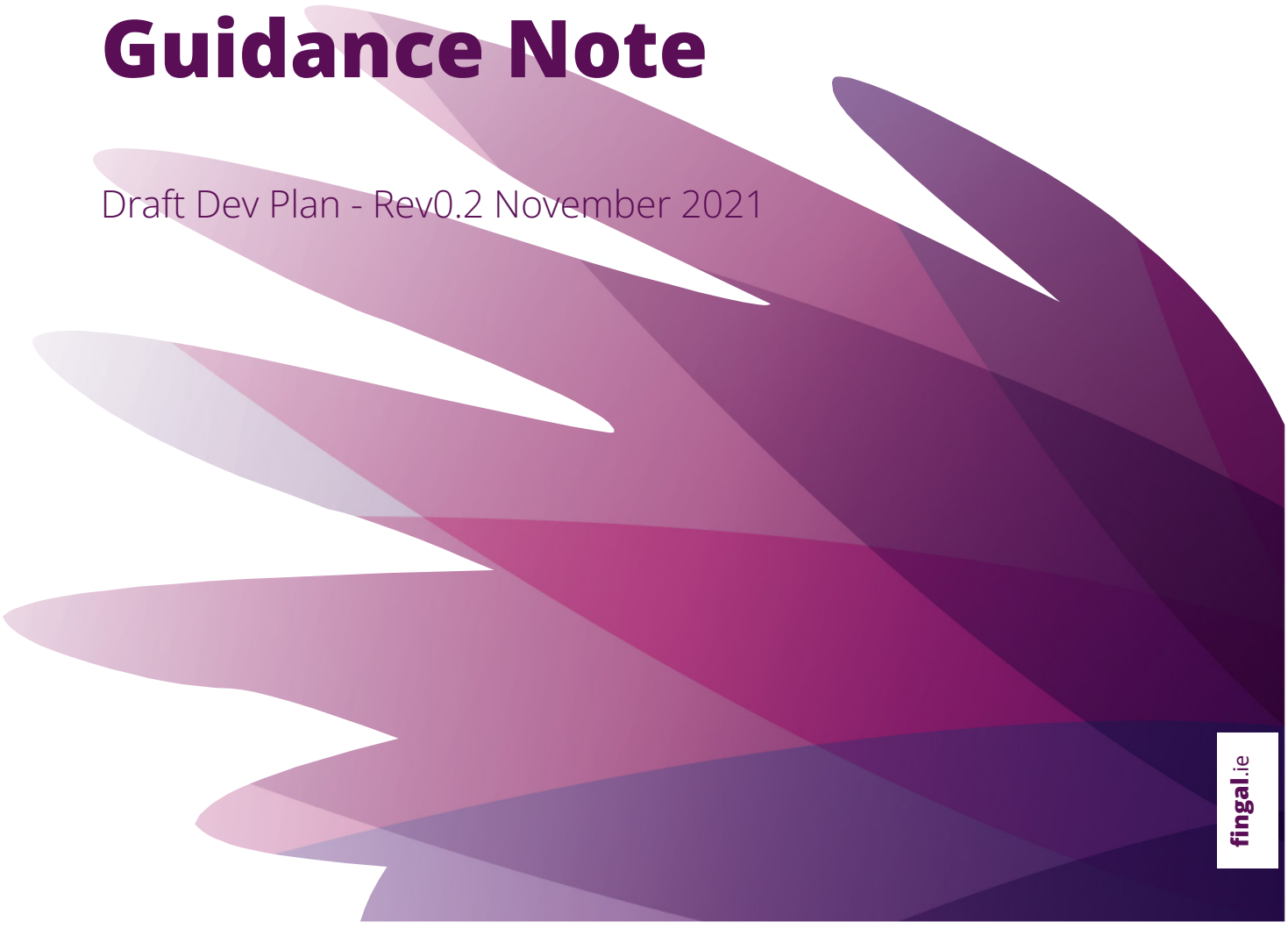
APPENDIX 11

FCC SUDS GUIDANCE DOCUMENT – GREEN/ BLUE INFRASTRUCTURE FOR DEVELOPMENT

Green/ Blue Infrastructure for Development

Guidance Note

Draft Dev Plan - Rev0.2 November 2021



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DOCUMENT CONTROL SHEET

Document Title	Green Infrastructure for Drainage – Guidance Note					
Document No.	Draft Dev Plan Rev0.2 – Nov 2021					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
						3

Rev.	Status	Author(s)	Reviewed By	Approved By	Issue Date
1	draft	DS NMck GC	SM	SM	Feb 2020
2	draft	DS NMck GC	SM KH	SM	Oct 2020
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0.2	Draft Dev Plan	DS	PG DC	CG	NOV 2021

ACKNOWLEDMENTS

C753 The SuDS Manual

Woods Ballard, B, Wilson, D, Udale-Clarke, H, Illman, S, Scott, T, Ashley, R, Kellagher, R (2015) The SuDS Manual, CIRIA, C753, London (ISBN: 978-0-86017-759-3). Go to: www.ciria.org

Table 17.1 Operation and maintenance requirements, P. 329, Chapter 17 Swales

Table 20.15 Operation and maintenance requirements, P. 430, Chapter 20 Pervious Pavements

Table 22.1 Operation and maintenance requirements, P. 483, Chapter 22 Detention Basins

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Sustainable Drainage – Design & Evaluation Guide

London Borough of Bexley, McCloy Consulting & Robert Bray Associates

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1. INTRODUCTION

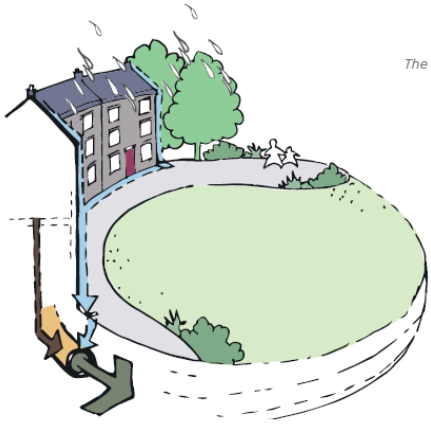
Fingal County Council is a Local Authority north of Dublin with offices at Swords and Blanchardstown. Fingal County Council services a geographical area of 452.sq km which spans rural, urban and suburban communities, and is home to several key elements of national and regional infrastructure, including Dublin Airport.

The Council is responsible for the delivery of a wide range of services and also plays a key role in supporting economic development and enterprise at a local level. The purpose of this document is to provide guidance in the delivery of surface water drainage infrastructure in collaboration with the provision of open space for new developments. The term Green / Blue is used to describe this multi purposed Infrastructure for Development.

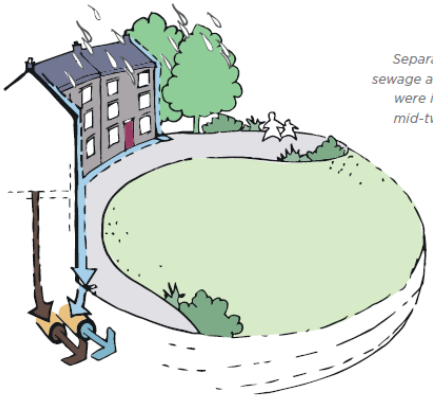
The guidance document will set out the need for Sustainable Urban Drainage Systems (SuDS) in developments, typical SuDS features that we would expect to be included in schemes, a selection of tools that have been incorporated to assist with the implementation of these, and finally items that shall be submitted as part of future planning applications.

2. NEED FOR SUSTAINABLE URBAN DRAINAGE SYSTEMS (SuDS)

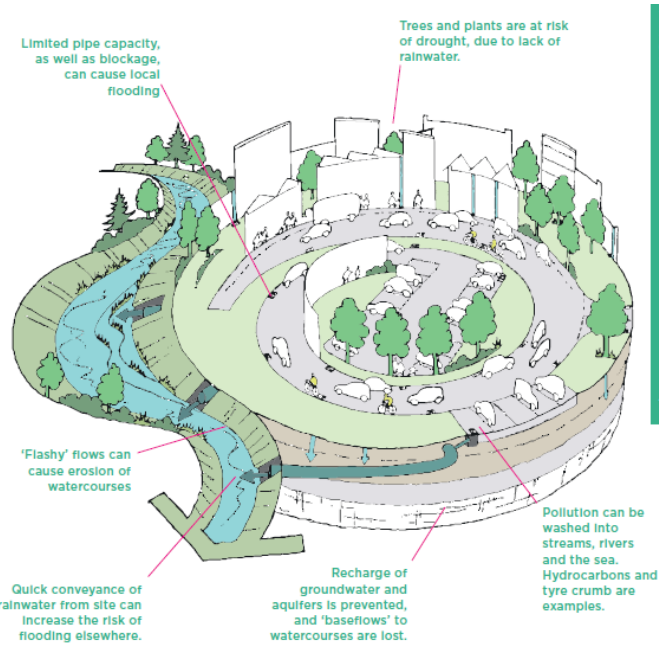
The Greater Dublin Strategic Drainage Study (GDSDS) produced five policy documents including an Environmental Policy, Drainage of New Developments and Climate Change Policy. These three documents focused on the design approach and criteria for new drainage with the objective of ensuring that any future development did not continue the trend towards increasing flooding in the city and the pollution of rivers.



The Combined Sewer.



Separate pipes for foul sewage and surface water were introduced in the mid-twentieth century.

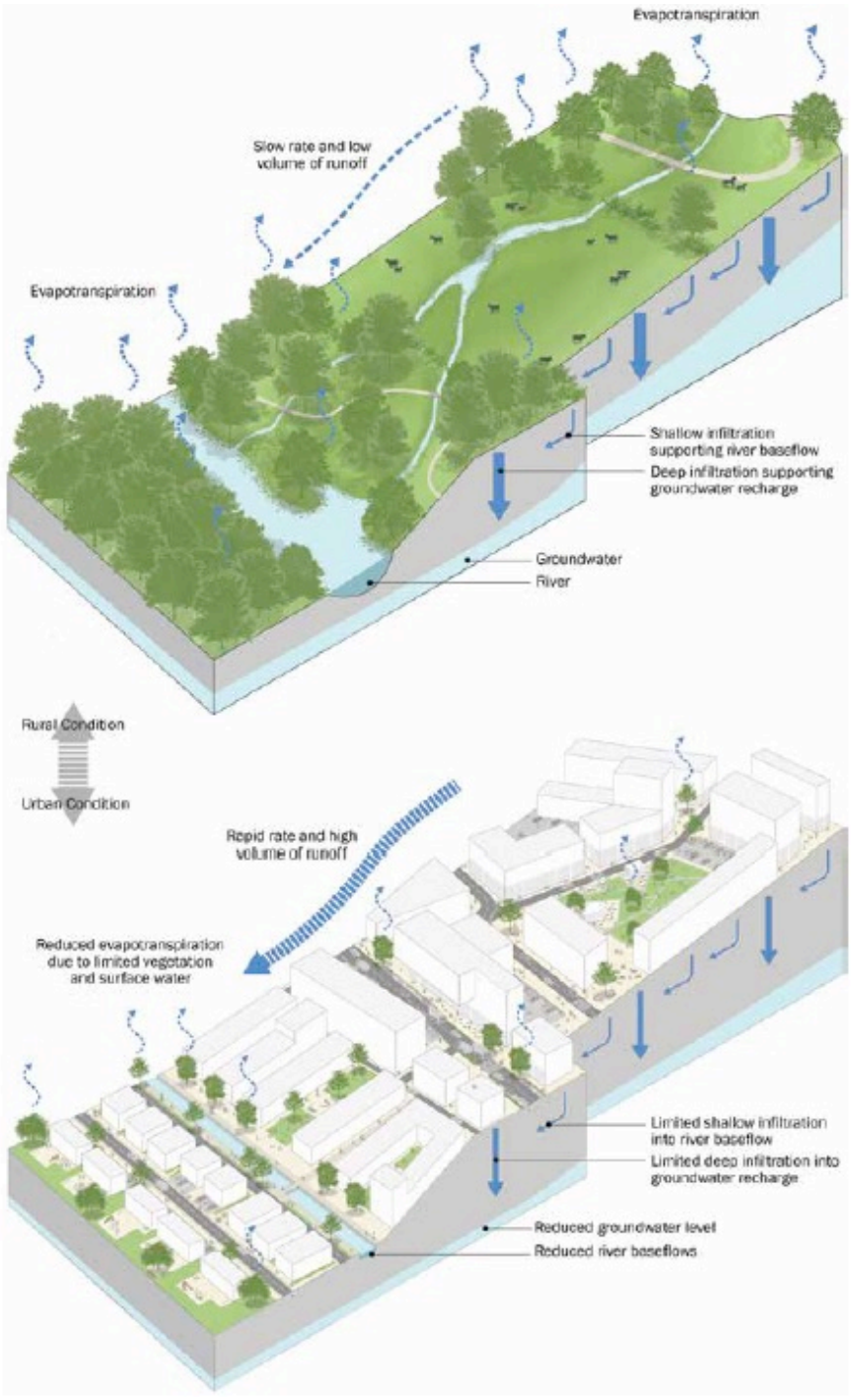


Conventional drainage results in high rates and increased amounts of runoff reaching streams and rivers. Pollution from urban surfaces is also washed into watercourses.

Issues encountered:

- Limited pipe capacity
- Trees and plants are at risk of drought due to lack of rainwater
- 'Flashy' Flows can cause erosion of watercourses
- Quick conveyance of rainwater from site can cause increase risk of flooding downstream
- Poor groundwater recharge

The approach of using Sustainable Drainage Systems (SuDS) can best be summarised as offering a “total” solution to rainwater management and is applicable in both urban and rural situations. By using SuDS techniques, water is either infiltrated or conveyed more slowly to the drainage system and ultimately to water courses via permeable paving, swales, green roofs, rain water harvesting, detention basins, ponds and wetlands.

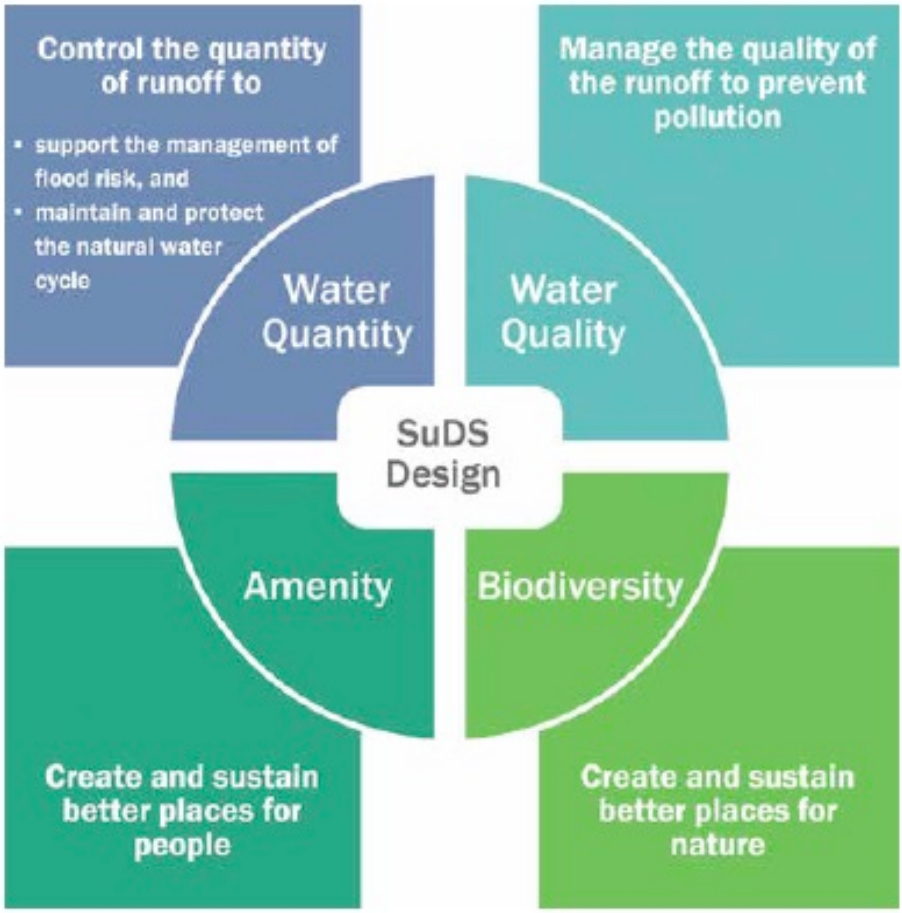


These facilities are designed to prevent pollution of streams and rivers and to slow down runoff from sites, therefore helping to prevent downstream flooding and improve water quality. This closely mimics natural catchment behaviour where rainfall either infiltrates through the soil or runs off slowly 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. In this way SuDS features are not just part of the County's drainage infrastructure but a vital part of the County's Green Infrastructure.

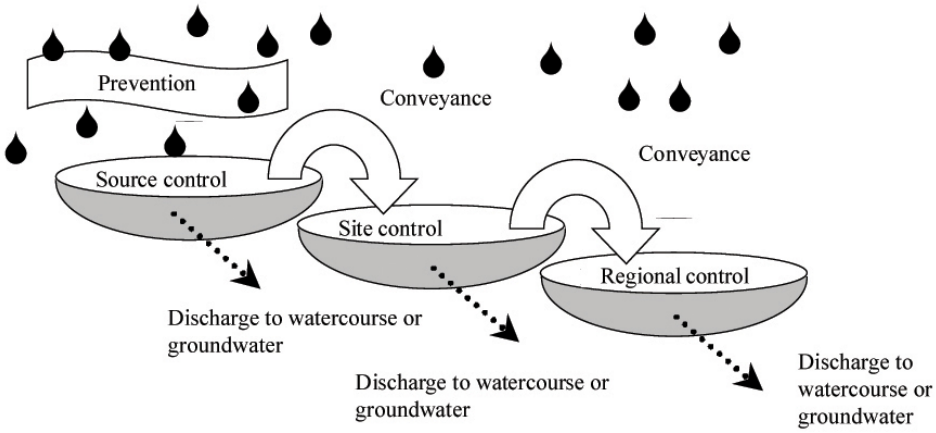
Fingal County Council encourage and promote the use of green solutions such as swales, tree pits, green roofs, downpipe planters, ponds and wetlands for drainage. Green solutions minimise negative environmental impacts resulting from development. Above ground drainage solutions maximise the benefits in terms of water quality, flooding, biodiversity, amenity, climate change and maintenance amongst others. The use of green solutions for drainage is underpinned in the National Planning Framework, County Development Plan, Fingal's Climate Change Adaptation Plan and in various other Local Area Plans and Masterplans and is a key cornerstone of achieving flooding and Water Framework Directive objectives.

Sustainable Urban Drainage Systems

Sustainable Drainage Systems (SuDS) can best be defined as offering a 'total' solution to rainwater management and must be included in all new developments. Ponds, artificial wetlands and water features can make a positive contribution to the provision of Sustainable Drainage Systems (SuDS) and to the amenity of an area. Properly designed and located SuDS features can be incorporated within and can complement the amenity and aesthetic value of open spaces. SuDS areas do not form part of the public open space provision, except where they contribute in a significant way to the design and quality of open space as defined by the Planning Authority. The design of SuDS is best addressed at a macro level and consolidated solutions shall be examined which allow for the aggregation of volumes in larger parks and solutions shall be examined which allow for the aggregation of volumes in larger parks and open spaces rather than a fragmented and phased approach.



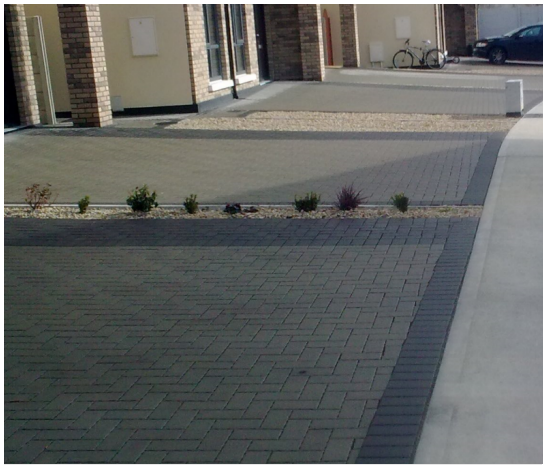
Drainage systems on developed sites shall seek to mimic natural water cycle processes including infiltration, evaporation, transpiration, reuse and attenuation of rainfall. Drainage systems shall use green, more natural landscaped above ground solutions as opposed to concrete and plastic underground attenuation tanks. To assist Planning Applicants in the design of their drainage system a "SUDS Selection Hierarchy Sheet" has been developed (see Appendix A). This sheet shall be completed and submitted with all planning applications within Fingal.



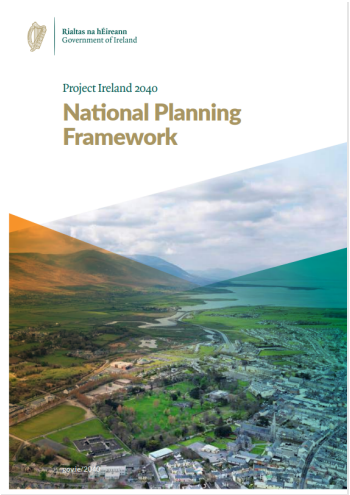
Drainage systems shall be designed to include a treatment train approach using source, site and regional SuDS facilities in accordance with Cira document C753 'The SuDS Manual'.

Supporting National and Regional Objectives

The provision of sustainable urban drainage systems has featured heavily in Fingal development plans over the last 15-20 years. This has facilitated the provision of sustainable drainage systems throughout Fingal on new development sites. There are several objectives contained in the previous development plan 2017-2022 supporting the provision of sustainable drainage systems for new developments. These objectives spanned over four separate chapters which echo the 4 pillars of SuDS mentioned in the previous chapter and lead to the implementation of many systems as shown below.



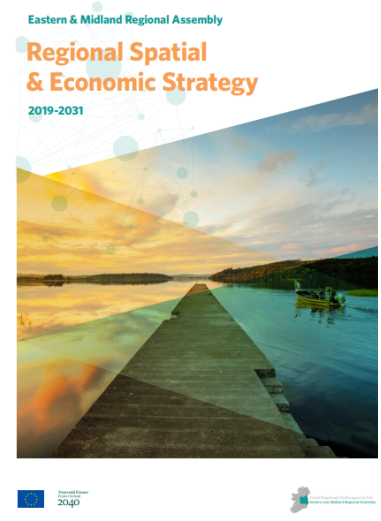
The provision of sustainable drainage continues to have a strong emphasis in current national and regional planning policy. This is also echoed in the River Basin Management Plan (RBMP). As part of the 3rd cycle of the RDMP recommendations are being developed for an implementation strategy for nature based Sustainable Urban Drainage Systems on a national scale. In advance of this interim guidance documentation will be issued to Planning Authorities on measures are to be implemented to support the delivery with a greater focus on nature-based solutions within the constraints of the current legislation and policy.



National Policy Objective 57

Enhance water quality and resource management by:

- Ensuring flood risk management informs place-making by avoiding inappropriate development in areas at risk of flooding in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities.
- Ensuring that River Basin Management Plan objectives are fully considered throughout the physical planning process.
- Integrating sustainable water management solutions, such as Sustainable Urban Drainage (SUDS), non-porous surfacing and green roofs, to create safe places.



REGIONAL POLICY OBJECTIVES:

Surface Water

RPO 10.15: Support the relevant local authorities (and Irish Water where relevant) in the Region to improve storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in the urban environment and in the development and provision at a local level of Sustainable Urban Drainage solutions.

RPO 10.16: Implement policies contained in the Greater Dublin Strategic Drainage Study (GDSDS), including SuDS.

RPO 10.17: Implement the specific recommendations of the GDSDS in relation to Climate Change Regional Drainage Policies for all relevant developments within the Region.

RPO 10.18: Local authorities shall ensure adequate surface water drainage systems are in place which meet the requirements of the Water Framework Directive and the associated River Basin Management Plans.

3. DESIGN APPROACH

3.1 DESIGN GUIDE SUMMARY

This document seeks to ensure the early consideration of surface water drainage management and open space provision in the development design process. The overarching principle of SuDS design is that surface water runoff should be managed for maximum benefit. The types of benefits that can be achieved by SuDS will be dependent on the site, but fit broadly into four categories water quantity, water quality, amenity, and biodiversity. These four categories are known as the four pillars of SuDS design.

Water Quantity:

- Use surface water runoff as a resource
- Support the management of flood risk in receiving catchment
- Protect morphology and ecology of receiving waters
- Preserve and protect natural hydrological systems on site
- Drain the site effectively
- Manage on-site flood risk
- Design systems flexibility /adaptability to cope with future change

Water Quality

- Support the management of water quality in the receiving surface waters and ground waters
- Design system resilience to cope with future change

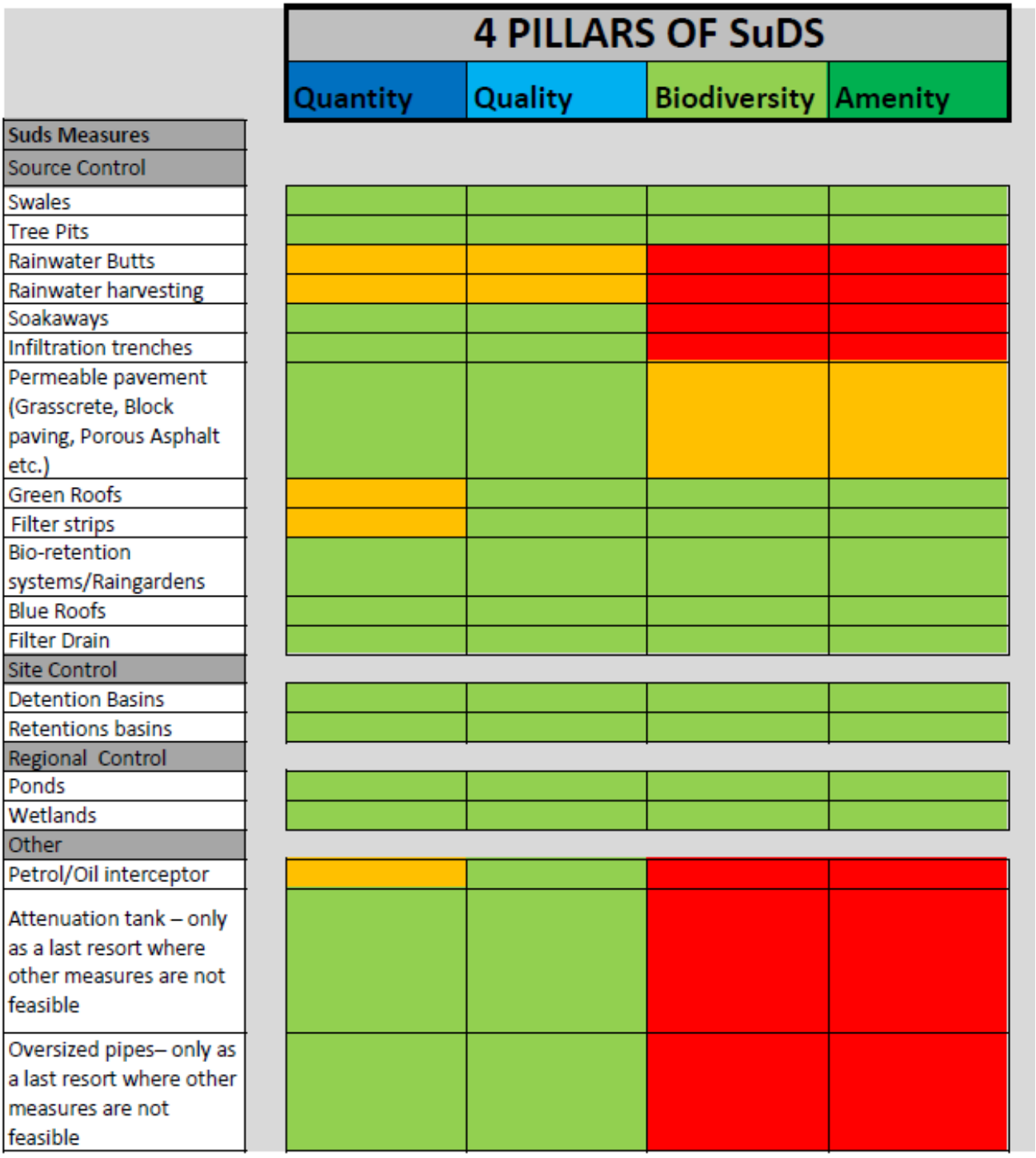
Amenity

- Maximise multi-functionality
- Enhance visual character
- Deliver safe surface water management systems
- Support development resilience/adaptability to cope with future change
- Maximise legibility
- Support community environmental learning

Biodiversity

- Support and protect natural local habitats and species
- Contribute to the delivery of local biodiversity objectives
- Contribute to habitat connectivity
- Create diverse, self-sustaining and resilient ecosystems

This guidance document introduces useful tools to assist in the overall delivery of SuDS on development sites and assist with our assessment at planning stage. The table below demonstrates the various SuDS measures available using our SuDS Selection Rational spreadsheet and ranks their performance against the 4 pillars of the SuDS. (Green = good performance in that area, Orange = moderate, Red = poor performance in that area)

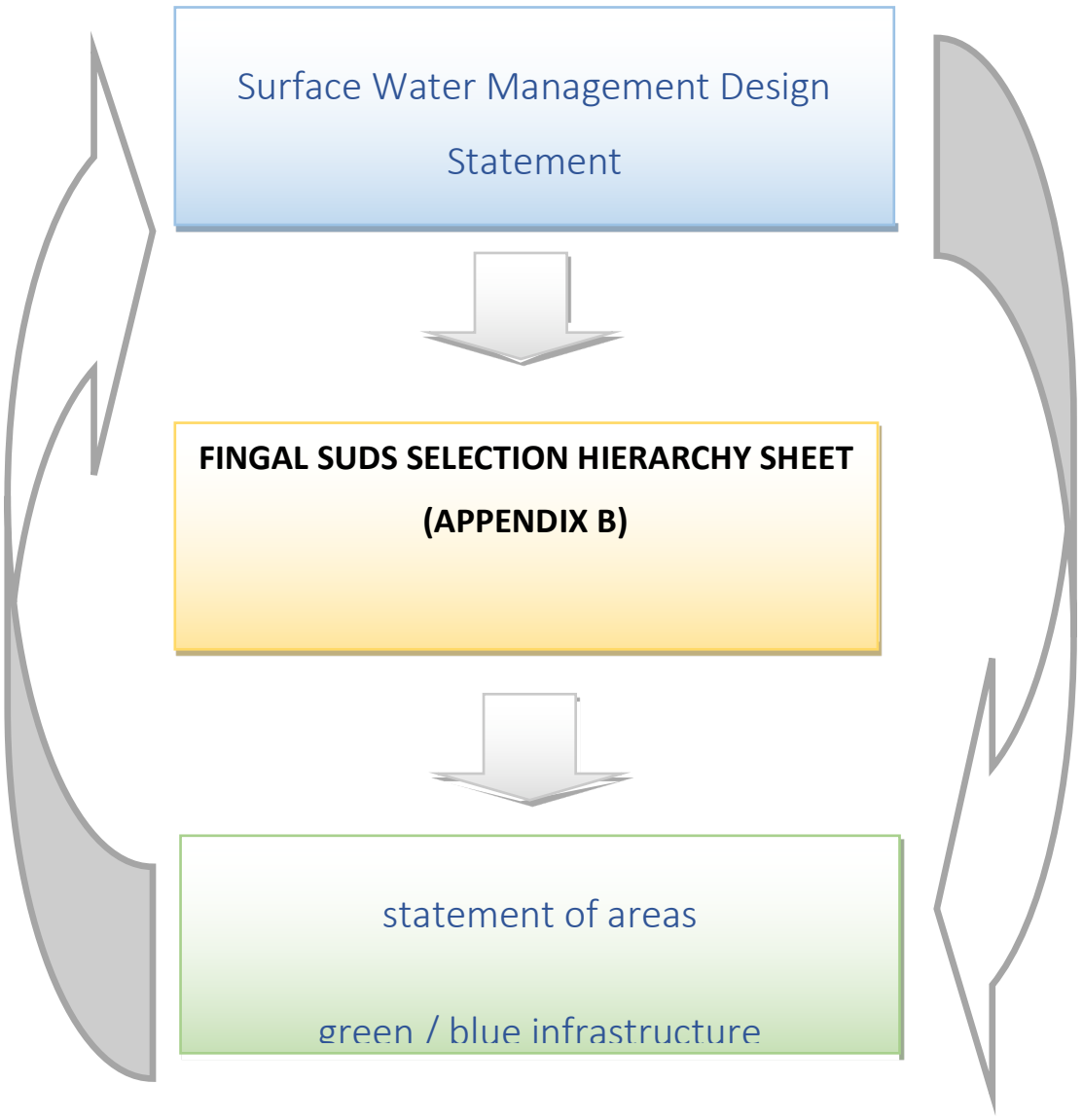


Green = good performance in that area,

Orange = moderate,

Red = poor performance in that area

To assist with the early consideration of SuDS applicant are requested to complete a Surface Water Management Design Statement. The applicant shall set out clearly the way in which existing surface water is currently drained off the site. This should be a short concise statement with the necessary supporting documentation contained as part of the planning application. Based on the information provided the applicant should then provide a brief summary of the proposal with regard surface water drainage, again with supporting documentation included in the planning application were necessary. Following this the "SuDS Selection Hierarchy Sheet" shall be completed followed by the "Statement of Areas – Green / Blue Infrastructure" to demonstrate compliance with the open space requirements. The SuDS shall be in accordance with development plan standards and objectives. In relation to public open space provision and the locating of SuDS on open space.



Existing Scenario: **Surface Water Statement**	**(250 words max)** *separate sheet may be included*
Description of existing subject site outlining the drainage characteristics - topography, ground conditions, suitability for infiltration, natural directions and paths for water movement, existing surface water flood risk.	
Proposed Scenario: **Surface Water Management Design Statement**	**(250 words max)** *separate sheet may be included*
This shall be a clear concise summary of the surface water design proposal. Applicants shall provide a brief explanation of how they have responded to the principles of Sustainable Drainage Systems (SuDS) Design contained in this policy. This could include implications of SuDS on design of other aspects of the development and price comparisons. We encourage that proposals are mindful of future implications from the beginning and present outline designs based on realistic options including maintenance activities and how they are resourced. Applicants be required to clearly demonstrate how the design makes a significant and positive contribution to the amenity value of the open space provision and shall state how the usability of these areas by the public has been addressed. Reference shall also be made on how the design considered the access and use of maintenance machinery in terms of slopes and any hard structures (e.g. head walls) located within the open space areas.	

Surface Water Management Design Statement

SuDS Measures	Measures to be used on this site	Rationale for selecting/not selecting measure	Area of feature (m^2)	Attenuation volume of feature (m^3)
Source Control				
Swales				
Integrated constructed Tree Pits				
Rainwater Butts				
Downpipe Planters				
Rainwater harvesting				
Soakaways				
Infiltration trenches				
Permeable pavement (Grasscrete, Block paving, Porous Asphalt etc.)				
Green Roofs				
Green wall				
Filter strips				
Bio-retention systems/Raingardens				
Blue Roofs				
Filter Drain				
Site Control				
Detention Basins				
Retentions basins				
Regional Control				
Ponds				
Wetlands				
Other				
Petrol/Oil interceptor				
Attenuation tank – only as a last resort where other measures are not feasible				
Oversized pipes– only as a last resort where other measures are not feasible				

FINGAL SUDS SELECTION HIERARCHY SHEET

(APPENDIX B)

Overall Development Site Area (m2)											
% Permeable Areas (open space, green roofs, permeable surfacing etc)											
% Hardstanding Areas (roof areas, road surfaces, concrete paved areas etc)											
Park Type as per Table 12.5 of the Development Plan)	**Park size (m^2)**	**Area of Drainage green infrastructure in park (m^2)**	**Percentage of drainage infrastructure per park (%)**	**Swale (m^2)**	**Filter strip (m^2)**	**Bioretention area (m^2)**	**Retention basin (m^2)**	**Detention basin (m^2)**	**Pond (m^2)**	**Wetland (m^2)**	**No. of head walls located on open**
Pocket Park (500m2- 0.2ha)											
Small Park (0.2ha to 2ha)											
Local Park (2-20ha)											
Urban Park Neighbourhood (20ha to 50ha)											
Regional Park (over 50 ha)											
Other permeable surfaces Grass margins/ Environmental open space ***Not part of open space provision**											

statement of areas

green / blue infrastructure

3.2. FACTORS INFLUENCING SuDS SELECTION & DESIGN

This document sets out key design considerations for Designers to consider when designing drainage systems for developments. More detailed information is available in key design documents including the Ciria C753 "The SuDS manual" and the Greater Dublin Strategic Drainage Study 2005.

SELECTION	DESIGN
Site topography **Flood Plains** **Ground investigation** **Hydrological assessment**	**Climate Change** **Water Quality** **Hydraulic Design**
OTHER FACTORS	
Outfalls to watercourses **Culverting of watercourses** **Riparian Corridors** **Redevelopment of Brownfield sites** **Tree root protection zones** **Archaeology**	

3.2.1 SELECTION OF SuDS

3.2.1.1 Site Topography

The topography of the site shall be considered at the earliest stages of the design and SuDS systems shall be located at the lower parts of the site, outside of the 1%AEP MRFS floodplain. Draining according to the topography of the land will help prevent unnecessary depths of excavation. Wherever feasible drainage features shall be accommodated at the surface to prevent unnecessary depths of excavation. For example, consideration shall be given to dropped kerbs and roadside swales in lieu of gullies and underground pipework.

3.2.1.2 Flood Plains

Designers shall be cognisant of coastal and fluvial floodmaps available at www.floodinfo.ie and of pluvial floodmaps available at www.myplan.ie. These maps are a useful aid in determining the flood risk to the subject site. Please note that a full site-specific flood risk assessment will be required in areas identified within or adjacent to floodplains.

SuDS systems shall be located outside of the 1% AEP Medium risk future scenario floodplains to ensure their continued functionality during a 1%AEP event.

The Applicant shall provide flood route mapping to demonstrate how pluvial exceedance events i.e greater than the 1% AEP MRFS event are catered for within the subject site.

3.2.1.3 Ground Investigation

Evidence of infiltration rates and water table levels shall be submitted as part of the Planning application. Sufficient depth in excess of one metre of unsaturated subsoil in accordance with CIRIA C753 shall exist below the bottom of the SuDS system. This should take into account any seasonal fluctuations in the water table.

Infiltration testing shall be carried out in accordance with BRE Digest 365.

3.2.1.4 Existing Hydrological Assessment

Calculations demonstrating Qbar must be provided with every proposal. This shall be based on site specific factors including rainfall intensities, infiltration rates and soil type. Rainfall intensities shall be based on Met Eireann depth frequency duration tables.

Where there are existing flooding issues downstream of the subject site, Qbar shall be limited to 2l/s/ha.

3.2.2 DESIGN OF SuDS

3.2.2.1 Climate Change

Rainfall intensities shall be factored up by 20% to account for predicted increased rainfall due to climate change. Attenuation storage shall therefore be provided for the 1 in 100 year plus 20% i.e 1%AEP MRFS event.

Higher percentage additions may be specified in particular Local Area Plans, e.g Dublin Airport LAP 30% for critical infrastructure.

An online guidance tool for calculating greenfield runoff rates is available at www.ukSuDS.com.

Designers shall clearly indicate the four storage volumes for the site i.e Interception, treatment, attenuation and long-term storage. A range of design storm events shall be used to determine the critical attenuation storage requirement.

The functionality of the drainage network and attenuation storage shall be modelled to ensure operability in a range of design events including design exceedance events.

3.2.2.2 Water Quality Assessment

The drainage system shall have sufficient pollutant removal efficiency in accordance with the Ciria SuDS Manual C753. A treatment train approach will be adopted which requires a number of SuDS systems in series in order to adequately treat runoff from development sites prior to discharging to the surface water network, watercourse or waterbody.

As a minimum the below stages of treatment shall be provided. For larger development sites a more detailed design in accordance with the SuDS manual will be required.

- Roof runoff - minimum one stage of treatment
- Road runoff – minimum two stages of treatment

3.2.2.3 Hydrological assessment

Flow velocities shall be calculated to ensure that soil erosion does not become an issue within the SuDS system and to ensure sufficient residence time for settlement of silts. Peak velocities should be less than 1.5m/s.

Flow control devices contained within manholes have proven problematic in terms of maintenance especially when the outlet size is less than 75mm. Therefore, above ground flow control devices such as weirs and orifices are favoured.

Coefficient of Volumetric runoff Cv shall be taken as 1.0 (100%) for all hard surfaces. A Cv of 0.9 for paved areas shall be used. The designer must justify where a Cv of less than 0.9 is used. Some design software uses Cv values as low as 0.75. These lower values shall not be used for storage estimation. Designers shall be cognisant of urban creep and the resultant increased runoff resulting from same.

3.2.3 OTHER INFUENCING FACTORS

3.2.3.1 Outfalls to watercourses

At times outfall into a watercourse may not be possible due to flooding or surcharge. Consideration of flooding or surcharge at the outfall point shall be considered in the design of the drainage system and increased storage provided as a result.

3.2.3.2 Culverting of watercourses

Watercourses shall not be culverted except for road crossings. The feasibility of de-culverting watercourses through a development site shall be examined and agreed with the Planning Authority. The amenity, biodiversity, water quality and flooding benefits of same shall be considered within the Planning application.

3.2.3.3 Riparian Corridors

Riparian corridors shall be provided and maintained along all watercourses in accordance with the objectives of the County Development Plan.

3.2.3.4 Redevelopment of Brownfield sites

All proposed re-developments of brownfield sites shall include a SuDS strategy fully in accordance with this document in order to protect and maintain water quality in accordance with the Water Framework Directive. Developments should be designed to be as permeable for rainwater as possible including permeable pavement and reducing extent of hardstanding.

3.2.3.5 Tree root protection zones

The Designer shall be aware of the tree root protection areas (RPA) to ensure SuDS features do not affect trees. The RPA should be calculated in accordance with BS5837:2012. It is noted that the RPA is normally calculated by measuring the trunk diameter at 1.5 metres above ground level, multiplying this distance by 12 and converting the result into a radius centered on the tree.

3.2.3.6 Archaeology

The Designer shall ensure that there are no items of Archaeological interest in the vicinity of any proposed SuDS feature. The applicant shall contact the Fingal Heritage Officer to agree the appropriate location and design of the surface water proposal on sites containing Archaeological features.

3.4. ITEMS TO BE SUBMITTED WITH PLANNING APPLICATION

The Applicant is requested to design the surface water network in accordance with the principles of this Guidance note.

3.4.1 Planning Stage

The following key documents shall be contained within the Applicants planning submission;

- Engineering Report including Surface Water Management Design Statement (Appendix A), Fingal SuDS Selection Hierarchy Sheet (Appendix B) and Statement of Areas – Green / Blue Infrastructure (Appendix C).
- Design drawing including plan and long sections.
- Where SuDS features are proposed on areas of open space, these features (including head-wall etc) shall be indicated on the Landscape Plans and associated sections with the area of each SuDS feature shown in square metres.
- Ground investigation information including infiltration rates and water table.

3.4.2 Construction Stage

- Post completion of the development the Applicant will be required to provide as constructed drawings for the surface water network in accordance with the requirements of Section 3.5.5 (As-Built Drawings) of this document.

- The applicant shall agree the SUDS design with the Water Services Section and Parks prior to the commencement of works, and submit the necessary compliance information in accordance with the grant of planning permission.

Notwithstanding the above, the Landscape Plan shall identify clearly trees to be retained on site and show the SuDS design are accommodated accordingly without having any negative

impact. Any alterations to the SuDS design shall ensure no loss of a mature trees or any reduction of areas identified as flat areas for kickabout. The location of playground provision in proximity to SuDS features shall also be considered.

3.5 MAINTENANCE & TAKING IN CHARGE

3.5.1 Health and Safety aspects of SuDS

All SuDS proposed to be designed in accordance with current health & safety legislation.

3.5.2 Maintenance of SuDS systems

All SuDS features to be designed in accordance with current H&S legislation, bearing in mind the construction phase and the usage/maintenance phase. This may include consideration for the short/medium- and long-term usage of the areas in the context of Fingal's Development Plan and other policy documents such as Biodiversity Plan, Pollinator Plan etc.

A Maintenance Plan shall be submitted for every proposal outlining the extent of work required and the frequency of maintenance required for all SuDS systems.

3.5.3 Information signage

Information signage for education and safety purposes shall be required particularly on regional wetlands and ponds. The need for information signage on detention basins shall be considered on a case by case basis and as agreed with the Planning Authority.

3.5.4 Liability for design

Designers must ensure that the Principles of Prevention are considered from the earliest stages in the design process to ensure risks to safety are avoided or reduced. Design risk assessments shall be prepared for the entire drainage design and include for both the operation and maintenance of the green infrastructure e.g machinery for grass cutting. Liability for design continues to be retained by the Designer in all cases.

3.5.5 As-Built Drawings

As built drawings shall be provided as part of the Taking in charge process. Any changes that have been made to the SuDS system since the Planning stage shall be clearly indicated on the drawings. Retention planning permission may be required for same.

Drawings are to be submitted in AutoCAD compatible (dwg/dxf) format, with the surface water infrastructure shown on a separate layer and a standard legend included. All Drawings to be geo-coordinated & Scaled to the Ordinance Survey Ireland Irish National Grid and all levels related to fixed Ordnance Survey Datum (Malin Head).

Mapping of SuDS features shall be undertaken in compliance with the recommendations of "SuDS asset register and mapping" by HR Wallingford February 2019.

3.6. SuDS FEATURES

Listed below is a selection of eight SuDS systems that are currenlty used in Fingal and can be incorporated more extensivly and effiectivley in developments going forward.

- **Swales**
- **Pervious Pavements**
- **Detention Basins**
- **Bioretention Systems**
- **Ponds & Wetlands**
- **Integrated Constructed Tree Pits**
- **Green Roofs**
- **Attenuation Tanks**

Specific Fingal County Council requirement or comments for each of the features are listed below each feature along with an extract from the SuDS Manual outlining the typical operational and maintenance requirements for each feature

NOTE: Ideally site and regional runoff control measures should be designed to be inline rather than offline measures to maximise the environmental benefits of same. Inline measures whereby runoff is directed through green infrastructure have significantly more water quality and biodiversity benefits than offline measures which only come into use in extreme events i.e 30 year or greater.

3.6.1 Swales

Shallow vegetated channels designed principally to convey and treat surface water run-off.

Fingal Comments:

- Particular attention to side slopes, head walls, / dropped kerbs and maintenance.
- An effective means for draining to a swale or basin is via a dropped kerb, which removes the risk of blockage associated with pipework.

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

3.6.2 Pervious Pavements

Pavements that are suitable for pedestrian and / or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural and foundation layers

Fingal Comments:

- Pervious paving shall be implemented widespread throughout any new scheme. Proposals shall be in accordance with TII Standards.

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

3.6.3 Detention Basins

Landscaped depressions that are normally dry except during and following rainfall events, designed to attenuate runoff and where vegetated, provide treatment.

Fingal Comments:

- Perforated manholes shall be located in the corners of basins rather than in the middle to minimise the impact on the amenity value of the area. Basin slopes shall slope gradually to the perforated manhole to ensure free draining of the basin.
- Headwalls in basins shall not be used except where otherwise agreed with the Planning Authority.
- Detention basins shall be designed to hold no more than 1.2m of water in the 1% AEP MRFS event. Basin slopes shall be no steeper than 1:4 to allow machinery access for grass cutting. A number of benches in the side slope may help to ameliorate safety risks.
- Inlets and outlets to/from detention basins shall be perforated manholes if on the basin floor or chamfered pipework surrounded in concrete if on the basins sides. Chamfered inlets and outlets are preferred as they are less prone to blockage. Chamfered inlets shall match the basin slope to minimise impacts on the amenity value of the basin.

Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	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 banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

REFERENCE

3.6.4 Bioretention Areas

Shallow planted depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils for collection or infiltration

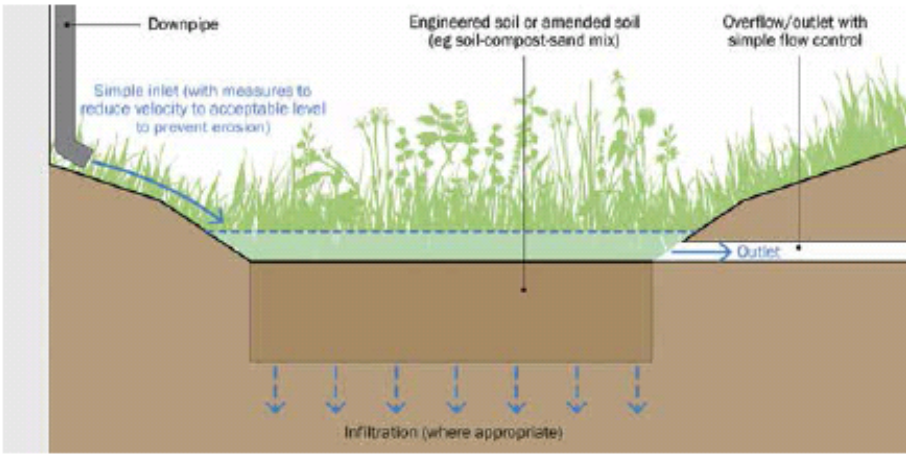


Figure 18.2 Section through a simple rain garden with outlet pipe

Fingal Comments:

- Not widely utilised in the Fingal area up to now.
- particularly suitable on small sites of infill dwellings.

Operation and maintenance requirements for bioretention systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

3.6.5 Ponds & Wetlands

Depressions designed to temporarily store surface water above permanently wet pools that permit settlement of suspended solids and biological removal of pollutants. This includes wetlands, which are ponds with a higher proportion of shallow zones that promote the growth of bottom-rooted plants

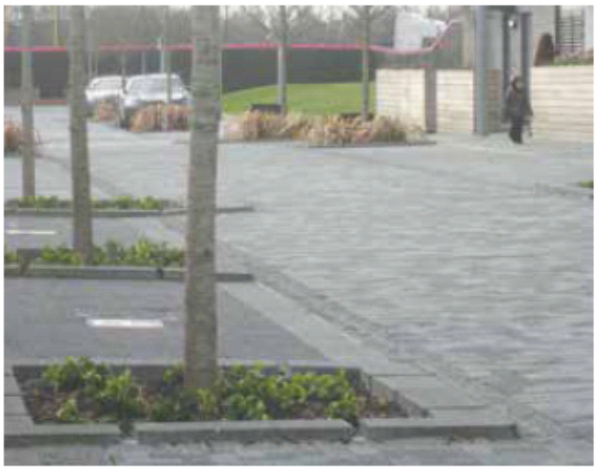
Fingal Comments:

- Schemes should avoid the use of fencing where possible.
- Where possible, the feasibility of introducing wetlands as a means of treating urban runoff, shall be considered by Fingal County Council and the Developer. These
- wetlands are purely for treatment storage rather than for attenuation storage.

Operation and maintenance requirements for ponds and wetlands		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1–5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows.	As required

3.6.6 Integrated Constructed Tree Pits

Integrated constructed tree pits can store runoff from surrounding impermeable surfaces.



Fingal Comments:

- A very efficient wat of providing attenuation storage efficiently. These systems can be used extensively on new schemes and as part of retrofit designs. The use of these systems contribute considerably towards the attenuation storage requirement of a development and well as providing an excellent amenity value.

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

3.6.7 Green roofs

Areas of living vegetation, installed on the top of building, for a range of reasons including visual benefit, ecological value, enhanced building performance, and the reduction of surface water run-off.

Fingal Comments:

A green roof proposal is required for all roof areas greater than 300m2 for the following types of development unless otherwise exempted by the Planning and Strategic Infrastructure Department. Apartments, Employment, Retail and Ancillary, Leisure, Education.

Exemptions may apply where the Applicant can demonstrate that a significant suite of alternative green infrastructure proposals wholly address the interception, treatment and attenuation volumes across the site.

The green roof shall cover a minimum of 60% of the roof area.

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

3.4.8 Attenuation tanks

Attenuation storage tanks are used to create below-ground void space for the temporary storage of surface water before infiltration, controlled release, or use. The storage structures are usually formed using one of the following methods. Geocellular storage systems, plastic corrugated arch structures, oversize concrete/plastic/steel pipes, precast of in situ concrete box culverts, glass-reinforced plastic (GPR) tanks.

Fingal Comments:

Underground Tanked systems whether concrete or plastic are the least favoured means for surface water management. They shall only be used when green solutions have proven not feasible. In this event, the Designer shall provide the following information with regard to these tanks;

Certification that the tanking is designed to support all predicted loads e.g tractor, wet clay, crane etc.

The design life of the structure clearly demonstrating it meets the design life of the development. Additional sediment/pollutant removal measures upstream to minimise risk of blockage and risk to water quality.

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

APPENDIX A

Surface Water Management Design Statement

Surface Water Management Design Statement

The applicant shall set out clearly the way in which existing surface water is currently drained off the site. This should be a short concise statement with the necessary supporting documentation contained as part of the planning application. Based on the information provided the applicant should then provide a brief summary of the proposal with regard surface water drainage, again with supporting documentation included in the planning application were necessary.

Existing Scenario: **Surface Water Statement**	**(250 words max)** *separate sheet may be included*
Description of existing subject site outlining the drainage characteristics - topography, ground conditions, suitability for infiltration, natural directions and paths for water movement, existing surface water flood risk.	
Proposed Scenario: **Surface Water Management Design Statement**	**(250 words max)** *separate sheet may be included*
This shall be a clear concise summary of the surface water design proposal. Applicants shall provide a brief explanation of how they have responded to the principles of Sustainable Drainage Systems (SuDS) Design contained in this policy. This could include implications of SuDS on design of other aspects of the development and price comparisons. We encourage that proposals are mindful of future implications from the beginning and present outline designs based on realistic options including maintenance activities and how they are resourced. Applicants shall be required to clearly demonstrate how the design makes a significant and positive contribution to the amenity value of the open space provision and shall state how the usability of these areas by the public has been addressed. Reference shall also be made on how the design considered the access and use of maintenance machinery in terms of slopes and any hard structures (e.g. head walls) located within the open space areas.	

APPENDIX B

FINGAL SUDS SELECTION HIERARCHY SHEET

SuDS Measures	Measures to be used on this site	Rationale for selecting/not selecting measure	Area of Feature (m^2)	Attenuation volume of feature (m^3)
Source Control				
Swales				
Integrated constructed Tree Pits				
Rainwater Butts				
Downpipe Planters				
Rainwater harvesting				
Soakaways				
Infiltration trenches				
Permeable pavement (Grasscrete, Block paving, Porous Asphalt etc.)				
Green Roofs				
Green wall				
Filter strips				
Bio-retention systems/Raingardens				
Blue Roofs				
Filter Drain				
Site Control				
Detention Basins				
Retentions basins				
Regional Control				
Ponds				
Wetlands				
Other				
Petrol/Oil interceptor				

Attenuation tank – only as a last resort where other measures are not feasible				
Oversized pipes– only as a last resort where other measures are not feasible				

Notes:

1. Fingal has a preference for above ground Green Infrastructure rather than tanks or oversized pipes. Above ground flows through swales, basins etc are encouraged.
2. Demonstrate SUDS system will have sufficient Pollutant removal efficiency in accordance with Ciria Suds Manual C753
3. Basins and swale sides should be no steeper than 1:4 and no deeper than 1.2m in the 1%AEP
4. Culverting shall be avoided where possible
5. De-culverting is encouraged.
6. Please submit evidence of infiltration rates
7. To account for climate change in the design of the drainage system rainfall intensities should be factored up by 20%
8. The Applicant must provide Suds checklists in accordance with the Appendix B of the Ciria Suds manual C753

Appendix	**Name**
B3	Full planning
B4	Scheme design
B5	Health and safety
B6	Infiltration assessment
B7	Proprietary treatment
B9	filter strip
B11	filter drain
B13	swale
B15	bioretention
B16	pervious pavement
B17	attenuation tank
B19	basin
B21	pond wetland

APPENDIX C

statement of areas

green / blue infrastructure

Overall Development Site Area (m2)											
% Permeable Areas (open space, green roofs, permeable surfacing etc)											
% Hardstanding Areas (roof areas, road surfaces, concrete paved areas etc)											
Park Type as per Table 12.5 of the Development Plan)	**Park size (m^2)**	**Area of Drainage green infrastructure in park (m^2)**	**Percentage of drainage infrastructure per park (%)**	**Swale (m^2)**	**Filter strip (m^2)**	**Bioretention area (m^2)**	**Retention basin (m^2)**	**Detention basin (m^2)**	**Pond (m^2)**	**Wetland ((m^2)**	**No. of head walls located on open**
Pocket Park (500m2- 0.2ha)											
Small Park (0.2ha to 2ha)											
Local Park (2-20ha)											
Urban Park Neighbourhood (20ha to 50ha)											
Regional Park (over 50 ha)											
Other permeable surfaces Grass margins/ Environmental open space ***Not part of open space provision**