A Guide to Representing SuDS in InfoDrainage

In accordance with the SuDS Manual CIRIA 753

Table of contents

In this guide:

Please note: The contents of this guide are subject to change, all information is correct as of October 2023.

The SuDS Manual (C753F)
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CIRIA 2015
ISBN: 978-0-86017-759-3

01 Introduction

The Sustainable Drainage Systems (SuDS) Manual has been created by the Construction Industry Research and Information Association (CIRIA) primarily used for the planning and design process of SuDS. It focuses on maximising amenities and ensuring the benefits of green infrastructure are considered to reduce flood risk and improve water quality.

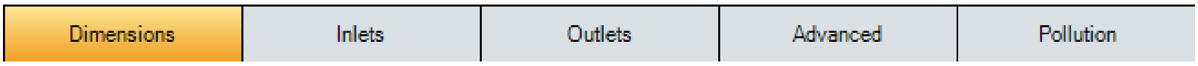
This SuDS framework aligns with the outcomes that InfoDrainage a full design and analysis software solution from Autodesk provides. Our drainage design technology is developed using direct insight from the industry to meet sustainability goals whilst still considering outcomes of meeting compliance, budget and approval.

InfoDrainage is being used by designers, developers, landscape architects, engineers, consultants and local authorities across the UK to design and audit drainage systems efficiently, deliver sustainable and compliant designs all whilst accelerating their Building Information Modelling (BIM) workflows.

A greater focus on sustainability from towns and cities of all sizes means drainage designs need to offer biodiversity, amenity, water quantity, and water quality improvements and ensure confidence that these systems will perform during extreme weather events. This requires creative designs that include a variation of green infrastructure. These natural details could save a town from flooding, a wastewater pipe from spilling over, or pollutants from running into a nearby river.

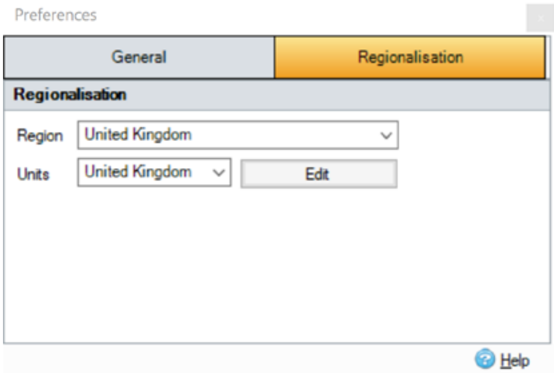
This guide has been created to ensure your SuDS features are in accordance with The SuDS Manual (TSM) providing details of how each structure could be represented in InfoDrainage.

You will notice that every Storm Water Control (SWC) apart from Bioretention will have the same five tabs within its menu as below:



In each tab, the guide will take any design guidance from TSM where applicable and summarise it.

Whilst TSM provides guidance, not all schemes and designs are alike and may require varying alterations to design. This guidance should be taken as an initial starting point, and then modified to match site specific conditions.



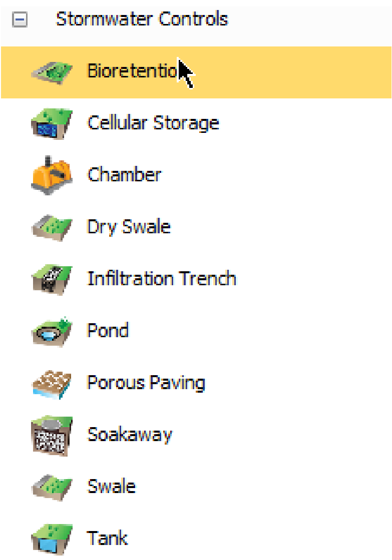
United Kingdom metrics are used throughout this guide.

Note: It is important to mention that whilst a particular SuDS device may have a dedicated SWC in ID, similarities in SuDS characteristics allow for flexibility in what SWC is used. Though TSM looks at the four pillars of SuDS. This document solely focuses on the water quantity pillar, most notably hydraulic performance.

To supplement this document, users can review the InfoDrainage help documentation on the Autodesk InfoDrainage Help site.

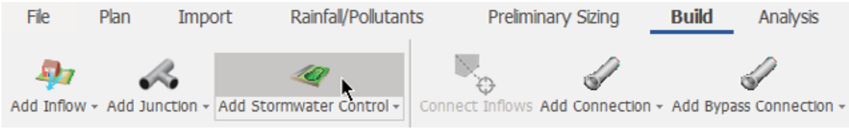
1.1 Selecting & Drawing a Storm Water Control

In InfoDrainage, SWCs can be found and selected in the toolbox:



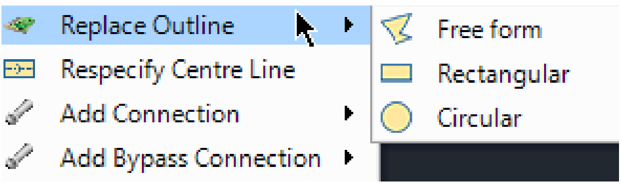
Note: Note: SWCs can be digitised by tracing and snapping onto CAD layers.

Or they can be found in the build ribbon:



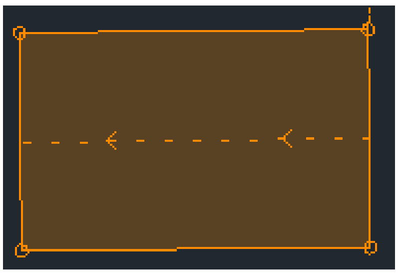
When drawing a SWC graphically, there are a few choices in how to draw, as well as a couple of considerations to remember when drawing.

All SWC controls can be drawn onto the plan view either as a free form shape, rectangular shape, or circular shape, this can be done by right-clicking on the SWC icon in the plan view:

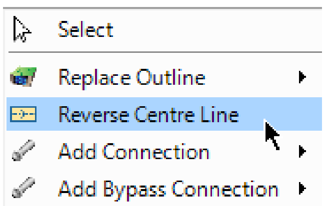


In the first instance, both the pond and bioretention SWC will default to a free-from shape, the rest of the SWCs will default to a rectangular shape.

A centre line is calculated for each outline type, which gives an indication of the direction of travel allowing a longitudinal slope to be applied. It is important to remember that the centre line should be in the same direction as the intended flow of water within both swales and infiltration trenches. For other structures, the direction of the centre line isn't so important as the swale and infiltration trench have a true direction of travel.



You can modify this by right clicking the polygon:



1.2 SuDS Features Represented in InfoDrainage

The table below outlines the most used SuDS devices with their corresponding pages in TSM, as well as the most likely Stormwater Control (SWC) to use in InfoDrainage.

SuDS Feature	TSM Reference (Page Numbers)	Summary of Representation in InfoDrainage
Swale	310-330	Dry Swale, Swale
Pond/Bioretention	482-506/330-358	Bioretention, Pond
Rainwater Harvesting	206-230	Green Roof
Green Roof	230-254	Green Roof
Pervious Paving / Carpark	384-434	Porous Paving, Cellular Storage
Filter Drain	288-300	Infiltration Trench
Attenuating Storage Tanks	434-470	Tank, Porous Paving, Cellular Storage

Within TSM (Figure 1.1), there is guidance on the factor of safety, the InfoDrainage default value of 2. The equation to calculate the infiltration outflow is below.

Based on figure 1.1, the safety factor ranges from 1.5 to 10. Note that the value 2 relates to an area of <100 m2 with minor damage to areas, this is the default value in ID and as such, characterises a typical site location. Numbers above or below 2 might be attributed to a unique site or exceptional consequences of failure.

Suggested factors of safety, F, for use in hydraulic design of infiltration systems (designed using Bettess (1996). Note: not relevant for BRE method)

Size of area to be drained	Consequences of failure		
	No damage or inconvenience	Minor damage to external areas or inconvenience (eg surface water on car parking	Damage to buildings or structures, or major inconvenience (eg flooding of roads)
< 100 m^3	1.5	2	10
100-1000 m^3	1.5	3	10
> 1000 m3	1.5	5	10

Figure 1.1 Factor of Safety (Page 553)

Outflow = (Infiltration Rate/Safety Factor) *Infiltration Area.

02 Bio Retention Systems

According to TSM (Page 334), a bioretention typically comprises of three layers:

- Filter layer (750 – 1000mm depth)
- Transition layer (100mm depth)
- Drainage layer (100mm depth)

Parameter	TSM Guidance	Page Reference
Side Slope	1:3	Page 475
Length	0-40m	Page 340
Width	600mm-2000mm	Page 340
Longitudinal Slope	1%	Page 339
Area	2-4% of the total site	Page 339

In InfoDrainage, these three layers can be simplified into two layers. The filter layer and the drainage layer. The transitional layer is focused on the removal of pollutants and has no impact on the hydraulic performance of the system; therefore, it is not crucial to model in InfoDrainage.

In TSM (Page 342), guidance states that the infiltration rate of the filter layer of a bioretention system should be between 100-300mm/h. When taking an infiltration value such as this, one will look to enter it into the Filtration Rate (m/hr) text box found in the Ponding Area part of the Dimensions Tab, as highlighted in Figure 2.1.

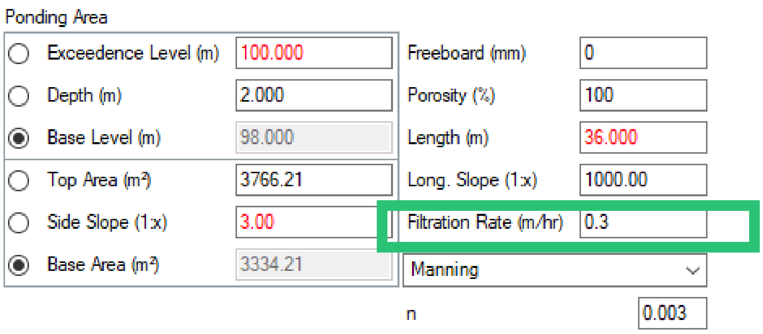


Figure 2.1

Important: There are two key variables to consider in the hydraulic design of a bioretention system, these are infiltration and conductivity. Infiltration focuses on the loss of water from the structure into the surrounding soil, whereas conductivity focuses on the flow rate of water through soil within the structure itself.

There is currently a small section of guidance relating to conductivity rates in Bioretentions. On page 342, TSM suggests a rate between 100-300mm/h. So in ID, this would be 0.1-0.3m/hr. For an alternative view, the InfoDrainage Help site provides indicative conductivity rates for a given material. This information could be used to identify a conductivity rate for the storage layer, below the filtration layer. These are good starting points and may be subject to change based on site needs and conditions.

Additionally, TSM (Page 352) states the following "the drainage layer should be much more permeable than the filter medium". So again, by that reasoning, you can look to Figure 2.2 and find materials that have a higher porosity than 30% and take the corresponding conductivity rate for the drainage layer.

Material	Typical Porosity (%)	Typical Conductivity (m/hr)
Clay	40 - 55	< 0.1
Sand	35 - 50	5 - 50
Gravel / Crushed Stone	10 - 30	50 - 500
Porous Concrete	10 - 50	50 - 500
Rubber (Shredded)	40 - 50	> 300
Crates/Lined tank	90 - 100	> 500

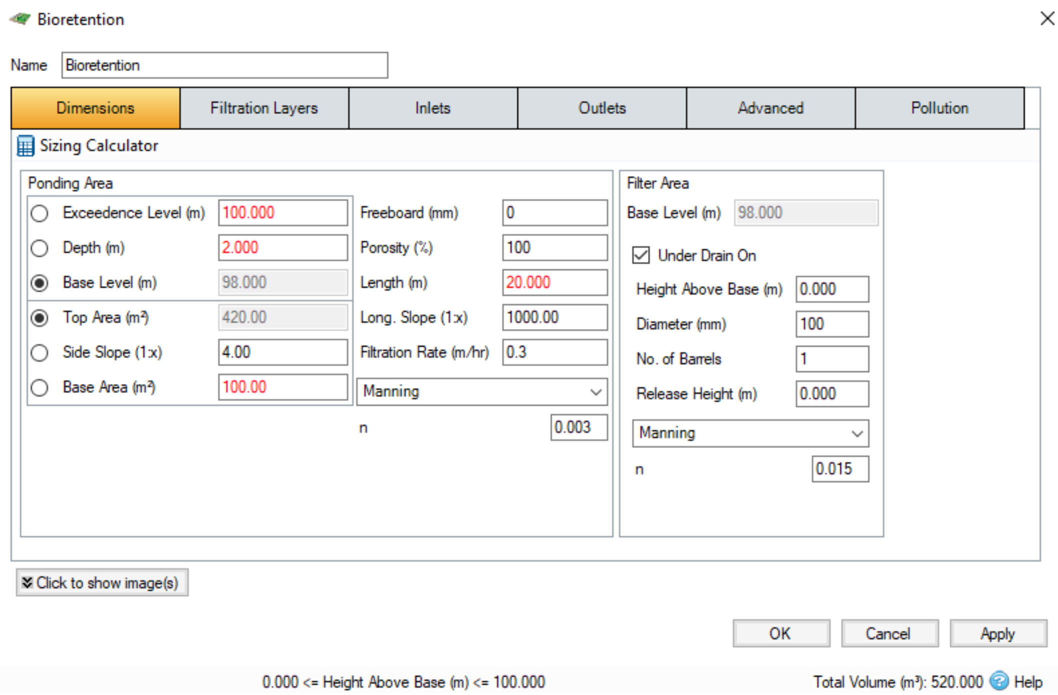
Figure 2.2

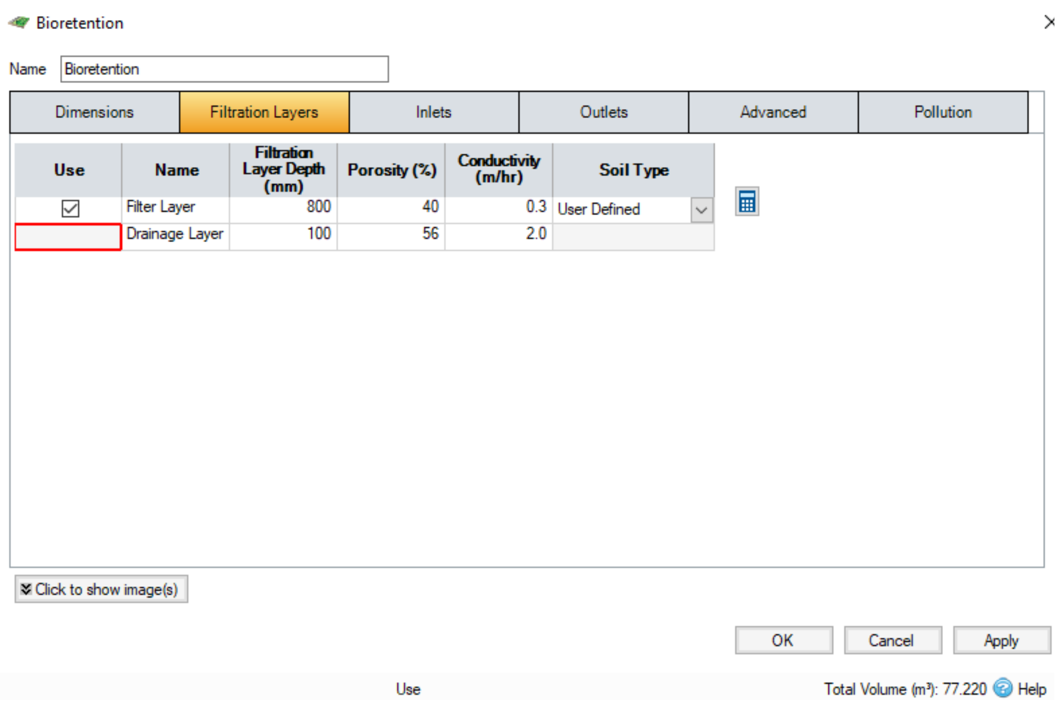
Applying a conductivity rate to a bioretention system can be achieved by entering a value in the Conductivity (m/hr) column found in the Filtration Layers tab (Figure 3).

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☑	Filter Layer	800	40	0.3	User Defined
	Drainage Layer	100	56	2.0	

Figure 3

By taking all the recommended guidance in TSM, a typical bioretention structure may look like this:





03 Filter Drains in InfoDrainage

Parameter	TSM Guidance	Page Reference
Porosity	N/A	N/A
Length	Equal to the impermeable surface length	303
Depth	1-2m	304
Longitudinal Slope	Should not exceed 2% (1:50)	305
Width	150mm pipe = 450mm width	304
Conductivity	N/A	N/A

Filter drains are simple structures that attenuate and treat runoff. In the TSM (Page 306), there are three elements to think about when designing filter drains:

- Design of the filter material for adequate percolation of water
- Design of filter material to store water
- Design of the pipe underdrain

In InfoDrainage these elements are applicable in that the filter material will relate to the porosity and conductivity of the structure. The pipe underdrain is similarly important as it is the mechanism that conveys flow out of the structure.

TSM (Page 303) suggests that the length of the structure will equal the length of the adjacent impermeable area. It also states that the runoff will enter the structure laterally (Page 303). This can be represented in InfoDrainage by connecting a catchment area to the structure, then changing the inflow type to lateral in the inflow tab (Figure 3.1).

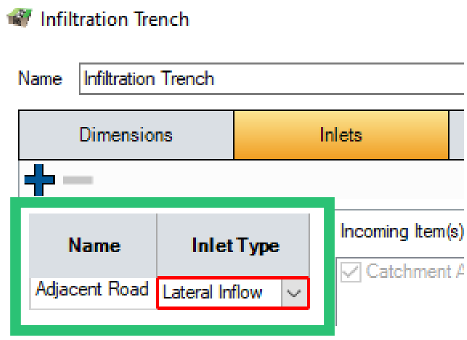


Figure 3.1 Lateral Inflow

Furthermore, TSM discloses (Page 304) that filter drains should be one to two meters deep, and that the width tends to accommodate the pipe diameter and surrounding bedding. As an example, a filter drain with a 150mm underdrain pipe will require 150mm width bedding surround, which totals a 450mm width for the structure (Page 304/305). Likewise, guidance (Page 306) on the placement of filter drains indicates that for sites steeper than 2%, filter drains should be avoided. The longitudinal slope should never exceed 2%, therefore in InfoDrainage the value should ideally not surpass 1:50.

However, what TSM does not provide explicit guidance on is the porosity of the structure.

It does allude to the type of material filled in the trench portion of the structure, which is stone/ gravel (Page 303). With this information, the [InfoDrainage Help site] provides an approximate porosity value based off the material suggested, this will be around 10-30% porosity (Figure 3.2).

Material	Typical Porosity (%)	Typical Conductivity (m/hr)
Clay	40 - 55	< 0.1
Sand	35 - 50	5 - 50
Gravel / Crushed Stone	10 - 30	50 - 500
Porous Concrete	10 - 50	50 - 500
Rubber (Shredded)	40 - 50	> 300
Crates/Lined tank	90 - 100	> 500

Figure 3.2 Material Porosity

Using the recommended dimension parameters taken from TSM (Table 1). A typical filter drain may look like Figure 3.3:

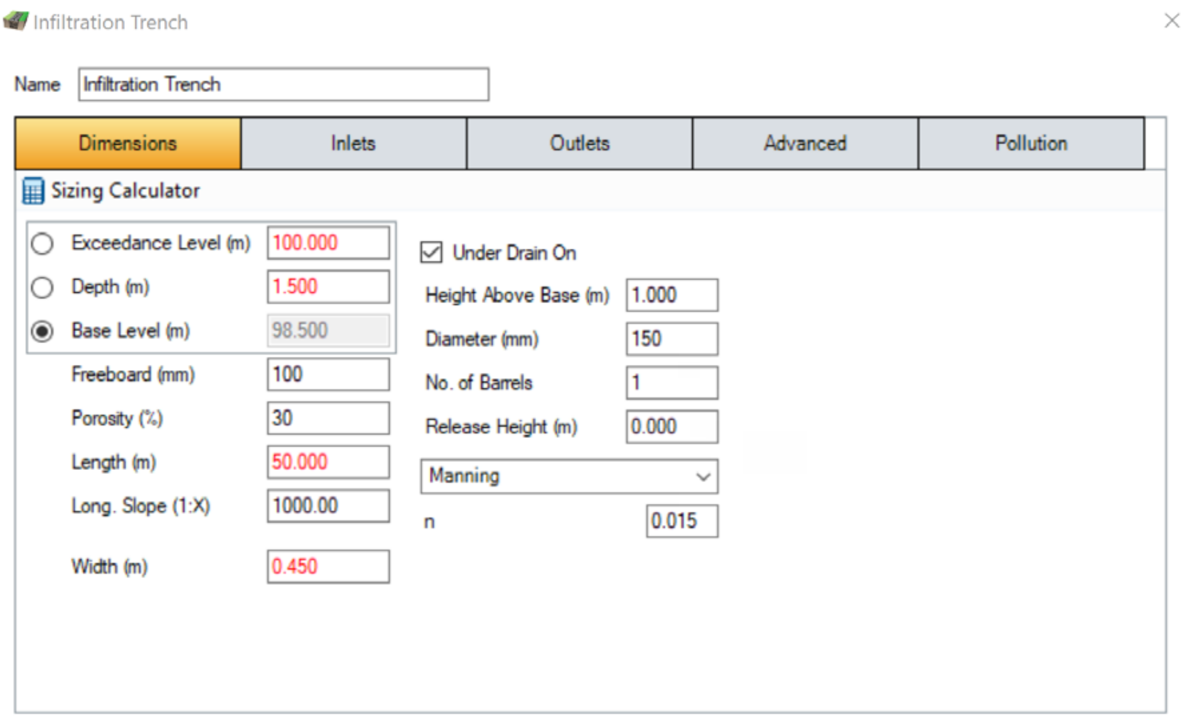


Figure 3.3

04 Green Roofs in InfoDrainage

Components:

Green roofs are represented differently to other typical SuDS structures in InfoDrainage. TSM (Page 233) states that green roofs collect runoff directly without the need for inlets. This is reaffirmed within the software as green roofs are treated as a runoff method, whereby parameters set can directly influence the runoff amount and rate which then flows into a manhole or structure.

The table below summaries the guidance that can be applied to the parameters found in the green roof menu:

Parameter	TSM Guidance	Page Reference
Depression Storage	N/A	N/A
Evapotranspiration	3mm/day (Summer)	240
Decay Coefficiency	0-1mm/day (Mid-Winter)	N/A
Time Delay	N/A	N/A
Volumetric Runoff Coefficient	0.80	217

Parameter Summarisation

According to TSM (Pages 233 & 234), green roofs can be categorised into either intensive or extensive roofs. The difference between the two is the depth of the substrate. Extensive green roofs have low substrate depths, whereas intensive green roofs have deeper substrates. When modelling a green roof in InfoDrainage, the type of roof is not significant as the substrate depth is not a parameter.

Whilst there is no direct guidance on depression storage, substrate depth guidance in TSM can be utilised as according to the InfoDrainage Help site. Research in the UK has shown the average depression storage value is 5% of the soil substrate depth. With this example, a green roof with a 100mm substrate would have 5mm depression storage. This would then be typed into the depression storage parameter (Figure 4.1).

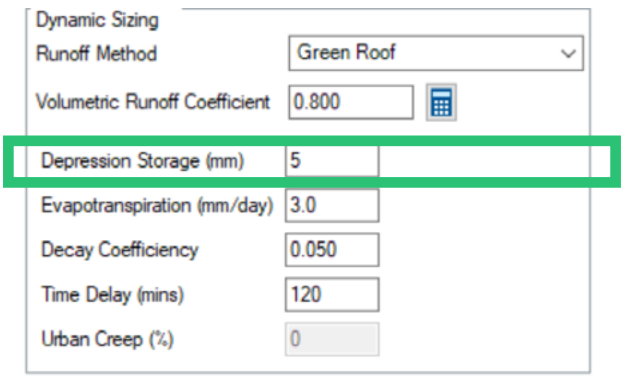


Figure 4.1 Depression Storage

Within TSM, substrate depths vary. The depth depends on what type of green roof is to be designed and what its purpose is. Guidance in TSM (Pages 234, 239 & 242) on substrate depth ranges from 20-150mm for extensive green roofs and depths greater than 150mm for intensive roofs. What TSM does not provide guidance on for green roofs is the decay coefficient and time delay parameters (Figure 4.2).

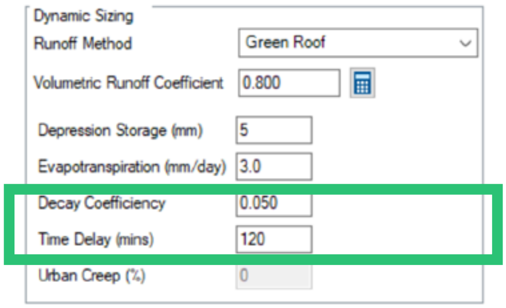


Figure 4.2 Decay Coefficient and Time Delay

These two parameters have been incorporated as part of the green roof methodology developed by Dr Virginia Stovin of Sheffield University. The InfoDrainage Help site provides guidance on these values, however the decay coefficiency value is sensitive and must be used cautiously, the higher the value the quicker the roof will drain down.

The default value of 0.05 is recommended. The time delay value relates to the decay coefficiency. This is the time over which the decay occurs, typically 120 minutes, and therefore the areas are spread out. Adjusting this value will not affect the decay of the curve.

Blue Roofs

TSM describes (Page 233) blue roofs as a roof design that is explicitly intended to store water, which can be designed as attenuation storage with water released in a controlled manner. How this is modelled in InfoDrainage is open to interpretation.

One choice is to treat it as an attenuation structure and model the blue roof as a storage tank at the ground level that has an orifice outlet discharging at a specific rate (Figure 4.4). Another option is to use the green roof catchment area with the addition of a rainwater tank that has a volume and outflow limit value applied to it (Figure 4.3).

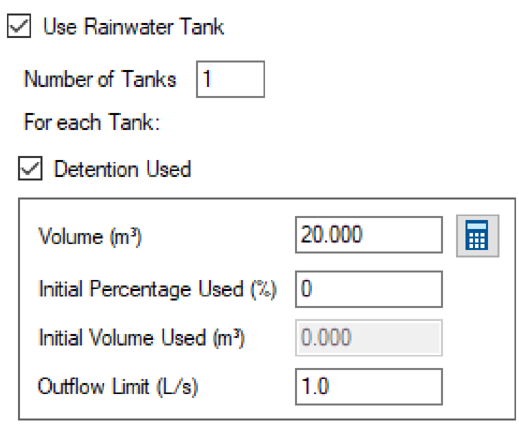


Figure 4.3 Option 1

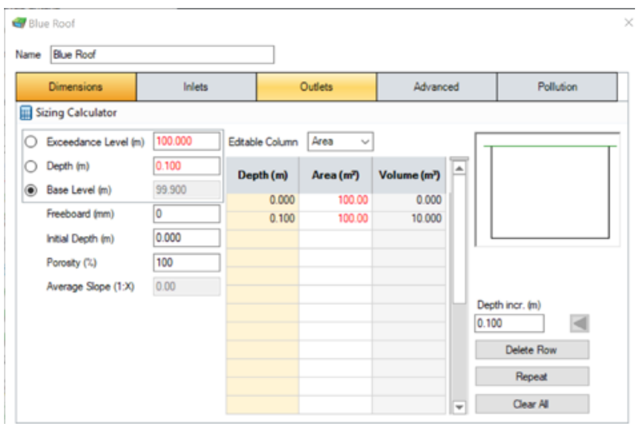


Figure 4.4 Option 2

05 Pervious (Porous) Paving in InfoDrainage

Parameter	TSM Guidance	Page Reference
Paving Layer Depth	Varies based on traffic category	412 & 415
Membrane Percolation	Minimum value of 2.5m/hr	400
Porosity	At least 30%	402
Infiltration (If applicable)	N/A	N/A
Conductivity	N/A	N/A

According to TSM (Page 400), there are three main hydraulic components to think about when designing porous paving:

- Identifying the rate of infiltration through the pavement surface
- Calculating the storage volume requirement
- Designing the outlets to convey and discharge water from the structure

All three of these components are applicable to InfoDrainage in that guidance relating to these points can be taken from TSM and applied in InfoDrainage, to model a pervious paving structure.

Paving Layer

For the surface of the pervious pavement structure, TSM proposes (Page 412 & 415) that the paving layer depth can be determined by a traffic category. For sites with no vehicular usage, paving layer depths can vary between 70mm-100mm. Conversely, sites with heavy vehicular usage, the paving depth can be 180mm and upwards. Direct guidance on depth for high traffic usage becomes less easy to obtain as this requires specialist consultation.

Storage Capacity

TSM advises (Page 401) that structure capacity depends on rainfall characteristics, design return period, impermeable area, discharge constraints.

In InfoDrainage, volumetric estimates are simplified into the Quick Storage Estimate Calculator (QSE). The QSE calculator takes these variables and provides a range by which a median value is taken an applied to the structure, to use this tool, users should open it within the structure interface (Figure 5.1).

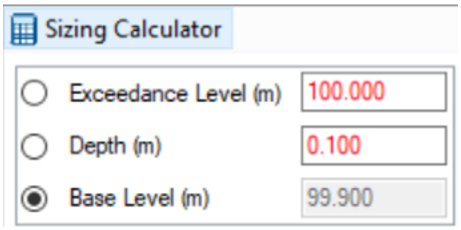
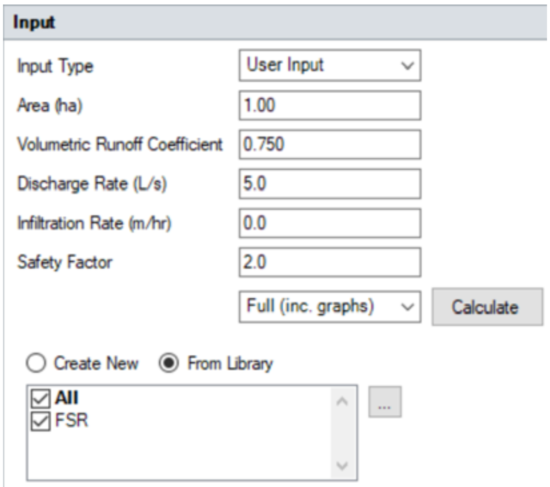
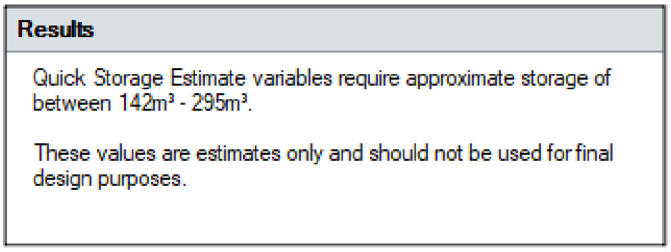


Figure 5.1 Sizing calculator

They can then edit the variables to obtain a range to apply to the structure:





Membrane Percolation

The rate of infiltration through the pavement surface is reflected as the membrane percolation in InfoDrainage. Guidance is provided within TSM as to what rates are deemed appropriate (Page 400). It states that the rate should exceed the rainfall intensity to avoid ponding, whereby a minimum value of 2500mm/h is considered reasonable. The unit of measurement in InfoDrainage is in m/hr therefore the value would be 2.5m/hr.

Outlet Design

There are currently two main ways to discharge water out of a porous pavement structure in InfoDrainage. It can be discharged via infiltration or a flow control like an orifice. Guidance on outlets for porous paving is currently limited. At present, TSM implies (Page 403) that for a porous paving structure to operate effectively, the system requires an outflow control. Guidance indicates that orifice plates are sufficient, and that the diameter can be small because the risk of blockage is low.

As for infiltration out of the structure, there is no clear guidance in TSM for porous paving. There are still two possibilities as to what values could be used. TSM implies (Page 395) that infiltration can be possible as long as the design complies with all relevant requirements for infiltration systems with respect to ground stability, depth to water table. This implies that on a site-by-site basis, infiltration rates will differ based on tests.

To provide straightforward guidance on infiltration rates would be complicated. Table 5.2 from TSM (Page 397) summarises infiltration potential based upon ground characteristics.

Guidance on selection of a pavement system type (after Interpave, 2010)

Ground characteristics		Type A: total infiltration	Type B: patrial infiltration	Ttype C: no infiltration
Permeability of subgrade defined by coefficient of permeability k (m/s)	1×10^{-8} to 1×10^{-3}	✓	✓	✓
	1×10^{-8} to 1×10^{-8}	X	✓	✓
	1×10^{-10} to 1×10^{-8}	X	X (1)	✓
Highest expected water level within 1000 mm of formation level		X	X	✓
Pollutants present in subgrade		X	X	✓
Ground conditions such that infiltration of water is not recommended (solution features, old mine workingbetc. Chapter 8)		X	X	✓

Table 5.2 Infiltration Potential

Using the recommended parameters taken from TSM. A typical porous pavement may look like Figure 1:

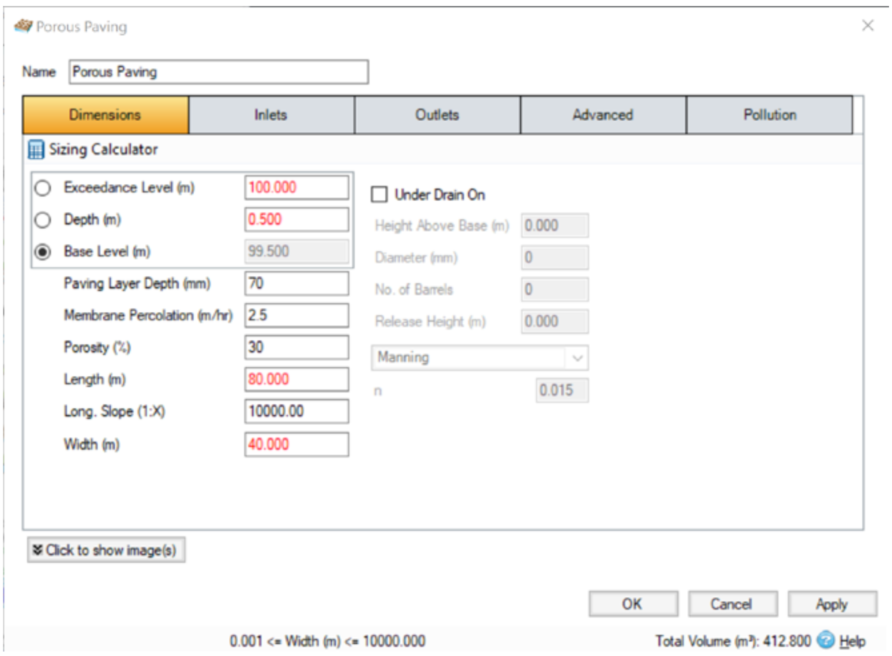


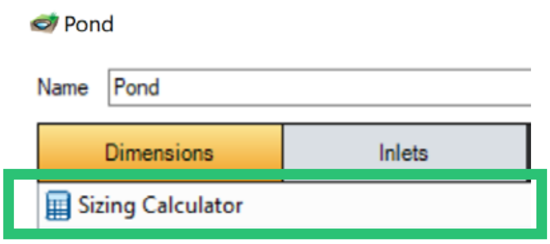
Figure 5.4 - Example Porous Pavement

06 Ponds and Wetlands in InfoDrainage

Parameter	TSM Guidance	Page Reference
Depth	Maximum depth of 2m, usually 1.2m	489
Freeboard	300mm	491
Slope	1:3/1:4	489
Volume	Sized to provide attenuation for 10, 30, 100/200 Y/RP	491

As acknowledged by TSM (Page 485), ponds and wetlands are typically depressions designed to temporarily store surface water. Ponds are usually beneficial to other aspects of the SuDS Pillars, but when designing a pond within ID, the design is mostly centred around its hydraulic capability. TSM does provide a good proportion of guidance on how to model a pond. Within ID, the design boils down to a few parameters that size the structure.

When sizing a pond to store runoff, TSM suggests (Page 491) that it should be designed to temporarily store water up to a 10, 30, 100, 200 Year Return Period Storm. Within ID, a ponds volume requirement can be modelled by using the Quick Storage Estimate (QSE) tool found in the sizing calculator (Figure 6.1). The QSE tool requires variables that influence storage requirement, one of those being the return period.



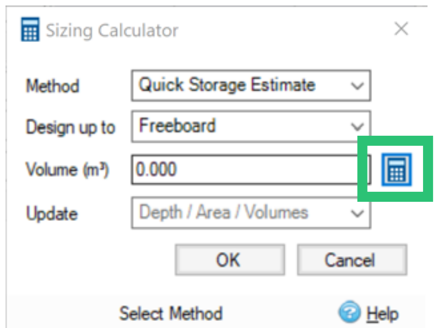


Figure 6.1 - Sizing Calculator and QSE

In terms of pond dimensions, TSM suggests (Page 489) that ponds should have side slopes no steeper than 1:3, in some cases it can go up to 1:4. Again, applying slope to a pond in ID requires the use of the sizing calculator. For the maintain options, choose Top Area to impose the side slope from the top area downwards; choose Base Area to impose the side slope from the base area upwards (Figure 6.2).

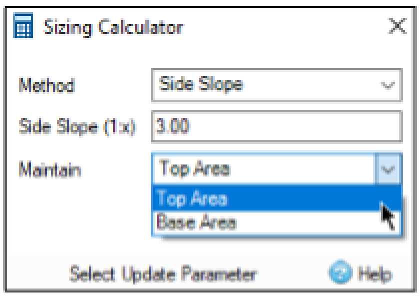


Figure 6.2 - Applying Slope

For permanent water, TSM specifies that the top water level for this should be at the invert level of the outlet structure. The maximum depth of temporary storage above the permanent pool should be limited to 0.5m, this is usually appropriate for small to medium-sized ponds.

Figure 6.3 provides an example of a pond using all of the guidance found in TSM on ponds. Guidance on freeboard in TSM suggests (Page 491) that a freeboard of 300mm, this can be increased where site flood risk is higher.

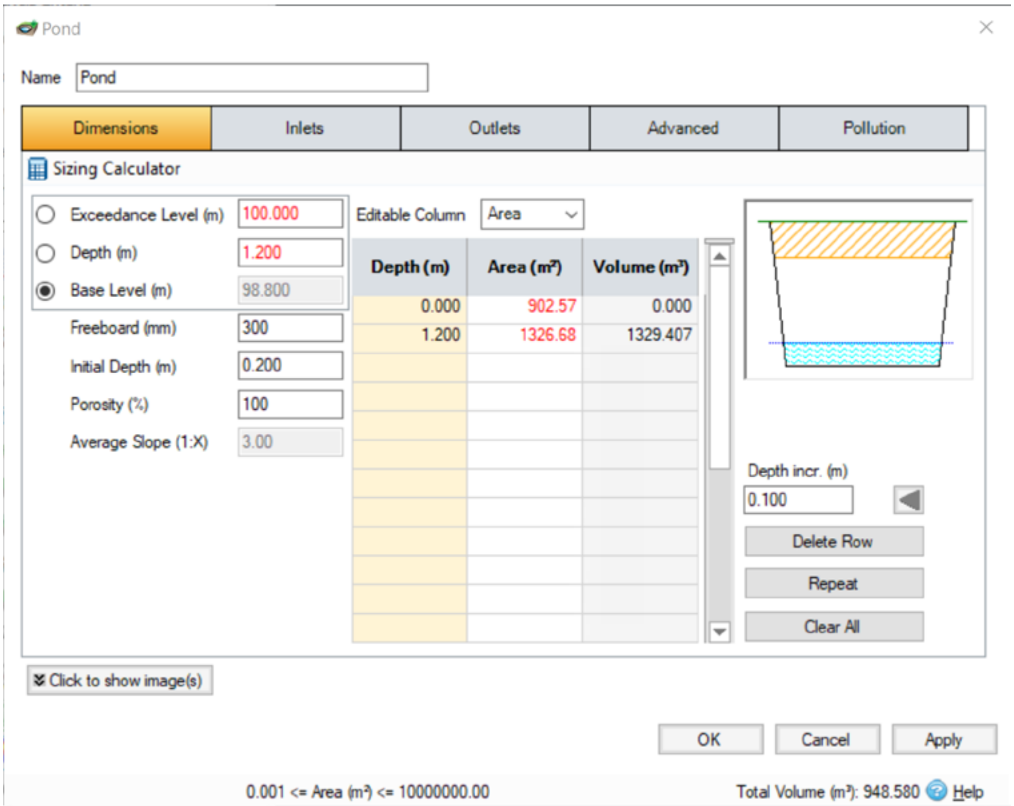
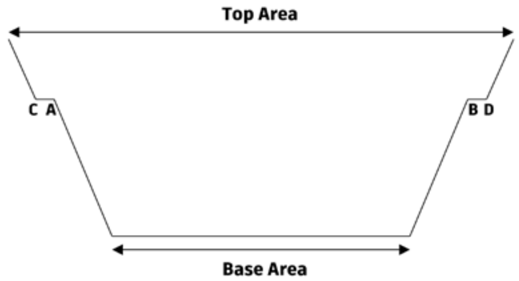


Figure 6.3 - Example Pond

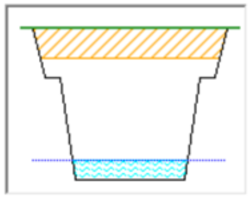
There is one parameter found within the pond dimensions tab that TSM does not provide explicit guidance on, this is the porosity. It is assumed that 100% of ponds are available for storage, therefore a value of 100 is usually appropriate.

Ponds that require a plateau or staged slope can be represented in ID. To design this configuration, the sizing calculator and depth/area table can be utilised to stage the pond at certain depths.



Editable Column: Area

Depth (m)	Area (m²)	Volume (m³)
0.000	300.00	0.000
1.000	500.00	395.766
1.001	740.00	396.382
1.500	970.00	821.735



As per the diagram above, first specify a base area and guess the top area (AB). Make sure the depth for the pond is same as the depth in Depth Vs Area column. Use the Sizing Calculator >> specify a slide slope >> maintain base area, so the top area (AB) is calculated. Follow a similar procedure but maintain top area this time to calculate the base area (CD). Next, populate the Depth Vs Area for the entire depth of the pond. A millimetre must be added to the staged section to allow for this to work.

07 Rainwater Harvesting in InfoDrainage

Similar to how green roofs are modelled in InfoDrainage. Rainwater harvesting (RWH) is defined within an inflow catchment. It is not an explicit structure, rather, the Rainwater Tank option allows flow to be captured with a predefined Harvesting Demand and removed from Inflows.
TSM states (Page 208) that there are three main types of RWH systems:

- Gravity-based
- Pumped systems
- Composite systems

These three types of systems cannot be explicitly modelled in InfoDrainage, instead the software takes a simplistic approach in that the system has an inflow and outflow, no unique controls like gravity or pumps can be truly represented.

According to TSM (Page 207), rainwater harvesting systems can address immediate water supply issues at a domestic, commercial, and industrial level. In addition, they can provide a level of attenuation at source. Water that is used for harvesting purpose is defined as “retention used”.

Whereas water used for attenuation is defined as “detention used” (Figure 7.1).

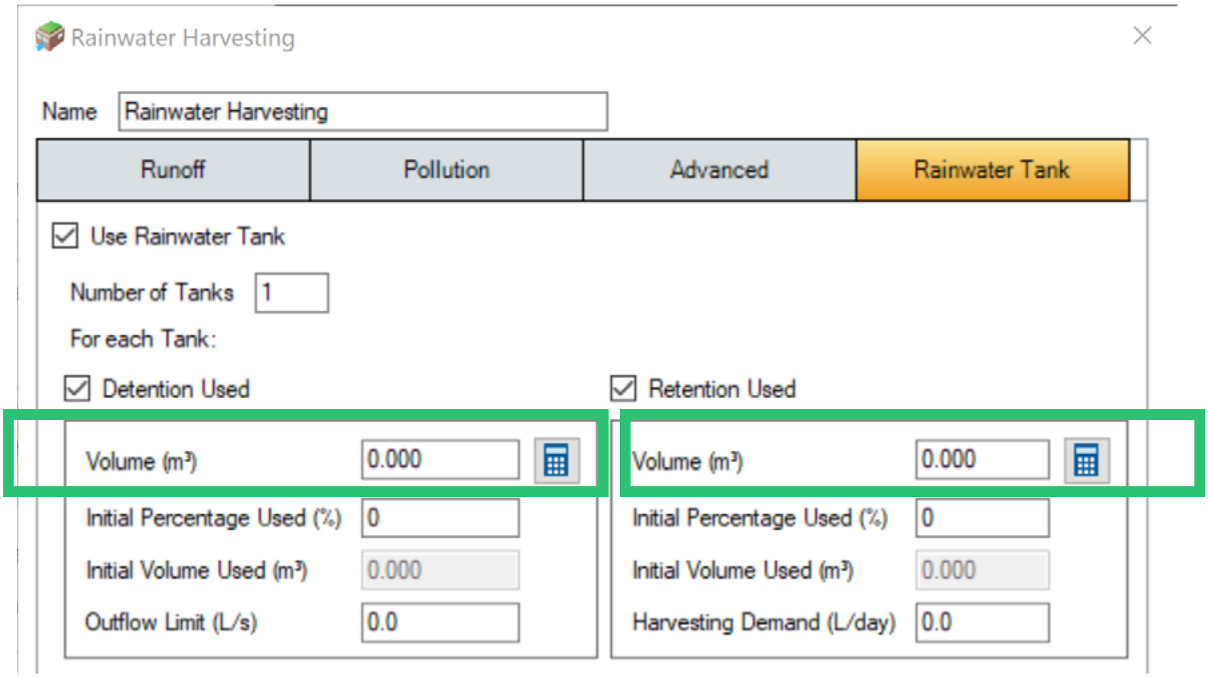


Figure 7.1 - Detention & retention

In terms of configuring a Rainwater Harvesting system. TSM provides guidance on parameters relevant to InfoDrainage. This chapter reviews the guidance in relation to harvesting and attenuation design.

Rainwater Harvesting Design

In TSM (Page 213), the daily demand for water is derived from research. The value provided is 40l/c/d. It suggests that the harvesting demand should be assumed at a conservative value when designing as water usage is likely to vary from case to case. Within ID, this value would be placed in the harvesting demand (L/day) box. This harvest flow which is a constant outflow is lost from analysis.

Attenuation Design

TSM does not provide specific guidance on the outflow from the detention section of the rainwater tank. In this case, the outflow could be derived from other sources relating to attenuation structures found in this document. It would be at the discretion of the user to identify the outflow in l/s. In any case, when an outflow is defined, the analysis will convey water to the next node.

Rainwater Tank Sizing

Within TSM (Page 218), there is guidance on sizing rainwater tanks in terms of volume. The simple look-up approach works well with ID as it uses variables similar to the software (Figure 7.2). The simple look-up method uses the roof area, number of people and SAAR to calculate the volume of the tank. Detailed equations for tank sizing can be found on pages 218, 219, 220 & 221 in TSM.

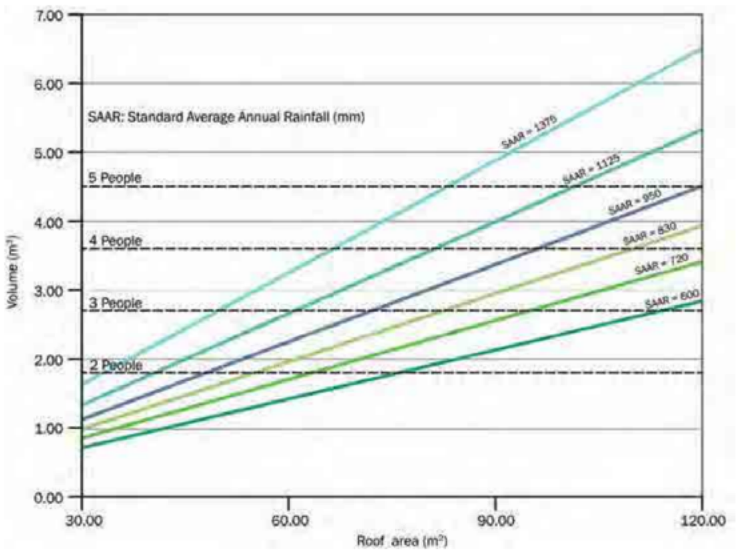


Figure 7.2 - TSM Simple Method

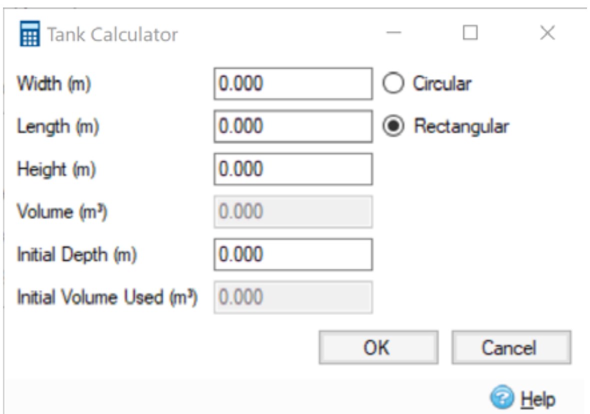


Figure 7.3 - ID Tank Sizing Calculator

Equally, whilst TSM has guidance on sizing tanks, ID has its own sizing calculator (Figure 7.3).

08 Swales in InfoDrainage

Dimensions:

Typical dimensions were extrapolated from TSM and condensed into the table below. Certain dimensions may differ depending on the configuration of the swale. For instance, if the proposed site as a slope greater than 3%, then a check dam is recommended by TSM. These dimensions are a starting point.

Parameter	SuDS Manual Guidance	Page Reference
Base Width	0.5m – 2m	316
Longitudinal Slope	0.5% – 6 % >3% - Check dam required >1.5% - underdrain required	316
Side Slope	33% (1:3) – 25% (1:4)	316
Depth	400-600mm	316
Length	= / > Road Length	316
Manning's N	0.35	318
Underdrain	Minimum diameter pipe - 100mm with 150mm clean gravel above the pipe	324

According to TSM (Page 313 & 314) there are two key varieties of swale. To summarise, the difference between these is whether or not there is additional treatment/conveyance beneath the base of the swale, that being a filter medium (trench) and underdrain. A swale can either be:

- A vegetated open channel (Conveyance and attenuation Swale)
- A vegetated open channel with extra attenuation and conveyance in the form of a trench and underdrain (Dry Swale)

These configurations are possible to model in InfoDrainage and will be explained in this chapter.

Using the recommended dimension parameters taken from TSM (Table 1). A typical conveyance swale may look like Figure 8.1:

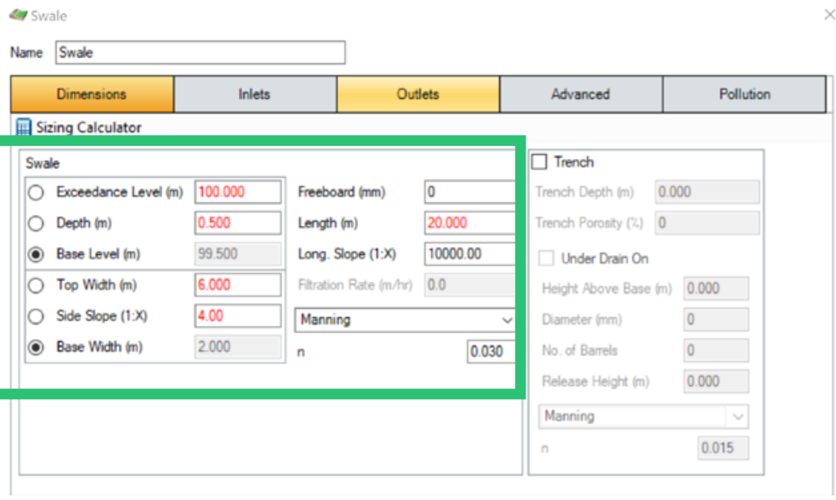
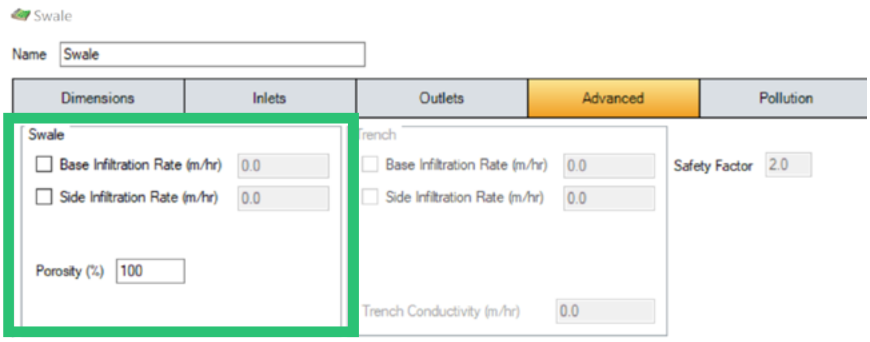


Figure 8.1

For a simple conveyance and attenuation swale, the parameters highlighted by the green box above are the most appropriate for this configuration. If infiltration is required, then the user will be required to enter an infiltration value in the advanced tab:

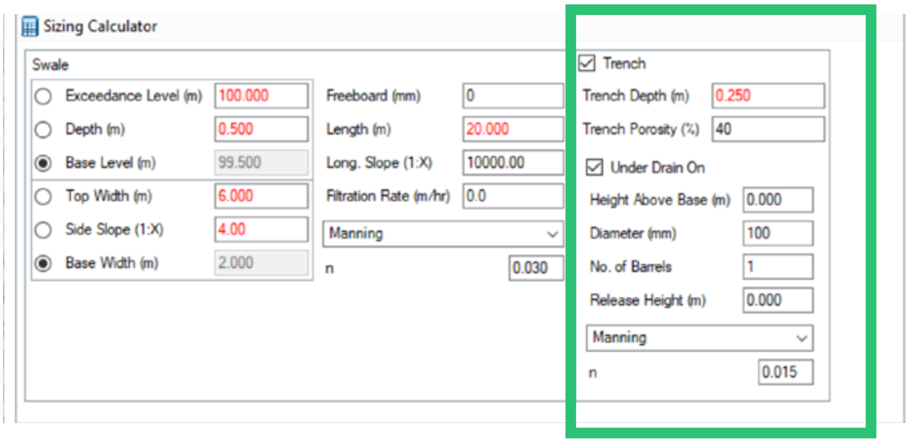


At present, guidance for swale infiltration rates is not directly provided within TSM. However, by looking to similar SuDS features for comparisons, one could look to use the infiltration rate for a bioretention system as a reference point. In this case, an infiltration rate of 0.3m/hr may well be a good starting point for a swale infiltration rate.

The justification being that both swales and bioretention systems can have similar soil and grass properties.

If the user is required to model a swale with a trench and underdrain, TSM does provide adequate guidance on certain parameters for this configuration. On page 324, TSM states that underdrains should use PVC perforated pipe (minimum diameter usually 100 mm) with 150 mm clean gravel above the pipe. In addition, TSM (Page 316) also states that Underdrains are required for conveyance swales with a slope of ¬ 1.5%.

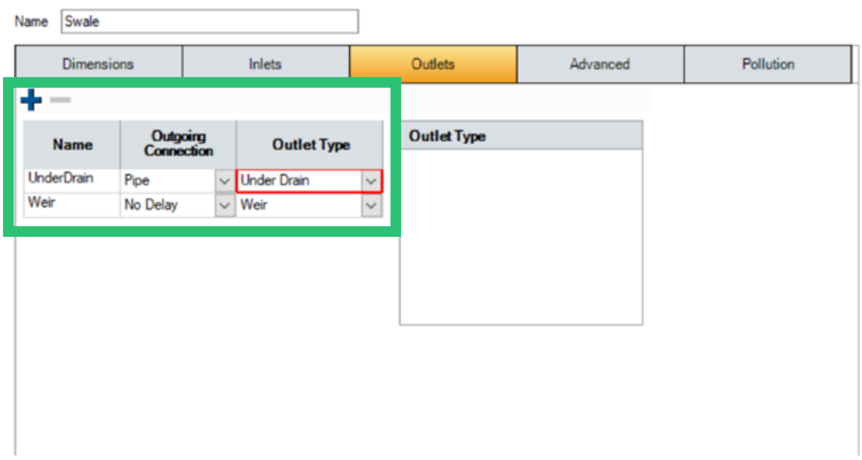
Therefore, with this information, one would look to apply this guidance in the following place:



However, what TSM neglects to provide guidance on in this case is the trench conductivity. Similar to the bioretention chapter, the InfoDrainage help site provides information on conductivity, to take the porosity value of their trench and then apply the subsequent conductivity rate.

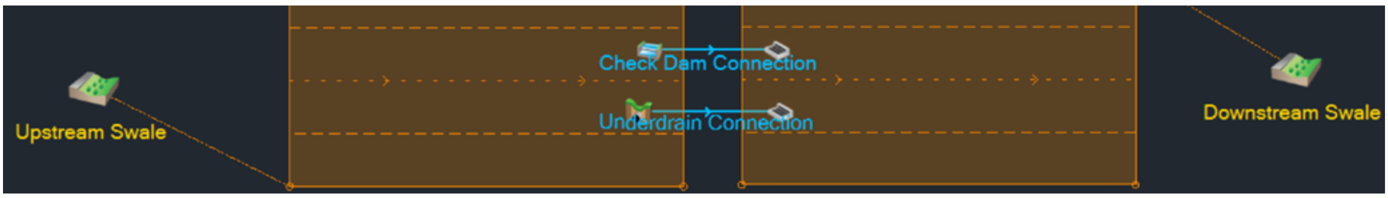
Check Dams

On pages 316 & 324, TSM provides guidance on check dam suitability. As per table 8.1, sites that have a slope greater than 3% require check dams to reduce the velocity of flow. The guidance states that check dams should be placed at 10-20m intervals and declares that they can be constructed using various methods and materials. In InfoDrainage the configuration can be simplified and completed by specifying both an underdrain and weir on the swale outlet:



This simulates what may occur in reality. The weir decreases and attenuates the flow, for the underdrain to discharge the runoff at a controlled rate.

Figure 2 provides an example of this configuration in InfoDrainage.



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09 Benefits of sustainable drainage design

Advanced design technology for stormwater and wastewater design ensures systems can withstand the pressures of urban development and extreme weather events. Innovative drainage design ensures that towns and cities are able to:

- Reduce environmental impact.
- Reduce errors and rework.
- Meet or exceed design requirements.
- Reduce overall design time.

Resources

Learn more from CIRIA on the Sustainable Drainage Systems (SuDS) Manual

Access multiple help documents on the InfoDrainage help site

Download your free 30-day InfoDrainage trial

Customer story How Jacobs engineered a SuDS friendly, sustainable, flood resistant amphitheatre for Sidmouth

Watch the webinar to learn how you can drive best practice for the design of Sustainable Drainage Systems

Learn more about using sustainable drainage in your designs today

autodesk.co.uk/products/infodrainage

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