction plant and storage depots.
- Faecal coliforms: contamination from coliforms can arise if there is inadequate containment and treatment of onsite toilet and washing facilities;
- Concrete/cementitious products: arising from construction materials.

These pollutants pose a temporary risk to surface water quality for the duration of the project if not properly contained and managed.

2. MITIGATION MEASURES

The surface water from the subject site will outfall into the Mayeston Estate piped surface water drainage system, which in turn discharges into the wider surface water drainage network and receiving environment. The following mitigation measures are proposed to address potential impacts on water quality and to protect the receiving environment. All construction works shall 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 mitigation schedule presented within Table 2 summarises measures that will be undertaken in order to reduce impacts on ecological receptors within the zone of influence of the proposed development.

Table 1 – Surface Water Mitigation Measures

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
1	Hydrocarbons from vehicle parking area entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Designated parking at least 50m from any watercourse or open sewer.	Ensure no soil disturbance or hydrocarbons leak near an aquatic zone
2	Pollutants from site compound areas entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological	The site compound will be located at least 50m from any watercourse or open sewer.	Prevents pollution of the aquatic zone from toxic pollutants

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
		receptors/qualifying interests		
3	Pollutants from material storage areas entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Fuels, oils, greases, and other potentially polluting chemicals will be stored in bunded compounds at the Contractor's compound or at a location at least 50m from any body of water or open sewer. Bunds are to be provided with a 110% capacity of the storage container. Spill kits will be always kept on site and all staff trained in their appropriate use. Method statements for dealing with accidental spillages will be provided to the Contractor for review by the Employer's Representative.	Prevents contamination of aquatic zone by toxic pollutants
4	Concrete/ cementitious materials entering the watercourse from washdown.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	A designated wash-down area within the Contractor's compound will be used for cleaning any equipment or plant, with the safe disposal of any contaminated water.	Prevents contamination of aquatic zone by suspended solids or pollutants, ensures invasive species material is not transported off-site
5	Concrete/ cementitious materials entering the watercourse from concrete pours.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Pouring of cementitious materials will be carried out in the dry.	Prevents contamination of aquatic zone by suspended solids or pollutants, ensures invasive species material is not transported off-site
6	Leaching of contaminated soil into groundwater.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	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 groundwater.	Prevents contamination of aquatic zone by petrochemicals

No.	Risk	Possible Impact	Mitigation	Result of Mitigation
7	Pollutants from equipment storage/ refuelling area entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	Any refuelling and maintenance of equipment will be done at designated bunded areas with full attendance of plant operative(s) within contained areas at least 50m from any watercourse or open sewer.	Prevents contamination of aquatic zone by petrochemicals
8	Runoff from exposed work areas and excavated material storage areas entering the watercourse.	Water quality impacts Reduction in habitat quality Mortality of aquatic key ecological receptors/qualifying interests	The Contractor is to prepare a site plan showing the location of all surface water drainage lines and proposed discharge points to the sewer. The plan will include the location of all surface water protection measures, including monitoring points and treatment facilities.	Prevents contamination of aquatic zone by suspended solids or pollutants.

3. CONSTRUCTION STAGE

Construction is envisaged to commence once final planning permission has been obtained. The construction program and duration are yet to be confirmed.

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.

3.1 Roles and Responsibilities

3.1.1 Main Contractor

The Main Contractor will be responsible for implementing the project Construction Surface Water Management Plan (CSWMP) during the construction phase. The appointed person from the Main Contractor's 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 ongoing basis.

Copies of the CSWMP 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 shall include (but not limited to) the following:

- Update 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 the 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 the effectiveness of mitigation, check the 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.
- Be responsible for maintaining all environmental-related documentation.

- Ensure the 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 the risk of environmental damage exists.

3.2 Pre-Construction Plan

3.2.1 Designated Storage Area & Site Compound

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

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.

3.3 Construction Plan

3.3.1 Vehicle Washdown

Where possible, and subject to license, the permanent connection to the public foul sewer will be used temporarily for the 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.

3.3.2 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. 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 a shutdown 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.

3.3.3 Surface Water Monitoring Parameters

In addition to daily visual inspections, a surface water monitoring programme, as outlined in Table 2 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 2 – Monitoring Guideline (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 ≥ 9 (mg/l O2) 100% of Samples ≥ 7 (mg/l O2)	Guide Limit	Weekly, a minimum of one sample representative of flow oxygen conditions of the day of sampling
pH	6 to 9	Mandatory Limit	Weekly
Nitrites	≤0.01 (mg/l N02)	Guide Limit	Monthly
Suspended Solids	≤25 (mg/l)	Guide Limit	Monthly
BOD5	≤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 NH3)	Guide Limit	Monthly
Total Ammonium	≤ 0.004 (mg/l NH4)	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

4. OPERATIONAL STAGE

In accordance with Fingal County Council's policy on surface water management for new developments, the proposed development incorporates appropriate SuDS measures. Details of the proposed surface water system are provided in Downes Associates Infrastructure Design Report and drawings, submitted under a separate cover. The principles behind the proposed operational stage surface water management system are set out below. For the plant-based SuDS features, the following proposals should be read in conjunction with plans and specifications prepared by the Landscape Architect.

4.1 Proposed SuDS Components

Sustainable drainage systems (SuDS) typically include a variety of components, each having different approaches to managing flows, volumes, water quality and providing amenity and biodiversity benefits. SuDS are a suite of components working in different ways that can be used to drain a variety of sites. SuDS components work in several ways: they can infiltrate (soak) into the ground, convey (flow) into a watercourse (or if necessary, a sewer), and they can also provide storage on site and attenuate (slow down) the flows of water. Often SuDS schemes use a combination of these processes and components may use a number of mechanisms, in what is termed a management train. The selection of SuDS components for this project was based on an analysis of the site opportunities and constraints, and an appropriate combination of approaches was developed to maximise the sustainability of the system within the constraints of the site. Each of the following SuDS components or approaches was examined and where appropriate for the site the component or approach has been adopted (as highlighted in green).

Source Controls
Maximise permeability within a site to promote attenuation, treatment and infiltration reducing the need for offsite conveyance.

Ref	Measure	Suitable	Comment	Adopted
A.1	Green roofs	Yes	Green roofs are proposed to the two external bike sheds to provide visual benefit, ecological value, enhanced building performance, and the reduction of surface water run-off, in line with Section 3.6.7 of FCC's Green/ Blue Infrastructure for Development: Guidance Note, Fingal County Development Plan– April 2023. Green roofs are not proposed to the apartment blocks, and these are considered exempt as outlined in the above guidance document, due to the inclusion of a significant suite of alternative green infrastructure proposals wholly addressing the interception, treatment and attenuation volumes across the site.	Yes

Ref	Measure	Suitable	Comment	Adopted
A.2	Permeable paving	Yes	Permeable paving is to be adopted for all external paved areas of the development. Due to the poor infiltration characteristics of the subsoils, a partial infiltration system is proposed, with exceedance events catered for by provision of a collector drain within the paved areas.	Yes
A.3	Grass	Yes	Extensive green areas are to be provided.	Yes
A.4	Reinforced grass	Yes	A reinforced grass pavement is to be provided for maintenance vehicles along the western boundary of the site.	Yes
A.5	Gravelled areas	No	Not suitable for the end users of this development.	No
A.6	Rainwater harvesting	No	Not suitable for the end users of this development.	No
A.7	Rain Trap	Yes	Not considered for this development.	No
A.8	Water Butt	No	Individual water butts are not suitable for this type of apartment development.	No

Swales and conveyance channels

Ref	Measure	Suitable	Comment	Adopted
B.1	Swales	Yes	Dry conveyance swales are provided within the central courtyard area as part of the landscaping proposals. The swales shall provide conveyance for exceedance runoff from the permeable pavements.	Yes
B.2	Canals and rills	Yes	Swales are preferred as the means of conveyance.	No

Filtration

Ref	Measure	Suitable	Comment	Adopted
C.1	Permeable pavements	Yes	The granular layers of the permeable pavements are considered appropriate to reduce runoff and treat pollutants adjacent to roadways where there is low pollution loading.	Yes
C.2	Bioretention areas	Yes	Tree pits are proposed adjacent to paved areas in the car park and access road to intercept exceedance runoff. Swales are proposed in the courtyard area to intercept exceedance runoff. The tree pits and swales are considered appropriate to reduce runoff rate and to treat pollutants.	Yes

Infiltration

Capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

Ref	Measure	Suitable	Comment	Adopted
D.1	Soakaways	No	Not suitable for site subsoils.	No
D.2	Infiltration basin	Yes	The granular layers of the proposed permeable paving shall allow for direct infiltration to the subsoils over an extensive area. The swales and tree pits shall also allow natural infiltration.	Yes
D.3	Rain garden	Yes	Permeable paving, tree pits and swales are preferred means of infiltration to suit the landscaping proposals.	No

Retention and Detention

Designed to either provide storage through the retention of surface water runoff, or attenuation through the detention of surface water runoff.

Ref	Measure	Suitable	Comment	Adopted
E.1	Detention basins	Yes	The granular layer under the permeable paving and the swale depressions shall provide temporary detention for exceedance events.	Yes
E.2	Retention ponds/ Wetland	Yes	Suitable, but the permeable paving and swales are preferred for this development.	No
E.3	Attenuation Tank/Oversized Pipes	Yes	The existing Mayeston estate attenuation system shall be used for runoff from the roofs.	Yes
E.4	Throttle device	Yes	Hydrobrake throttle adopted to restrict outflow from SuDS device.	Yes

Proprietary Treatment Systems

Densely vegetated water bodies that use sedimentation and filtration to provide treatment of surface water runoff.

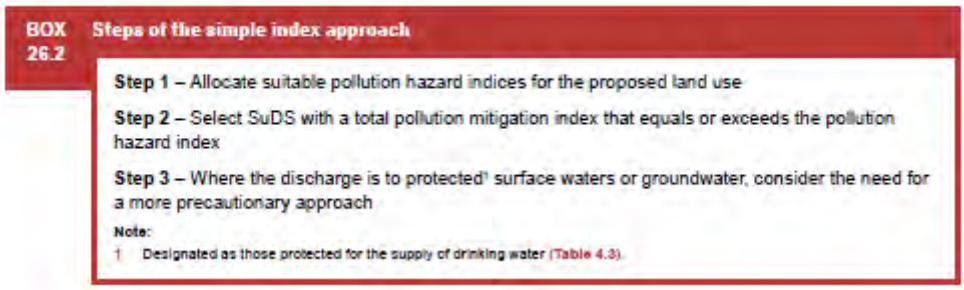
Ref	Measure	Suitable	Comment	Adopted
F.1	Proprietary bioretention system	Yes	Tree pits and swales are adopted as part of bioretention systems (see above).	Yes
F.2	Treatment Channels	No	Not suitable for this development.	No
F.3	Hydrodynamic vortex separators	No	Proprietary system to remove sediments by gravity not deemed necessary. Achieved in tree pits, permeable paving, and swales.	No
F.4	Proprietary	No	Not suitable for this development.	No

Ref	Measure	Suitable	Comment	Adopted
	filtration system			
F.5	Oil separator	Yes	Low hydrocarbon pollutant loading. Proprietary system to remove hydrocarbons not deemed necessary. Achieved in permeable paving, bioretention, and swales.	No
F.6	Multi process	No	Complex bespoke system not suitable to this type of development	No

The water quality, amenity and biodiversity properties of the proposed systems are summarised below.

SuDS Components		
Water Quality	Runoff collection	Standard downpipes shall convey roof rainwater to the underground surface water drainage system. Collector drains comprising a perforated drainage pipe shall convey exceedance runoff from permeable pavements and swales to the receiving surface water sewer.
	Interception	Permeable paving/swales/tree pits/green roof all intercept critical first run-off from impermeable hardstanding and bicycle store.
	Storage	Detention area attenuation volume - 1:100 year, including allowance for climate change.
	Conveyance	Pipes and swales direct water to detention systems and discharge to watercourse.
	Exceedance	Existing topography allows exceedance flows to be intercepted by the watercourse.
	Groundwater protection measures	Roof and carparking area – hazard is low. Permeable paving/swale/tree pits provide protection measures.
Amenity	Open spaces, and bioretention areas provide high amenity spaces	
Biodiversity	Tree pits, green roof, and swales provide ecological area and habitat for a range of species.	

Analysis of the effectiveness of the chosen SuDS components to achieve water quality criteria follows the “simple index approach” as set out in Chapter 26 of CIRIA C753 The SuDS Manual, as follows:



BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach

Note:
1 Designated as those protected for the supply of drinking water (Table 4.3).

From Table 26.2 of C753, the pollution hazard indices for the proposed land uses are as follows:

Land Use	Pollution hazard level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential car parks; low traffic roads	Low	0.5	0.4	0.4

For the selected SuDS components, from Table 26.3 of C753, the pollution mitigation indices are as follows for the site:

SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Permeable paving	0.7	0.7	0.6
TOTAL	**1.2**	**1.3**	**1.2**

The individual mitigation indices are greater than the risk indices so water quality requirements are deemed to be satisfied.

4.2 SuDS Maintenance

To ensure best practice design is adopted and for practicality of operation and maintenance, all SuDS measures adopted for the development shall be designed in accordance with the CIRIA SUDS Manual C753 as required by the GDSDS.

For the proposed SuDS system to work as intended, the entire drainage system must be well maintained. It will be the responsibility of the construction management team to ensure the drainage system is adequately maintained during the construction stage and initial phases of occupation. This will include inspection and cleaning of gullies, drain manholes (including catch pits) and flow control devices to ensure adequate performance. It will also be the responsibility of the design & construction management team to set out the maintenance requirements for the SuDS features in the project safety file. Specific recommended maintenance schedules for various SuDS elements that feature in the development as recommended by CIRIA are set out

in the tables below, and these are to be adopted for the safety file as appropriate. For plant-based SuDS features, these maintenance details should be read in conjunction with plans and specifications prepared by the Landscape Architect.

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

TABLE 16.1 Operation and maintenance requirements for filter drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

TABLE 19.3 Operation and maintenance requirements for trees (after CRWA, 2009)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required