Beeches, Booths & Barr (3Bs) Neighbourhood Plan

SuDS Guidelines

April 2019

Quality information

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Revision history

Project role	Name	Position	Action summary	Signature	Date
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Director / QA	Ben Castell	Technical Director	Revision and approval of Report		13-02-2019
Director	Michael Henderson	Regional Director	Report Preparation		06-02-2019
Researcher	Luke Szokalski	Graduate Landscape Architect	Research, graphics, concept plan, drawings		11-02-2019

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Background and Introduction

1.0

Background and Introduction

Background

Through the Ministry of Housing, Communities and Local Government (MHCLG), Neighbourhood Planning Programme, managed by Locality, AECOM has been commissioned to develop Sustainable Drainage Systems (SuDS) Guidance for Beeches, Booths & Barr (3Bs) Neighbourhood Planning Forum. The support is intended to provide more specific detail as to the role that neighbourhood planning can have in reducing flood risk associated with high surface water run-off from the area.

Objective

The objective of this report is to advise on the appropriate use of SuDS in the 3Bs Neighbourhood Area by providing:

- An overview of key flood risk;
- An understanding of the geology of the area;
- Indicative SuDS design ideas;
- Surface water management calculation advice; and
- Policy recommendations.

Location

The Neighbourhood area covers the Perry Barr ward of Birmingham - as defined in 2016 and bounded by the city boundaries of Birmingham, the railway line from Hamstead station to Perry Barr station, Regina Drive, the River Tame and the Aldridge Road from the river to the line of the M6 motorway as far as Queslett Road. The A34 Walsall Road runs through the heart of the proposed area with Queslett Road to the north, the railway line and the Old Walsall Road to the west and the M6 and the Aldridge Road to the east. The Neighbourhood area includes areas of Perry Barr, Perry Beeches, Hamstead and Tower Hill. Perry Barr ward has a population of 23,652 as per the 2011 census. The neighbourhood area falls in a suburban area with a growing, diverse and vibrant population. The neighbourhood area compromises areas for considerable development with significant community aspirations. There are a number of local centres within the proposed boundary including Tower Hill and Thornbridge Avenue as well as potential local centres around Turnberry Road/ Cardington Avenue.

Process

The following steps were undertaken to produce this report:

- Initial meeting, site visit and walk around;
- Desktop research;
- Policy review;
- Site analysis; and
- Development of design ideas

1.1 Problem Flooding Around Perry Beeches

When rain falls on an impermeable surface, it runs off as surface water. Usually, this water flows into drainage gullies and into the combined foul and storm water sewers. If the rainfall is particularly heavy, as it was in 2016, this surface water can flow towards the drainage gullies at such a rate they become overwhelmed and water backs up as surface water flooding. Sometimes the volume of water entering the combined sewers is so high that the sewers overflow, posing further health risks.

This situation is further exacerbated in the Perry Beeches area due to the local topography which creates two relatively steep sided valleys to the northwest and west (see Figures 1.3 and 1.4). This helps surface water to flow quickly down towards the largely culverted Perry Brook and the M6 embankment where it gets trapped, backing up and further increasing flood risk along the historic route of Perry Brook and Thornbridge Avenue. Without the ability to drain, this water will continue to flow towards Haddon Road where the sewer infrastructure can become overwhelmed and overflow[1].

Water flowing over impermeable surfaces, such as the roads in Perry Beeches, is likely to pick up diffuse urban pollution, such as heavy metals from car exhausts. If this is able to pool and flood, this pollution becomes concentrated and can present widespread health and environmental risks.

1. June 2016 Flooding: Flood and Water Management Act,

Figure 1.2 Canal running through the neighbourhood area

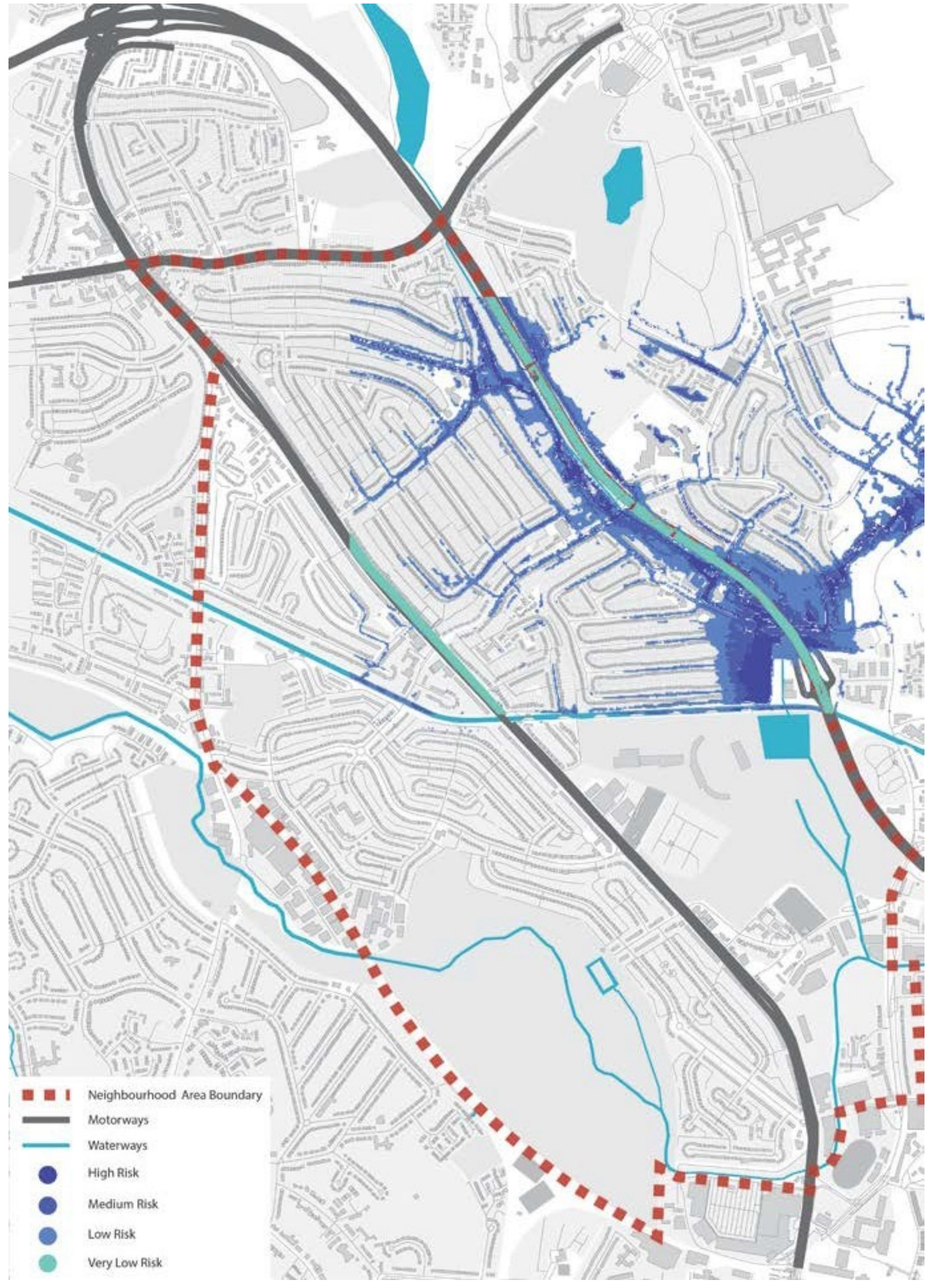


Figure 1.3 Flood Risk In Perry Beeches

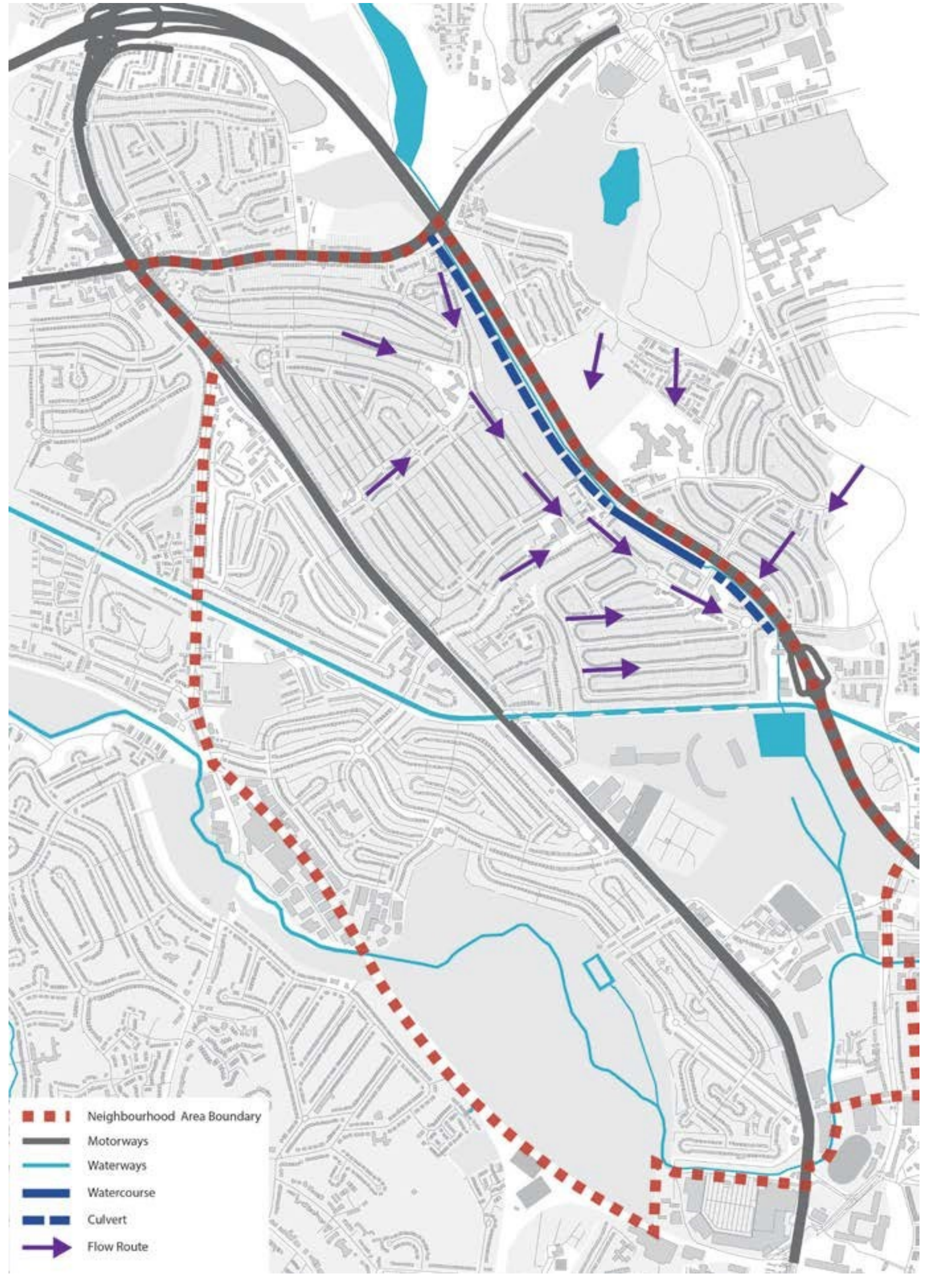


Figure 1.4 Surface Water Flows in Perry Beeches

What Are SuDS?

2.0

2.1 SuDS Definition

The term SuDS stands for Sustainable Drainage Systems. It covers a range of approaches to managing surface water in a more sustainable way to reduce

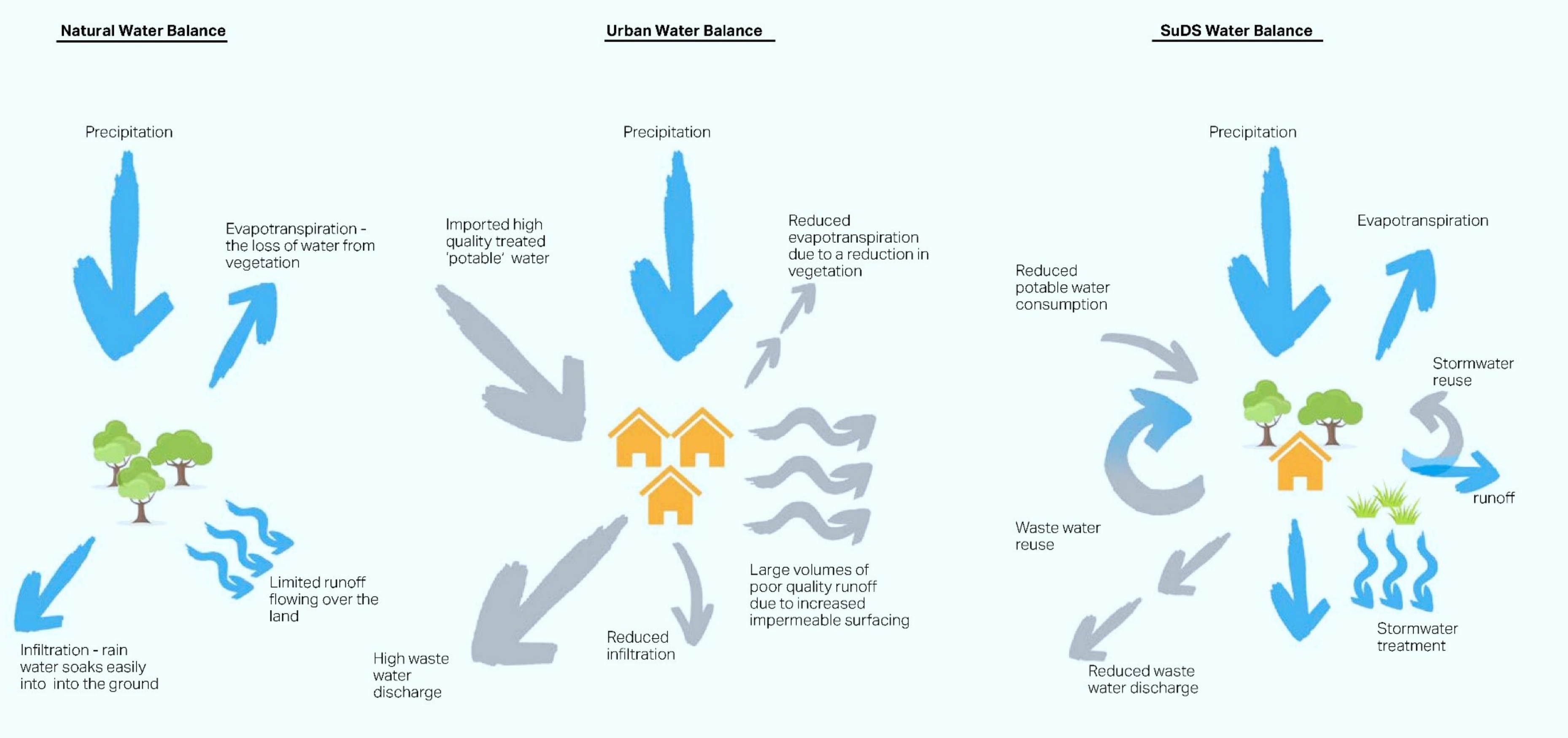
flood risk and improve water quality whilst improving amenity benefits. There are a number of overarching principles for SuDS:

- Manage surface water as close to where it originates as possible.
- Reduce runoff rates by facilitating infiltration into the ground or by providing attenuation that stores water to help slow its flow down so it does not overwhelm water courses or the sewer network.
- Improve water quality by filtering pollutants to help avoid environmental contamination.
- Form a 'SuDS train' of two or three different surface water management approaches.
- Integrate into development and improve amenity through early consideration in the development process and good design practices.
- SuDS are often as important in areas that are not directly in an area of flood risk themselves, as theycan helpreducedown streamfloodriskby storing water upstream.
- Some of the most effective SuDS are vegetated, using natural processes to slow and clean the water whilst increasing the biodiversity value of the area.
- Best practice SuDS schemes link the water cycle to also help make the most efficient use of water resources by reusing surface water.

Figure 2.2 Diagrams Illustrating alernating water cycles

Figure 2.1 Roadside rain garden intervention

The diagrams below show how the water cycle in urban areas has been affected by the modification of the natural landscape increasing flood risk. It also shows how the use of SuDS can be used to help to create a more balanced water cycle in built up areas.



Existing Planning Policy

3.0

3.1 Existing Planning Policy

The National Planning Policy Framework (NPPF) (2018) requires local planning authorities to ensure that development does not increase flood risk, both on site and elsewhere. It highlights that any increase in flood risk should be mitigated, potentially by incorporating SuDS, unless there is clear evidence that this would be inappropriate.

Birmingham City Council's Development Plan 2031 sets out planning policy across the city, which includes policy TP6 on the management of flood risk and water resources and sets out that:

'*To minimise flood risk, improve water quality and enhance biodiversity and amenity all development proposals will be required to manage surface water through Sustainable Drainage Systems (SuDS).'*

Development covers a range of activities that affect the use of land and buildings. Permitted Development Rights, however, enable some works to be undertaken without the need for planning permission. This includes extending residential properties so long as the development does not exceed 50% of the total area of land around the original house (including previous extensions).

In 2008 Permitted Development Rights enabling the resurfacing of front gardens were tightened to help reduce surface water flooding risks. Planning permission is not required if a new or replacement driveway of any size uses permeable (or porous) surfacing, such as gravel, permeable concrete block paving or porous asphalt, or if the rainwater is directed to a lawn or border to drain naturally. Planning permission is however required if the surface to be covered is more than five square metres of traditional, impermeable driveways that do not provide for the water to run to a permeable area[2]. This is particularly important for the Perry Beeches area which has seen a large number of front drives resurfaced.

Birmingham's Sustainable Drainage: Guide to Design, Adoption and Maintenance highlights that SuDS should not be restricted only to major developments, *but prioritised on any development (major or minor) where there is benefit to reducing flood risk*. Futhermore, the Guide emphasises that new development is likely to be a relatively small proportion of urban areas and that retrofitting SuDS is actively encouraged where it can be promoted as a means of mitigating flood risk in existing developments.

2. Part 1, Class of the Town and Country Planning (General Permitted Development) (England) Order 2015 sets out the permitted development rights in relation to paving

SuDS Design Guidelines

4.0

4.1 SuDS Design Guidelines

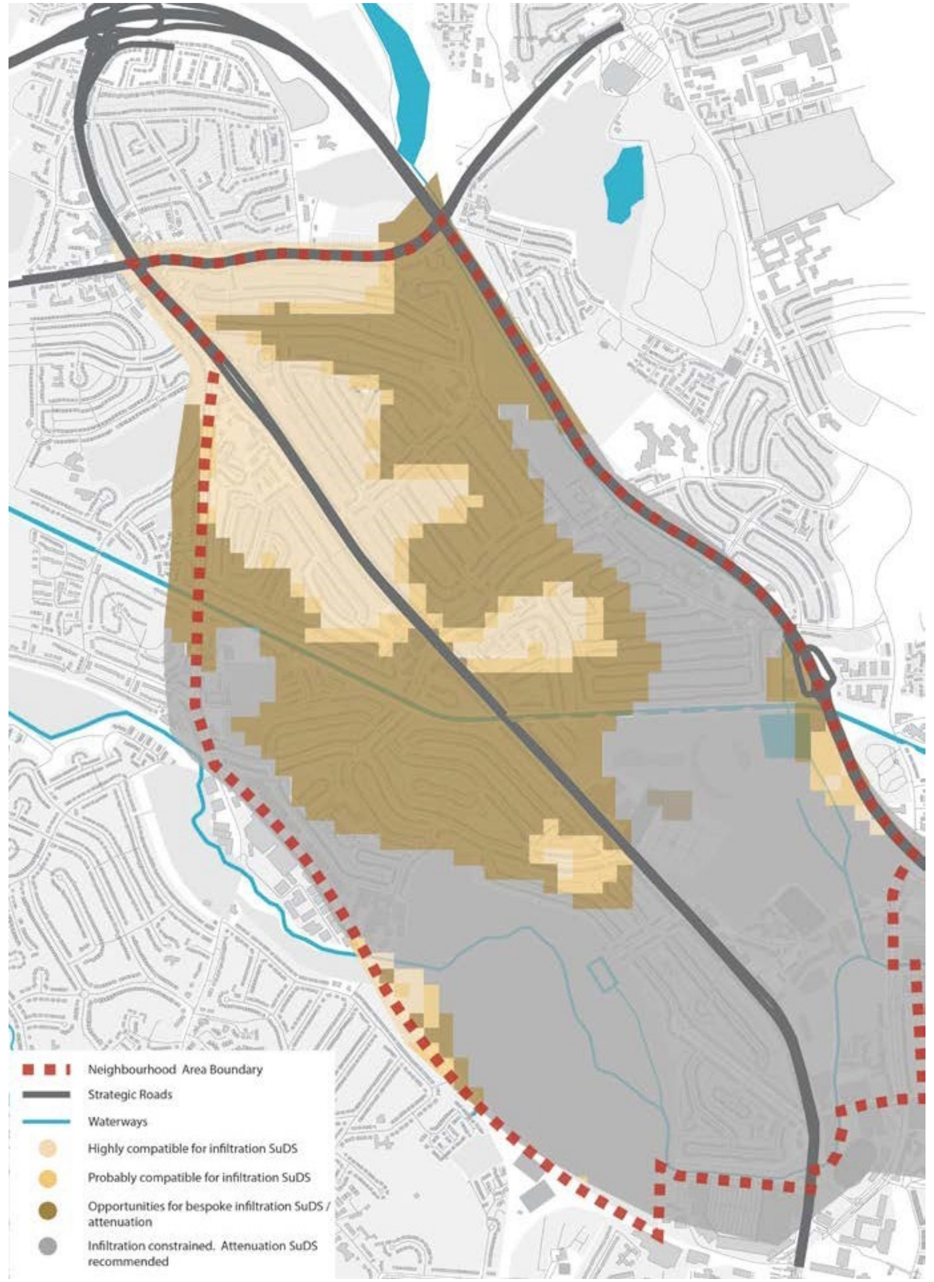
SuDS work by reducing the amount and rate at which surface water reaches the combined sewer system. Perhaps the most sustainable option is collecting this water for reuse, for example in a water butt or rainwater harvesting system, as this has the added benefit of reducing pressure on important water sources.

Where reuse is not possible there are two alternative approaches using SuDS:

- Infiltration, which allows water to percolate into the ground and eventually restore groundwater; and
- Attenuation and controlled release, which holds back the water and slowly releases it into the sewer network. Although the overall volume entering the sewer system is the same, the peak flow is reduced. This reduces the risk of sewers overflowing. Attenuation and controlled release options are suitable when either infiltration is not possible (for example where the water table is high or soils are clay) or where infiltration could be polluting (such as on contaminated sites).

The map shown in figure 5.1 shows where in the 3Bs area infiltration SuDS can be used and where their use is limited due to the ground conditions. This mapping should be used as a guide and drainage test to understand infiltration rate potential.

Addendum: The location of any soakaway or SuDS system should be at least 10 metres away from the top of the canal cutting.



4.2 SuDS Definitions

Permeable paving – This is durable paving that allows for surface water to percolate through into underlying substrate. Spaces within the substrate enable the water to be held before it infiltrates or is released. Permeable paving can also be used to create systems that can hold even more water. Permeable paving can also help to remove solids and pollutants from surface water.

Soakaway / rain garden – These planted spaces are designed to enable water to infiltrate into the ground. Cutting of downpipes and enabling roof water to flow into rain gardens can significantly reduce the runoff into the sewer system. The UK Rain Garden Design Guidelines provides more detailed guidance on their feasibility and suggests planting to help improve water quality as well as attract biodiversity. https://raingardens.info/wp-content/uploads/2012/07/UKRainGarden-Guide.pdf

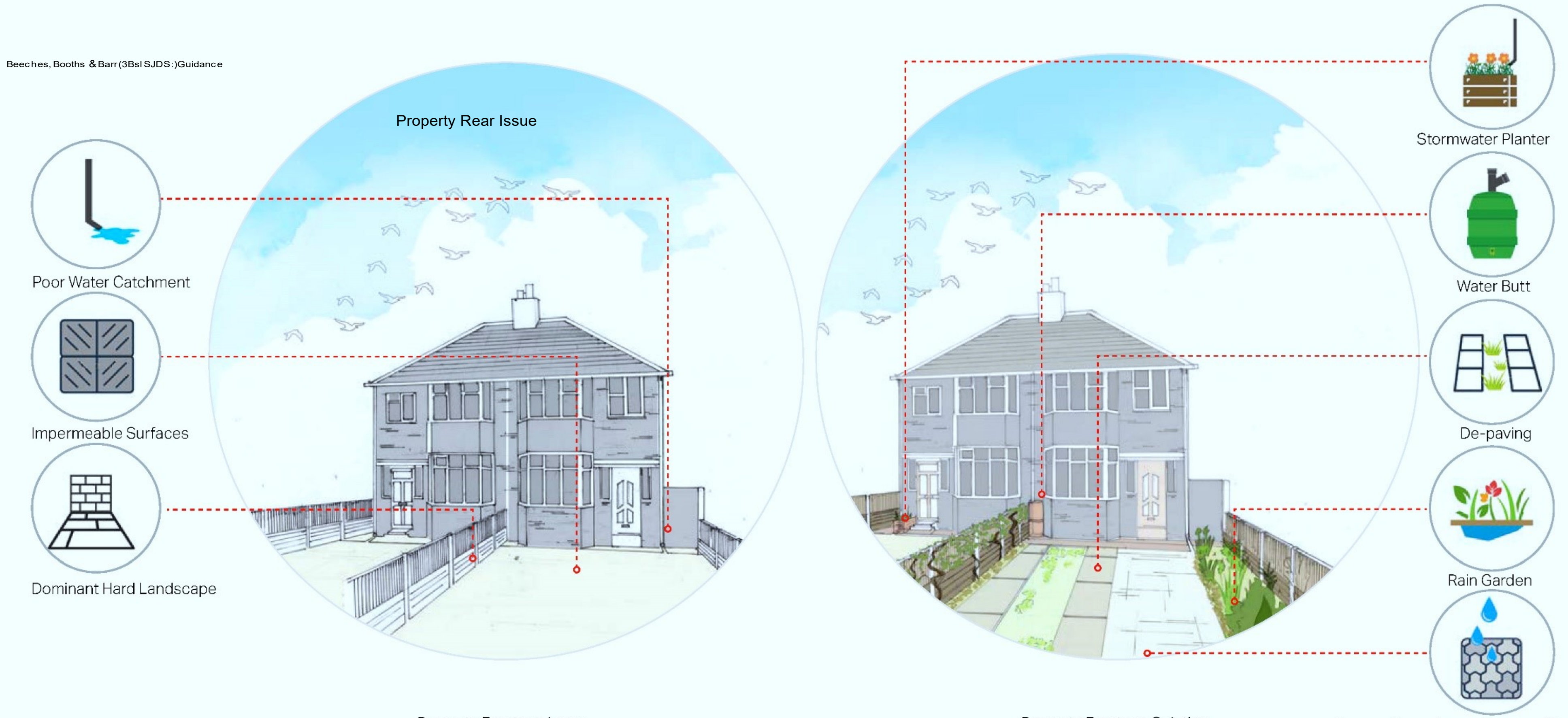
Storage and slow release – Simple storage solutions, such as water butts, can help provide significant attenuation. To be able to continue to provide benefit, there has to be some headroom within the storage solution. If water is not reused, a slow release valve allows water from the storage to trickle out, recreating capacity for future rainfall events. Some digital technologies are now available that predict rainfall events, enabling stored water to be released when the sewer has greatest capacity to accept it.

Green roofs – Vegetated roofs help to slow the flow of water to down pipes. As the substrate layer provides attenuation space, the thicker the substrate layer, the higher the storage volume on the green roof. In heavy rainfall events these can get overwhelmed but can provide around 5-10% of attenuation needs.

4.3 Current Design Issues

roperty Frontage Issue

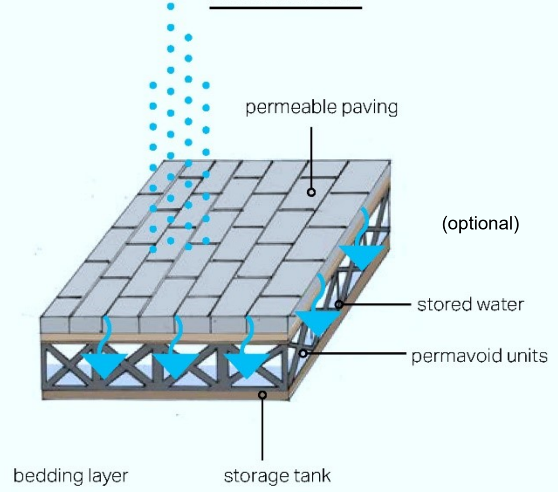
There are many different approaches to sustainable drainage. This section illustrates how SuDS might be integrated into typical front and back gardens within the neighbourhood plan area. It also provides more detailed illustration as to how SuDS should be constructed to ensure that they function properly.



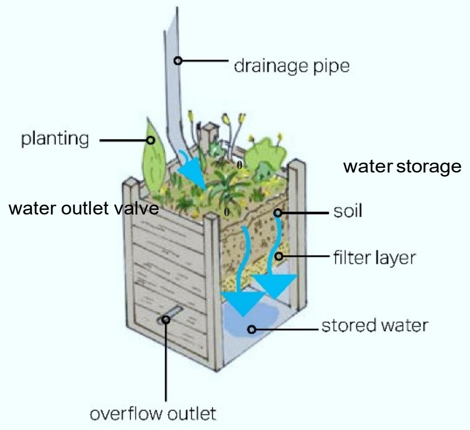
Property Frontage Issue

Property Frontage Solution

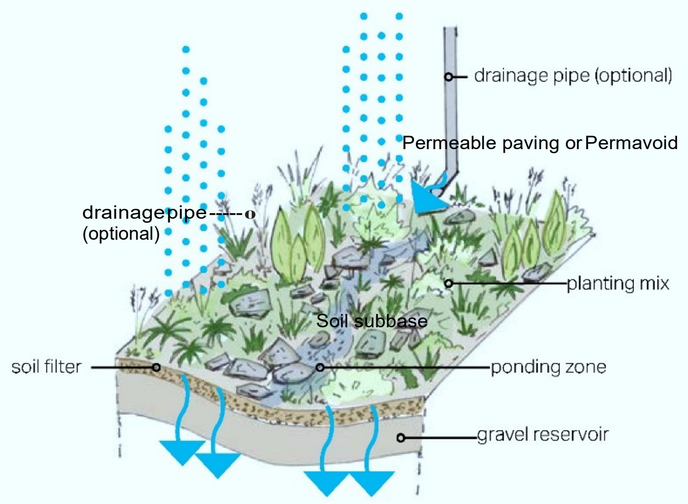
Permavoid Units



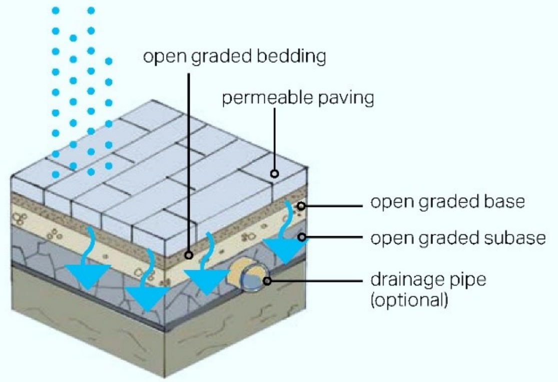
Storm water planter



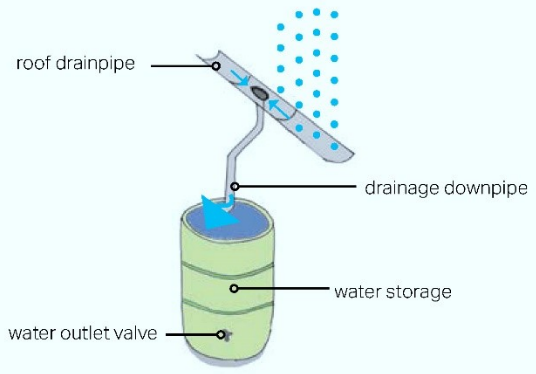
Rain Garden



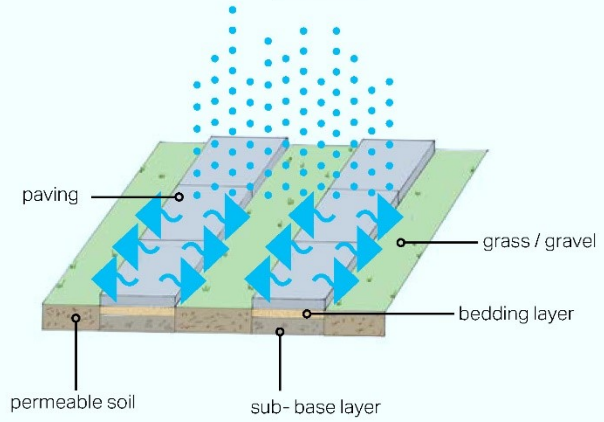
Permeable Paving

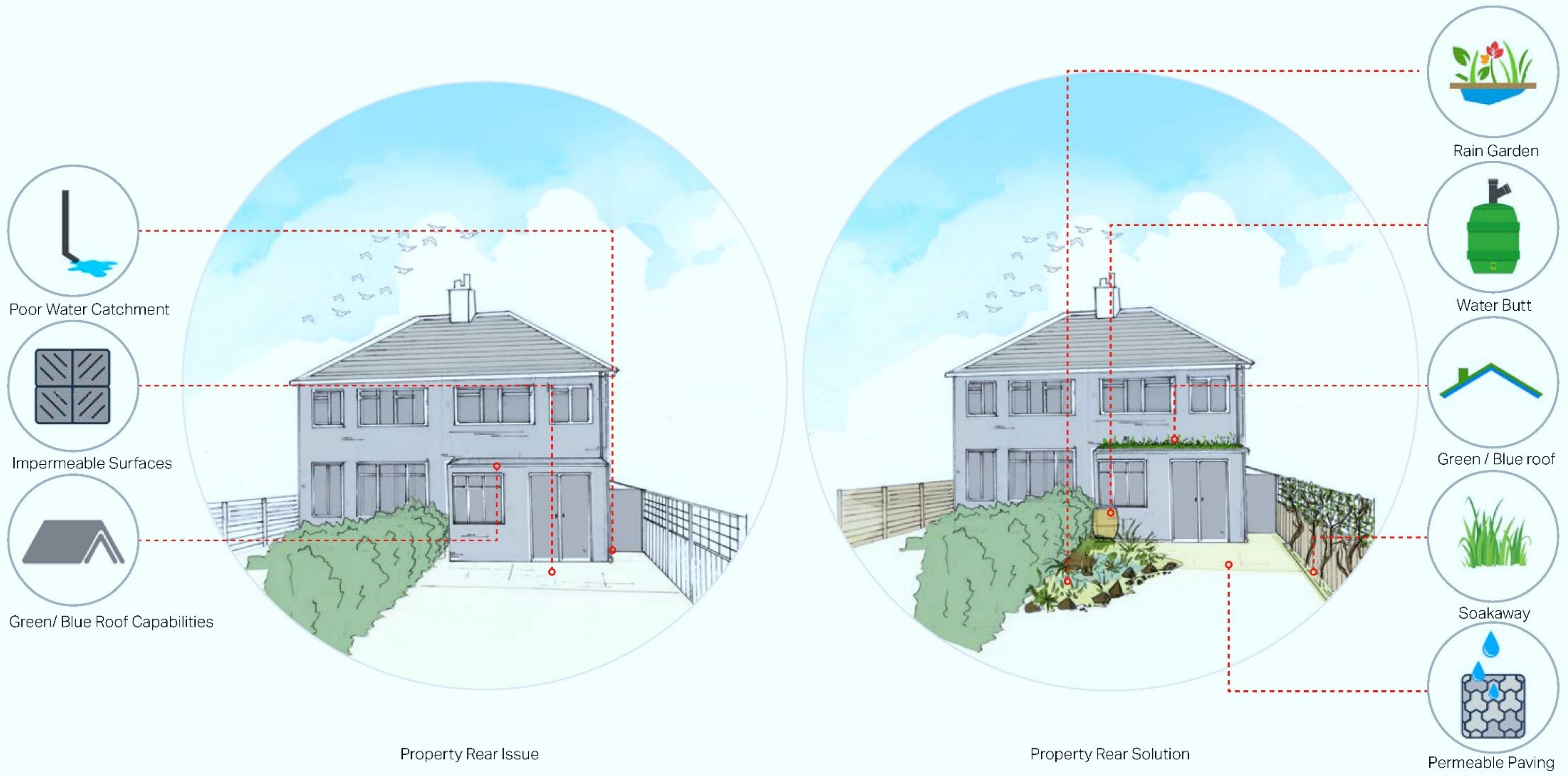


Water Butt



Depaving



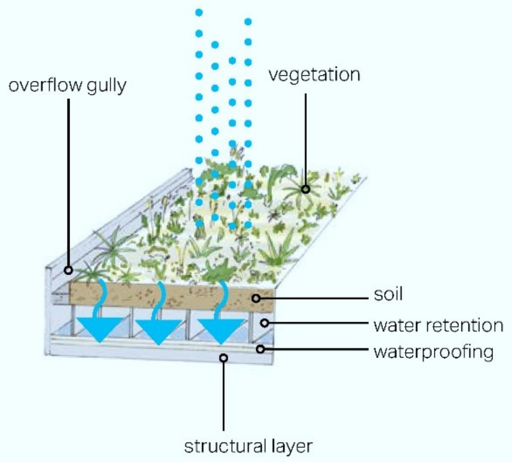


Property Rear Issue

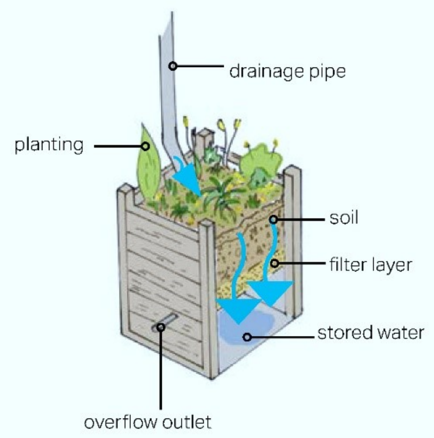
Property Rear Solution

Beeches, Booths & Barr (3Bs) SuDS Guidance

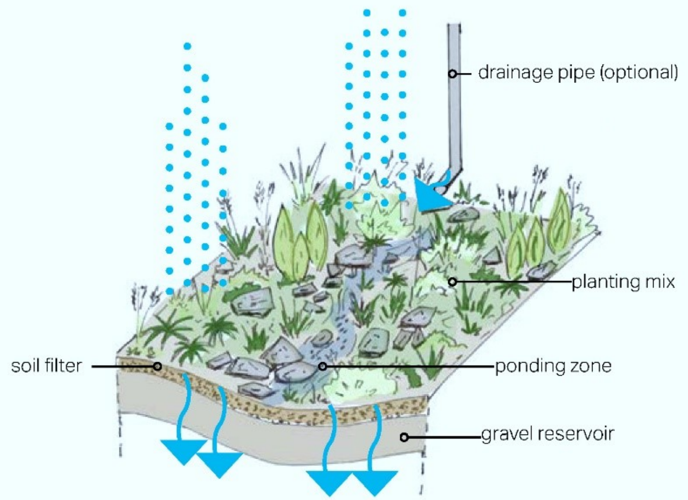
Green/ Blue Roof



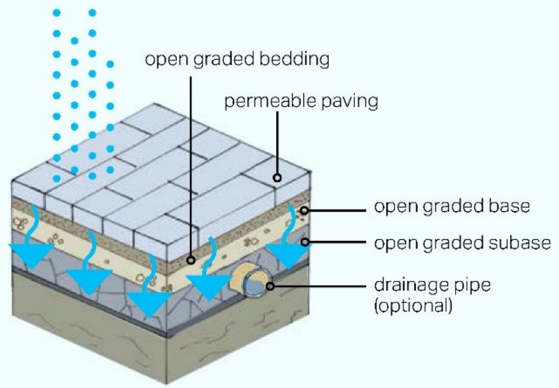
Storm water planter



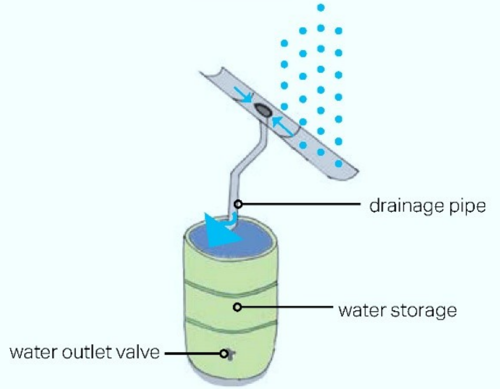
Rain Garden



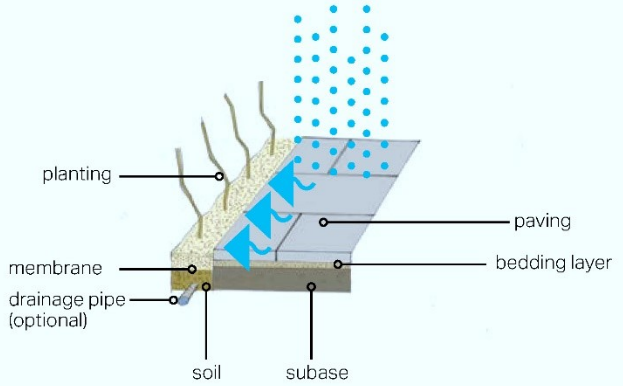
Permeable Paving



Water Butt



Soakaway



Calculating Attenuation Volume

05

5.1 Surface water storage estimation tool-Guidance

Different surfaces allow for differing levels of infiltration. As such, and depending on the design of the development, it may be required to attenuate some of the surface water generated on site. The following section provides guidance on using the UK SuDS Tool to calculate the required attenuation volume to reduce runoff rates to an acceptable level using different types of SuDS.

The following tables represent step by step guidance . You can access the UK SuDS Tool here: http://www.uksuds.com/drainage-calculation-tools/surface-water-storage

Site Address

Enter the postcode where your site is located and clock the search button. You can click on the map to the site coordinates and related hydrological characteristics.
Alternatively you can directly zoom in the map and click on the exact location

Site latitude		Auto updates once site is selected
Site longitude		

Site Details

Site name		For personal reference,no impact on calculations
Site location		

Site Characteristics

Total site area (ha)	1	Update with building /extension footprint
Significant public open space (ha)	0	Remains 0 unless on public land
Area positively drained (ha)	0	Auto- updates
Impermeable area (ha)	2	Same value as 1 unless permeable surfaces are proposed
Drained area that is impermeable (%)	0	Auto- updates
Impervious area drained via infiltration (ha)	3	Same value as 1 unless infiltration is proposed
Return period for infiltration system design (years)	-	Leave default if no infiltration is proposed.Use 100 otherwise.
Impervious area drained to rainwater harvesting systems (ha)	0	Remains 0 unless rainwater harvesting is proposed
Return period for rainwater harvesting system design (years)	-	Leave default if no rainwater harvesting is proposed (100 if not)
Compliance factor for rainwater harvesting system design (%)	-	Leave default
Net site are for storage volume design (ha)	0	Auto- updates
Net impermeable area for storage volume design (ha)	0	Auto- updates
Previous area contribution (%)	30	leave default

Hydrological Characteristics

This section auto-updates. Leave default values.

These data come from the click on the map. The values on the left can be edited

	My values	Map values
SARR (mm)	-	-
M5-60 rainfall depth (mm)	-	-
'r' ratio M5 / M5-2day	-	-
FEH/FSR conversion factor	-	-
Hydrological region	-	-

Figure 6.1 Guidance produced by AECOM, January 2019, based on UK SuDS- Surface Water Storage Volume Estimation Tool produced by HR Wallingford

Beeches, Booths & Barr (3Bs) SuDS Guidance

Design Criteria

This section auto-updates. Leave default values.

Specify volume control approach	Use long term storage	
Climate change allowance factor	1.4	
Urban creep allowance factor	1.1	
Interception rainfall depth (mm)	5	
Minimum flow rate (l/s)	4	Only update if known greenfield runoff rate or agreed discharge is known.

Selected method to calculate surface water storage requirments

IH124 method

IH124 specifically addresses the runoff from the small catchments (Insitute of Hydrology,1994). Although shown to be slightly less accurate than more recent FEH based methods, it is still considered to be an acceptable approach for assessing greenfield runoff rates.

Input fields for the IH124 method

Enter criteria needed to calculate surface water storage requirments with the IH124 method.

1. Growth curve factors This section auto-updates. Leave default values.

	My values	Map values
Growth curve factor 1 year		
Growth curve factor 10 years		
Growth curve factor 30 years		
Growth curve factor 100 years		

2.Derivation of Qbar Auto-updates. Leave default values.

	My values	Map values
Specify how Qbar should be delivered		
Specify how SPR should be delivered		
Specify SOIL type		
SPR		

3.Rainfall Input Auto-updates. Leave default values.

	My values	Map values
Rainfall 100 yrs 6hrs (mm)		
Rainfall 100 yrs 12hrs (mm)		

Results using the IH124 method

Estimated site discharges This section auto-updates.

	My values	Map values	
Qbar (l/s)			Site discharge rates for the proposed impermeable area increase if no limitations are applied. Discharge rate should be agreed with the local sewer company.
1 in 1 year (l/s)			
1 in 30 year (l/s)			
1 in 100 years (l/s)			

Estimated storage volumes

	My values	Map values	
Interception storage (m^3)			Attenuation storage required for proposed impermeable area increase. This is a guidance tool only.
Attenuation storage (m^3)	Required		
Long term storage (m^3)			
Treatment storage (m^3)			
Total storage (m^3)			

Description of this model run

Figure 6.2 Guidance produced by AECOM, January 2019, based on UK SuDS- Surface Water Storage Volume Estimation Tool produced by HR Wallingford

Beeches, Booths & Barr (3Bs) SuDS Guidance

Conclusions and Policy Recommendations

6.0

6.1 Conclusions

The topography of the 3B's area creates high velocity surface water flows downhill towards the motorway infrastructure where there is a risk of water pooling. This has been exacerbated by the increase in hard surfacing and built area as a result of household level development which prevents surface water from infiltrating into the ground. There are a number of areas within the 3B's Neighbourhood that could utilise SuDS to reduce surface water flow rates and in turn flood risk.

6.2 Policy Recommendations

Neighbourhood Plans have to align with the strategic policies of the Local Development Plan, and be in accordance with the NPPF. Both the NPPF and Birmingham's Local Development Plan require the use of SuDS to mitigate the additional surface water flood risks associated with development. Enforcement of these policies across the Perry Beeches area has been limited (particularly in relation to front garden conversion to drives) and the consequential impact of permitted development contributes to increased flood risk across the area.

Reducing surface water flow rates across the Perry Beeches area will not only reduce immediate surface water risks, but also lower the risk of downstream sewer flooding and fluvial flooding, in turn reducing the scale and cost of strategic flood risk reduction works. As such, local, small scale SuDS will play a role in managing surface water. The Neighbourhood Plan therefore has a role to play by reinforcing and enhancing surface water management policies. Central to this is the need to enforce policies associated with new built development and conversion of front gardens that promote infiltration or the slow release of surface water to a water course or drainage network.

The following policy is recommended alongside the design guidance:

- All development, including the conversion of front gardens for parking, should demonstrate that the 3Bs SuDS Design Guidelines have been used to assess the impact of development on surface water run-off from the site and, where this has been increased, that SuDS have been incorporated into the design to mitigate impacts, where feasible. In cases where surface water run-off is expected to rise and SuDS are not proposed, alternative mitigation proposals will need to be justified.

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