# SuDS Site Evaluation

# Soak-Pit Design

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|---|---|
| Client : | Kristian Hogan, Ciara Dolan, & Jarlath and Kevin Dolan. |
| Location: | Townland of Perrystown, (laneway of Muckross Avenue), Perrystown, Dublin 12 |
| Date: | 06/12/2022 |

ENGINEERS IRELAND


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# 1. Introduction

This is a site specific report to provide outline guidance on drainage and the use of SuDS. Neither HR Wallingford nor any Irish Local Authority is liable for the performance of any drainage scheme which is based upon these results. It is recommended that detailed design of any scheme is carried out before construction takes place.

The following site characteristics were entered.

**Site Development Includes:** Residential (Low Density);

**Drainage Ownership:** Private;

**Site Size:** Less than 1 ha.

**Soil Type:** 3.

**Land Use:** Brownfield Development.

**Location:** Uplands.

**Other Characteristics:** Aquifer (High Vulnerability);

**Note : Please refer to Planning SD19A/0403 with regard to The Civil Engineering Infrastructure Report For Planning.**

**General**

The general principle behind the use of SuDS for any site is to comply with the following:

achieve adequate water quality treatment

runoff volumes should be minimised

runoff rates should be minimised

the stormwater effluent is treated appropriately before discharge from the site bearing in mind the requirements of the receiving watercourse

groundwater must be protected

in addition it is desirable to maximise the amenity potential and ecological benefits where there is an opportunity to provide this.

The various suds components should not be treated as individual options, but should be seen as providing a set of drainage features (a **treatment train**) which are appropriate at various scales. It is always desirable to have a mix of suds components across the site to take opportunity of their respective benefits.

**SuDS Ownership**

Due to institutional and legislative constraints it is possible that the most technically appropriate solution may not be appropriate due to ownership and maintenance issues. It is essential that any drainage proposal will receive

appropriate long-term maintenance.

Private owners have no constraints on the use of any SuDS component. Careful assessment should be made of the risk of a change to the SuDS component occurring in the property and the impact this might have on the whole system performance.

The following table summarises the current position on vesting of SuDS systems in Ireland (LA = Local Authority).

| **Ownership/Maintenance by Drainage Organisation** | | | | |
|---|---|---|---|---|
| **SuDS Component** | **LA Drainage** | **LA Roads** | **LA Parks** | **Private** |
| Ponds | No | No | Yes | Yes |
| Basins | No | No | Yes | Yes |
| Pervious Pavements | No | No | No | Yes |
| Swales | No | Yes | No | Yes |
| Infiltration Trenches | No | No | No | Yes |
| Soakaways | No | No | No | Yes |
| Green Roofs | No | No | No | Yes |
| Rainwater Harvesting | No | No | No | Yes |
| Bio-retention | No | No | No | Yes |

**Design of SuDS**

It is important to be aware of both the opportunities and constraints of using SuDS for providing the most appropriate drainage system for a development. For more in-depth guidance the most appropriate document (other than GDSDS policy guidance) is the SUDS manual by CIRIA and SuDS for High Density Developments by HR Wallingford. Other SuDS reference documents and manuals are to be found in the references section of this web site.

Design of SuDS with access to temporary or permanent water should consider public health and safety as well as issues associated with construction and operational management of the structures.

Where SuDS are being used in rolling or steep terrain careful consideration of site layout planning and SuDS alignment is needed to minimise gradients of swales and construction of large embankments.

**Construction of SuDS**

SuDS are a combination of civil engineering structures and landscaping practice. Due to the limited experience of building SuDS in the water industry, there are a number of key issues which need to be particularly considered as their construction requires a change in approach to some standard construction practices. Detailed guidance on the construction related issues for SuDS is available in the SUDS Manual and the associated Construction Site handbook (CIRIA, 2007).

**SuDS Components for Your Site**

The following table summarises the SuDS components that might be used at your site, based on the input you have given:

| SuDS Component | Applicability |
|---|---|
| Ponds | no |
| Basins | no |
| Pervious Pavements | yes |
| Swales | yes |
| Infiltration Trenches | yes |
| Soakaways | yes |
| Green Roofs | yes |
| Rainwater Harvesting | yes |
| Bio-retention | no |

**The Use of SuDS for Infiltration**

There is a risk with steep sites that excessive use of infiltration might result in groundwater reappearing at lower locations. Careful consideration of the soil characteristics and groundwater depths is needed.

Careful consideration of the risks to groundwater should be made before infiltration options are proposed. In general the infiltration of roof runoff in residential areas is acceptable even where aquifers are vulnerable to pollution.

**Treatment Train**

In principle, the more SuDS used in a treatment train the better. Ponds should preferably not be used as the first SuDS component for any paved runoff. Treatment will be more effective and hydraulic benefits will also be gained.

Where developments drain to small streams, the impact of the development will be significant on the watercourse and greater emphasis on treatment is needed.

## 2. Suitable SuDS Components

The following SuDS might be suitable components of the drainage system for the reasons given:

**Pervious Pavements**

Pervious pavements are suitable for this site.

**Swales**

Swales are suitable for this site.

The land take of swales is significant except for mini-swales. Although these SuDS components are very effective, their use in high density developments may be precluded due to lack of space. In spite of this issue of land take and adoption difficulties, the use of these SuDS units is very desirable due to their effectiveness in addressing both hydraulic and water quality issues.

Swales are very effective in at adsorbing pollutants and therefore provide a reasonable level of protection to vulnerable aquifers. However the swales should not be designed to be particularly pervious and under-drained swales should be avoided.

**Infiltration Trenches**

Infiltration trenches are suitable for this site.

The use of infiltration systems in marginal soil conditions is to be encouraged, but designs may need to provide overflows connected to the drainage system downstream to cater for very wet conditions.

The use of infiltration trenches in areas with highly vulnerable aquifers is probably only acceptable for roof drainage in residential areas only.

**Soakaways**

Soakaways are suitable for this site.

The use of soakaways in marginal soil conditions is to be encouraged, but designs need to provide overflows connected to the drainage system downstream to cater for very wet conditions.

The use of soakaways in areas with highly vulnerable aquifers is probably only acceptable for roof drainage in residential areas.

**Green Roofs**

Green roofs are suitable for this site.

The use of green roofs provides a number of benefits including reducing runoff volumes for ordinary rainfall events. However they do not have a significant impact on the sizing of main drainage components unless the rainwater is harvested and used.

**Rainwater Harvesting**

Rainwater harvesting is suitable for this site.

Warning: Rainfall harvesting in areas of very high annual rainfall (greater than 1000mm) will probably have a higher yield than the demand for the collect water. In this situation stormwater management benefits assumed for extreme storm event management will be limited and require careful analysis.

Rainwater harvesting has benefits in reducing potable water demand and also can have a significant impact in reducing the size of some main drainage components if rainfall storage tanks are large enough. Where water

resources are particularly scarce, rainwater harvesting should be positively considered. Depending on proposed usage and yield, guidelines suggest that the volume of storage provided should be around 350 litres per person to ensure reasonable continuity of supply. However where rainwater harvesting is used to obtain stormwater management benefits, this figure should be multiplied by around 3 (1000 l/person). Detailed evaluation of the rainwater harvesting benefits requires the use of time series rainfall data.

## 3. Unsuitable SuDS Components

The following SuDS have been excluded as suitable components of the drainage system for the reasons given:

**Ponds**

Ponds are not suitable for this site.

A pond that is located on a site of less than 1 ha will probably need a throttle orifice which is far too small to meet the site discharge requirements without a significant risk of blockage.

**Basins**

Basins are not suitable for this site.

A basin that is located on a site of less than 1 ha will probably need a throttle orifice which is far too small to meet the site discharge requirements without a significant risk of blockage.

**Bio-retention**

Bio-retention is not suitable for this site.

The risk of pollutants affecting the groundwater is significant if bio-retention is used in areas with highly vulnerable aquifers (although this has yet to be demonstrated).

## 4. Soak-Pit Design

### Soakway Design to BRE Digest 365

**Project:** Perrystown
**Job No:**
**Date :** 05/12/2022

**Site specific info:** Green
**Storm specific info:** Orange
**Required input in** Red
**Result in** Blue

**Soak-Pit A_ Collecting rainwater from front communal area** **%FREE V=** 0.3

**A50=** 7.5 **Impermeable area =** 191 m*2

**Effective Depth =** 0.8 m
**Radius =** 1.5 m

| | | | | | |
|---|---|---|---|---|---|
| **V =** | 1.7 | m*3 | **f=** | 0.00013 | m/s |
| **O =** | 3.53 | m*3 | **Storm Duration =** | 3600 | s |
| **I =** | 4.8 | m*3 | **Rainfall =** | 25 | mm |
| **S = I - O =** | 1.2 | m*3 | | | |
| **S = V** | 0.4 | The soakpit has adequate dimensions when the free volume provided (V) equals *the storage required (S) (using the goal seek command set C26 to value* of 0.1 by changing L21) | | | |
| | DESIGN OK | | | | |
| **T50 =** | 0.2406 | hours | For a valid design the time for the soakway to half empty from full should be less than 24hours | | |
| | DESIGN OK | | | | |

Rainfall figures obtained from met eireann website www.met.ie

**Soak-Pit B_ Collecting rainwater from Roof & Paths of House 1** **%FREE V=** 0.3

**A50=** 4.5 **Impermeable area =** 106 m*2

**Effective Depth =** 0.8 m
**Radius =** 0.9 m

| | | | | | |
|---|---|---|---|---|---|
| **V =** | 0.6 | m*3 | **f=** | 0.00013 | m/s |
| **O =** | 2.12 | m*3 | **Storm Duration =** | 3600 | s |
| **I =** | 2.7 | m*3 | **Rainfall =** | 25 | mm |
| **S = I - O =** | 0.5 | m*3 | | | |
| **S = V** | 0.1 | The soakpit has adequate dimensions when the free volume provided (V) equals *the storage required (S) (using the goal seek command set C26 to value* of 0.1 by changing L21) | | | |
| | DESIGN OK | | | | |
| **T50 =** | 0.1444 | hours | For a valid design the time for the soakway to half empty from full should be less than 24hours | | |
| | DESIGN OK | | | | |

Rainfall figures obtained from met eireann website www.met.ie

**Soak-Pit C_ Collecting rainwater from Roof & Path of House 2** **%FREE V=** 0.3

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Impermeable** | | | | | |
| **A50=** | 4.7 | | **area =** | 110 | m*2 | | | |
| | | | | | | **Effective** | | |
| | | | | | | **Depth =** | 0.75 | m |
| **V =** | 0.7 | m*3 | **f=** | 0.00013 | m/s | **Radius =** | 1 | m |
| **O =** | 2.20 | m*3 | **Storm Duration =** | 3600 | s | | | |
| **I =** | 2.8 | m*3 | **Rainfall =** | 25 | mm | | | |
| **S = I - O =** | 0.5 | m*3 | | | | | | |
| **S = V** | 0.2 | The soakpit has adequate dimensions when the free volume provided (V) equals *the storage required (S) (using the goal seek command set C26 to value* | | | | | | |
| | **DESIGN OK** | | | | of 0.1 by changing L21) | | | |
| **T50 =** | 0.1604 | hours | For a valid design the time for the soakway to half empty from full | | | | | |
| | **DESIGN OK** | | should be less than 24hours | | | | | |

Rainfall figures obtained from met eireann website **www.met.ie**

**Soak-Pit D_ Collecting rainwater from Roof & Path of House 3** **%FREE V=** 0.3

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Impermeable** | | | | | |
| **A50=** | 5.0 | | **area =** | 120.67 | m*2 | | | |
| | | | | | | **Effective** | | |
| | | | | | | **Depth =** | 0.8 | m |
| **V =** | 0.8 | m*3 | **f=** | 0.00013 | m/s | **Radius =** | 1 | m |
| **O =** | 2.35 | m*3 | **Storm Duration =** | 3600 | s | | | |
| **I =** | 3.0 | m*3 | **Rainfall =** | 25 | mm | | | |
| **S = I - O =** | 0.7 | m*3 | | | | | | |
| **S = V** | 0.1 | The soakpit has adequate dimensions when the free volume provided (V) equals *the storage required (S) (using the goal seek command set C26 to value* | | | | | | |
| | **DESIGN OK** | | | | of 0.1 by changing L21) | | | |
| **T50 =** | 0.1604 | hours | For a valid design the time for the soakway to half empty from full | | | | | |
| | **DESIGN OK** | | should be less than 24hours | | | | | |

Rainfall figures obtained from met eireann website **www.met.ie**

## 5. Recommendation

PROVIDE FOUR SOAK-PITS AS FOLLOWS:

Soak-Pit A collecting stormwater runoff _ depth of 800mm with radius of 1500mm

Soak-Pit B collecting stormwater runoff _ depth of 800mm with radius of 900mm

Soak-Pit C collecting stormwater runoff _ depth of 750mm with radius of 1000mm

Soak-Pit D collecting stormwater runoff _ depth of 800mm with radius of 1000mm