Beeches, Booths & Barr (3Bs) Birmingham

SuDS Guidelines Draft

February 2019

Quality information

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Beeches, Booths & Barr (3Bs) Report	Draft	3Bs Neighbourhood Planning Forum	Michael Henderson	08-02-2019	Ben Castell

Revision history

Project role	Name	Position	Action summary	Signature	Date
Qualifying Body	3Bs Neighbourhood Planning Forum	Neighbourhood Planning Group	Comments on Draft Report		
Director / QA	Ben Castell	Technical Director	Revision and approval of Report		
Researchers	Maya Abdul-Latif Libaan Warsame	Senior Landscape Architect Assistant Landscape Architect	Research, site visit, concept plan, drawings		
Project coordinator					

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Contents

Background and Introduction

1.0

1.0 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 and 2). 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.

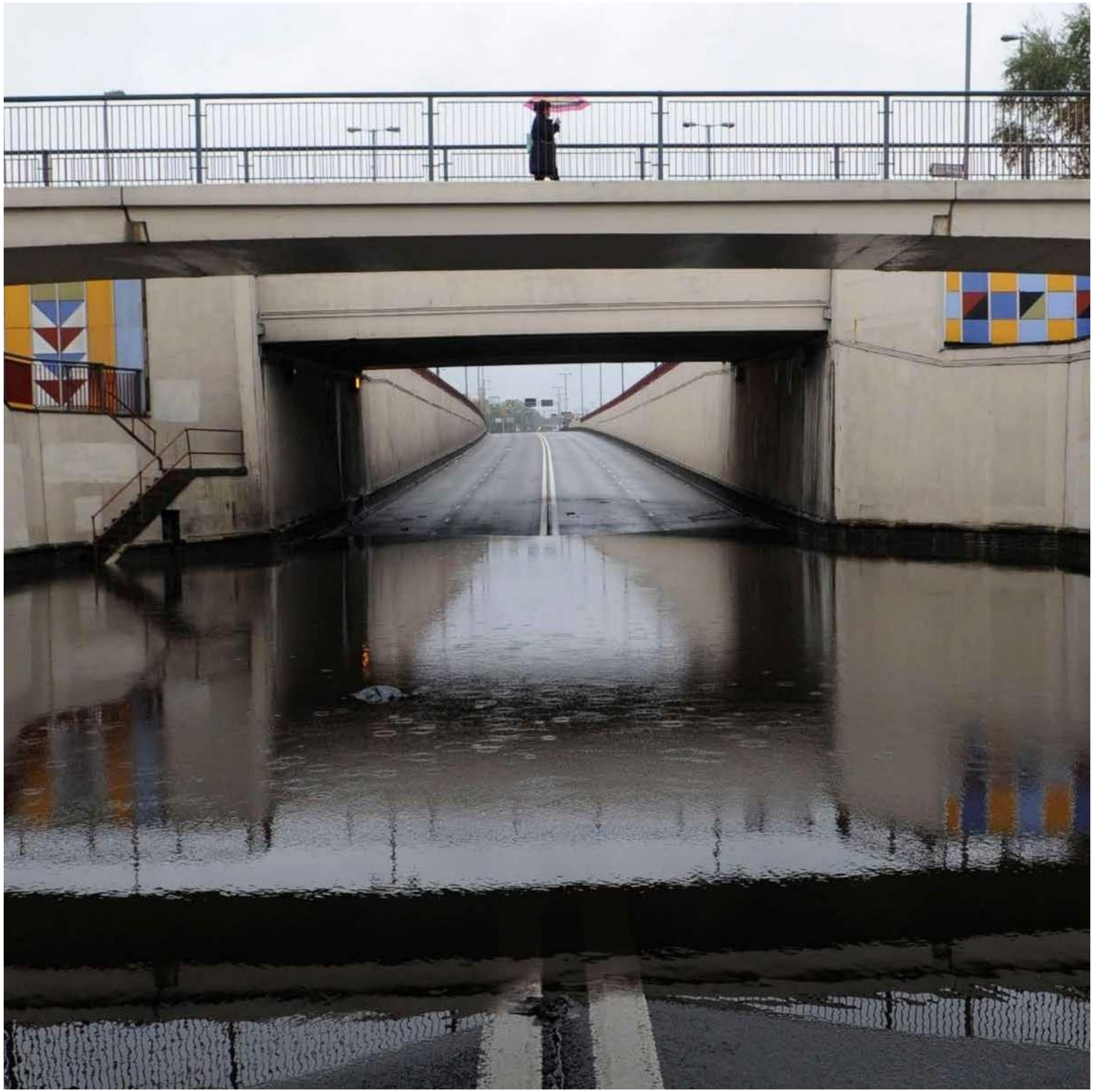


Figure 1.1 Flooded underpass in Perry Barr (source Birmingham Mail)

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

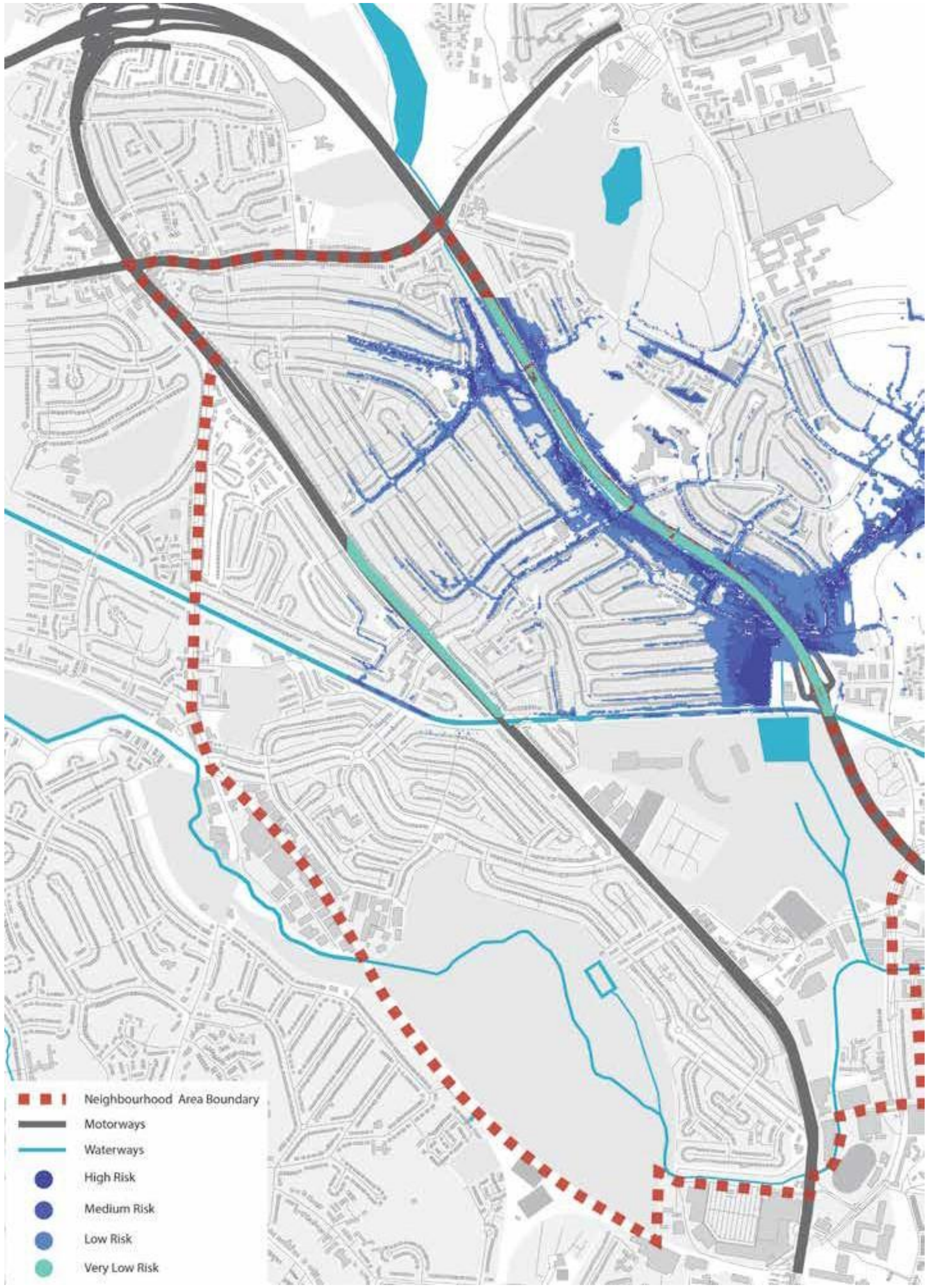


Figure 1.2 Flood Risk In Perry Beeches

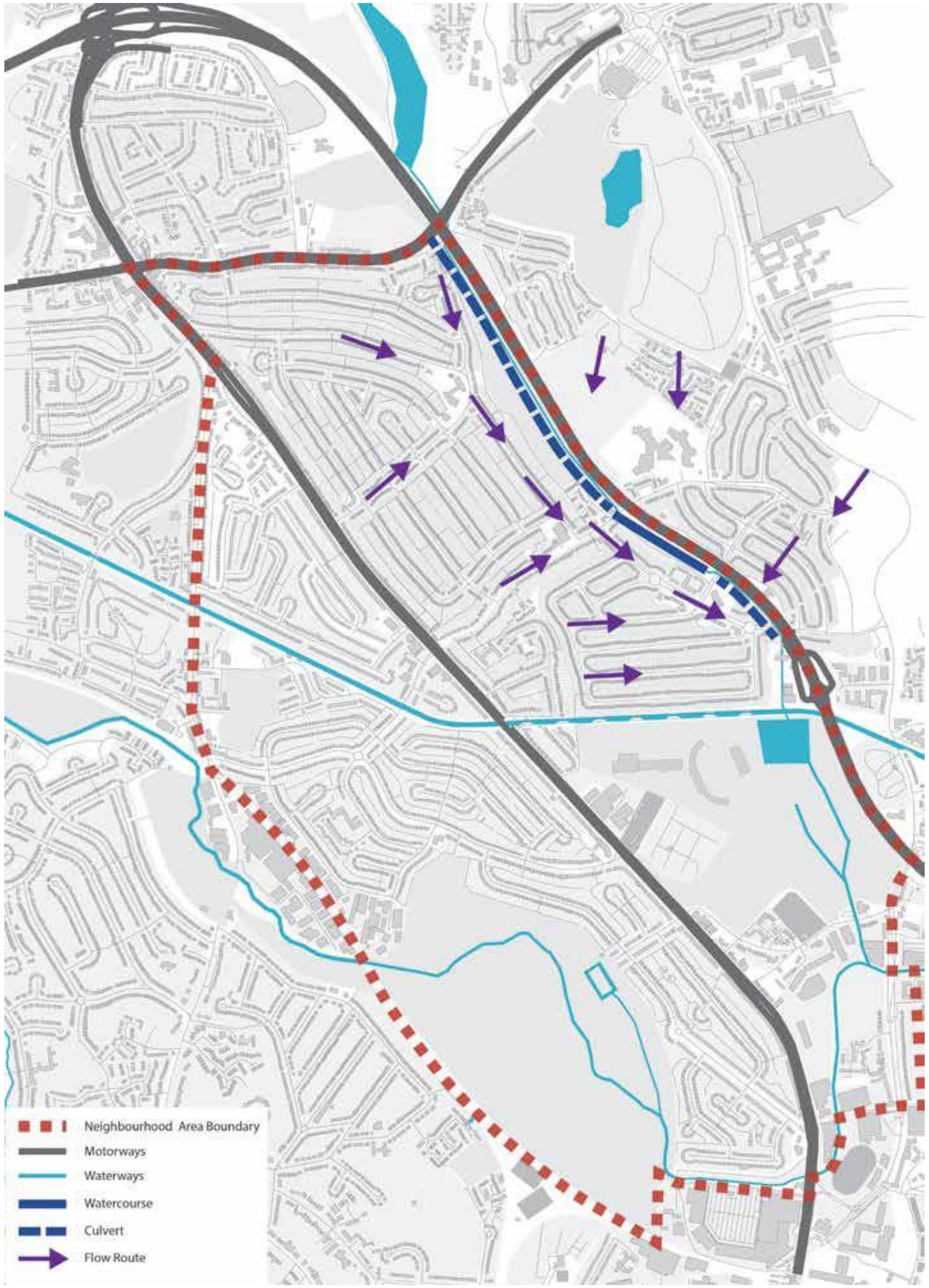


Figure 1.3 Surface Water Flows in Perry Beeches

What Are SuDS?

2.0

2.0 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 develop 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 they can help reduce downstream flood risk by 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 2.1 Roadside rain garden intervention

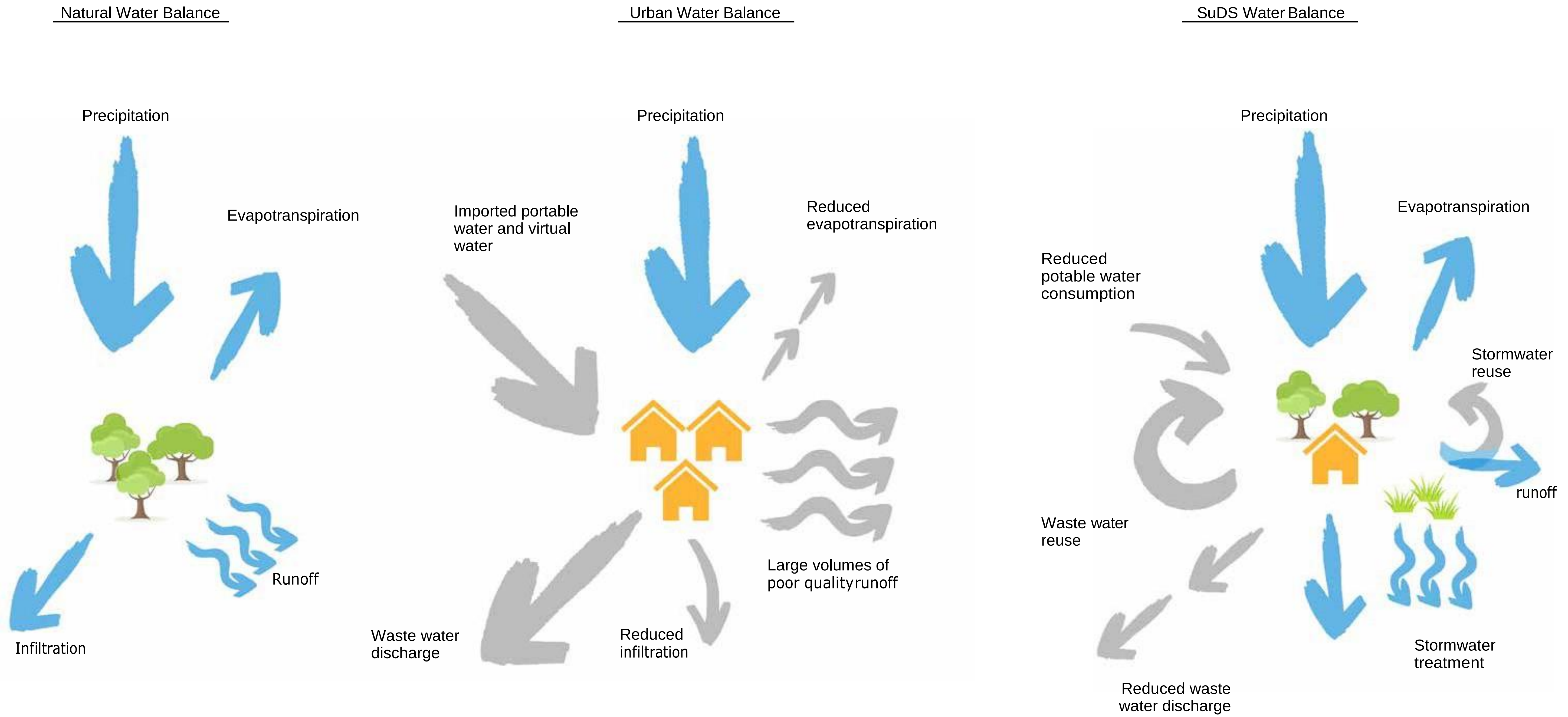


Figure 2.2 Diagrams Illustrating alternating water cycles


125
125
OOTHS FARM RD
123

Existing Planning Policy

3.0

3.0 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. It includes policy TP6 on the management of flood risk and water resources 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[1]. 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 to just 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 relative 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

Policy Recommendations

4.0

4.0 Neighbourhood Plan Policy Recommendations

Neighbourhood Plans have to support the strategic plans set out the Local Development Plan and 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 and 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 the SuDS Design Guidelines have been used mitigate for run-off generated from an increase in impermeable area covering the site.

SuDS Design Guidelines

5.0

5.0 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 from 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 we either cannot infiltrate (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 that infiltration SuDS can be used and where there use is limited due to the ground conditions. This mapping should be used as a guide and drainage test should be done on site to understand infiltration rate potential.

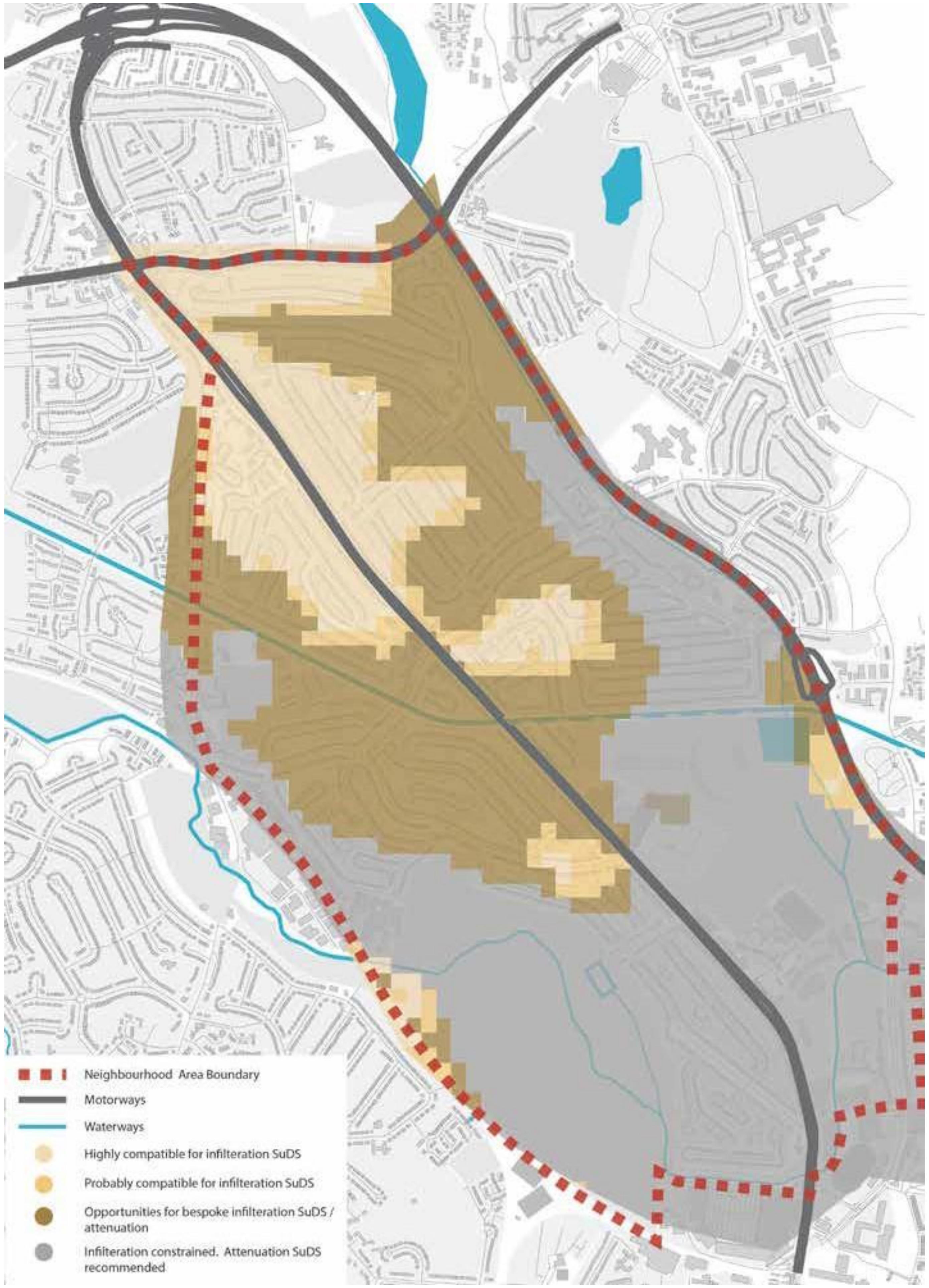


Figure 5.1 Map showing 3Bs areas of infiltration SuDS

5.1 SuDS Definitions

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

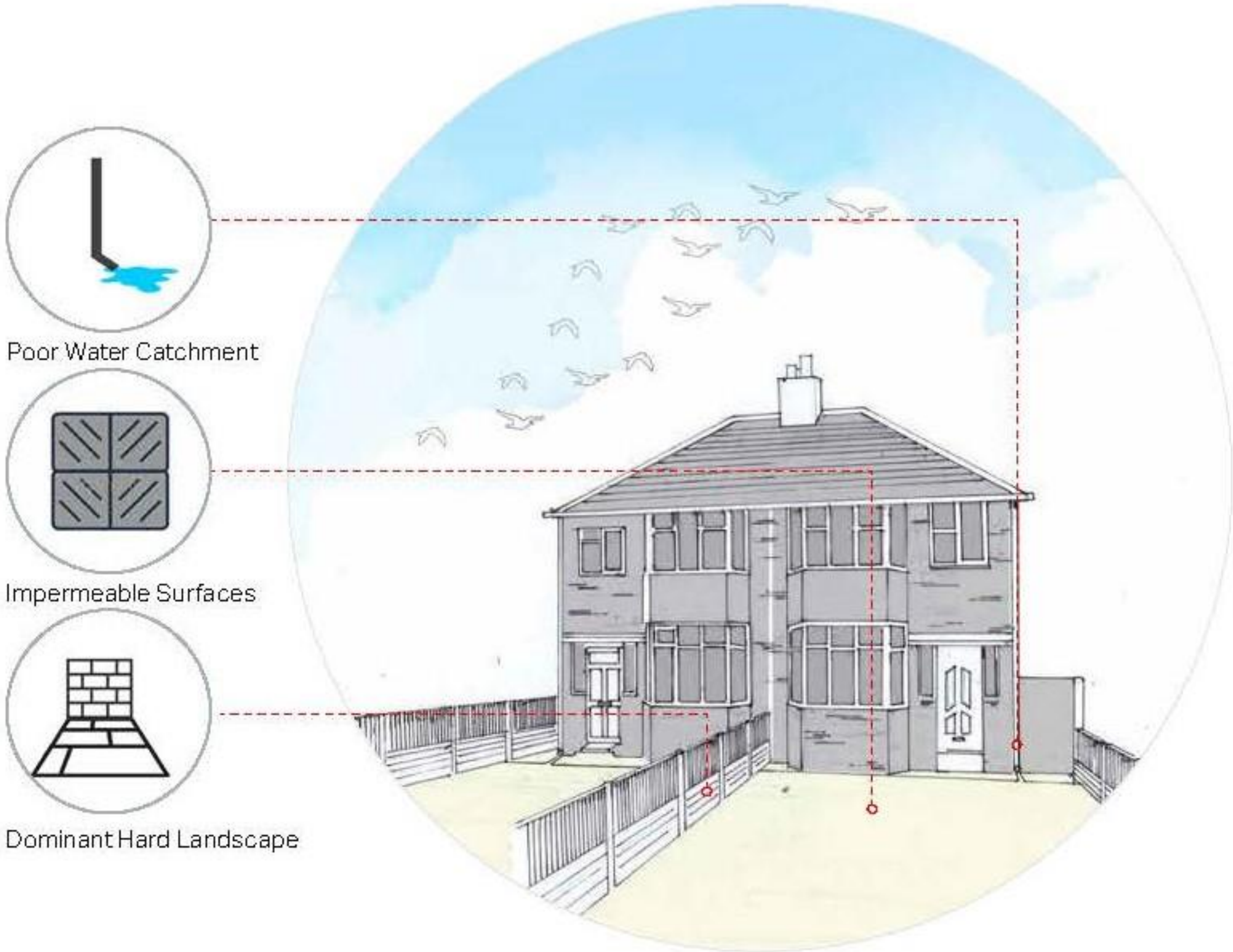
Soak way / rain garden – These planted spaces are designed to enable water to infiltrate into the ground. Cutting of downpipes and enabling roof water to flow into rain gardens can significantly reduce the runoff into the sewer system. The UK Rain Garden Design Guidelines provides more detailed guidance on their virility 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 be able 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 realised when the sewer has greatest capacity to accept it.

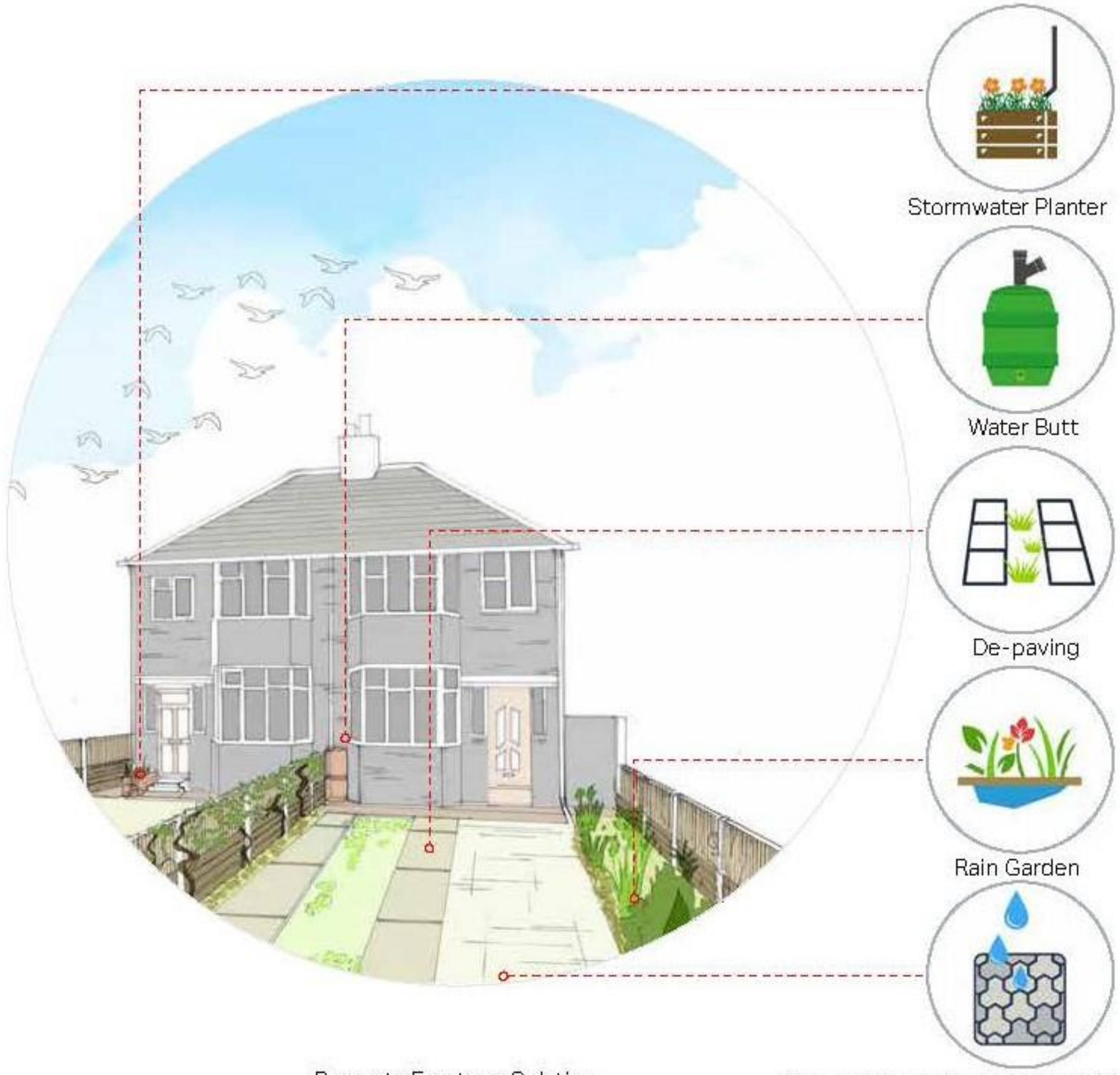
Green roofs – Vegetated roofs help to slow the flow of water to down pipes. As the substrate layer pr attenuation space, the thicker the substrate layer, the higher the storage volume on the green roof. In heavy rainfall events these can get overwhelmed but can provide around 5-10% of attenuation needs.

5.2 Current Design Issues

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.

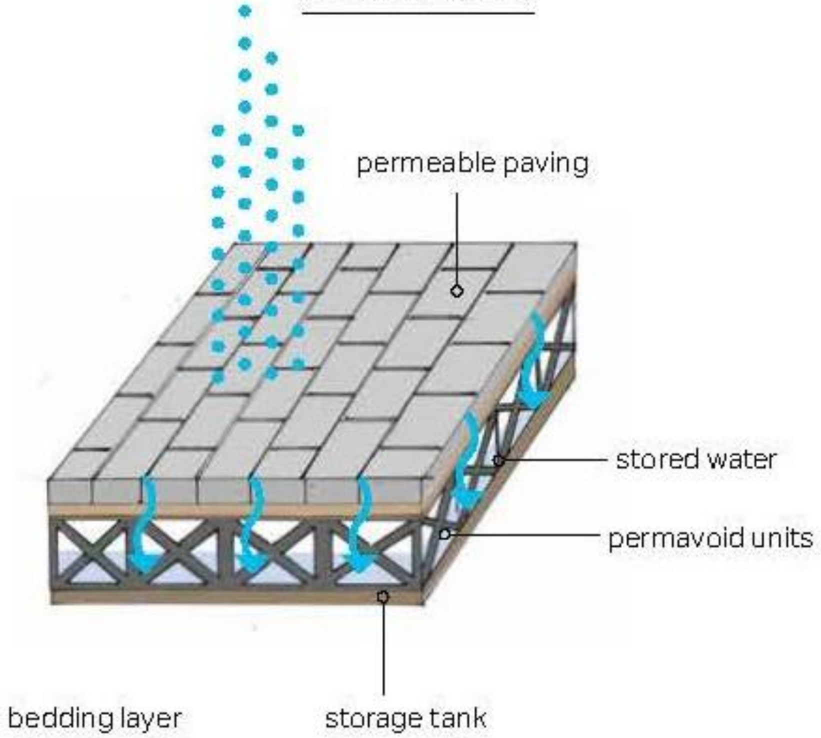


Property Frontage Issue

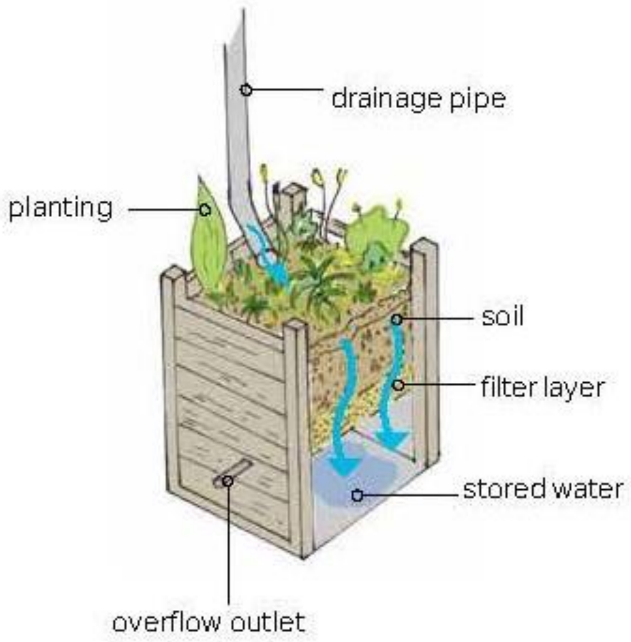


Property Frontage Solution

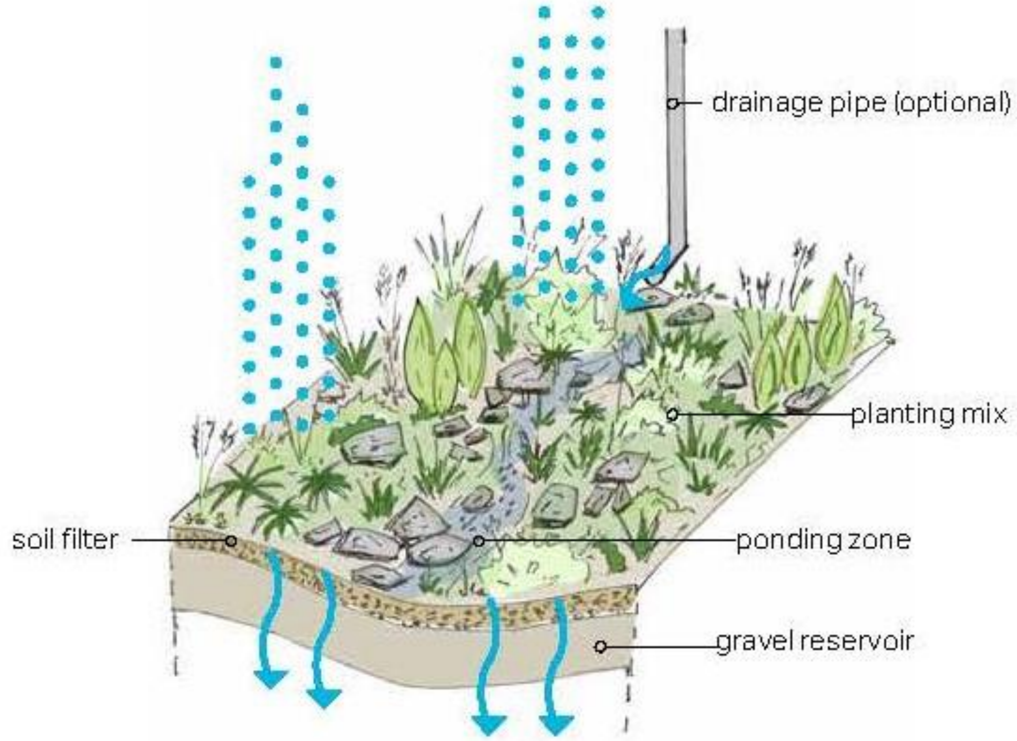
Permavoid Units



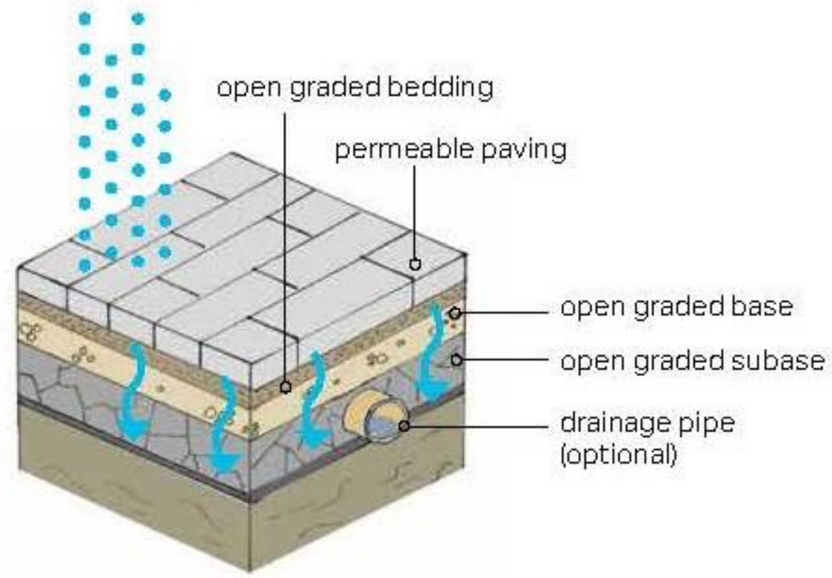
Storm water planter



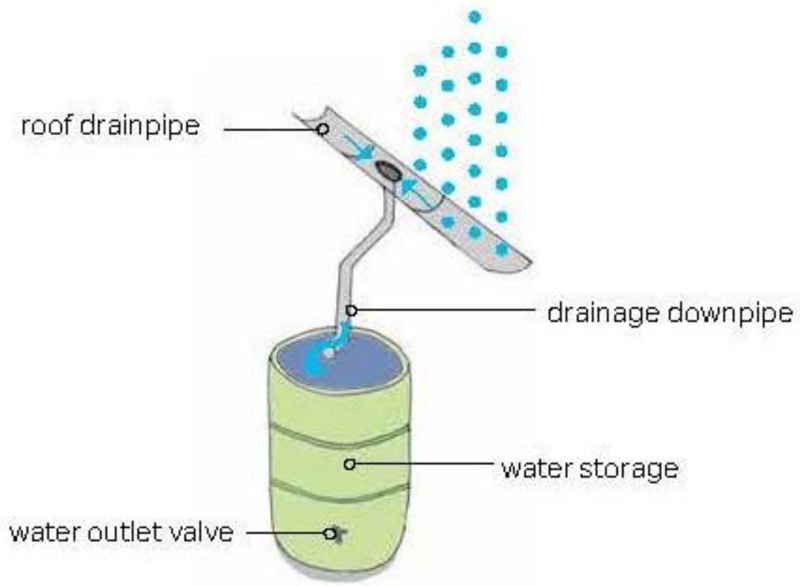
Rain Garden



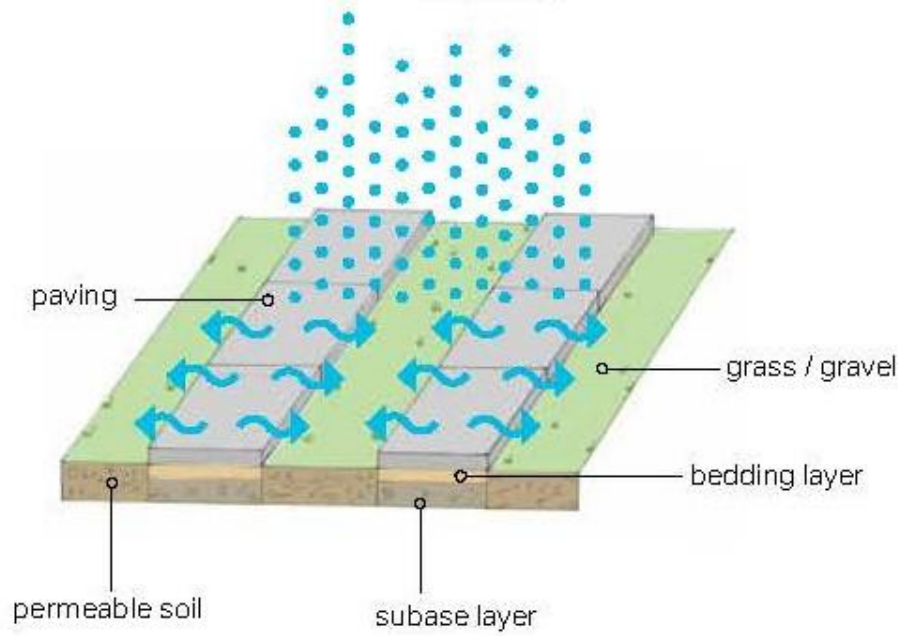
Permeable Paving

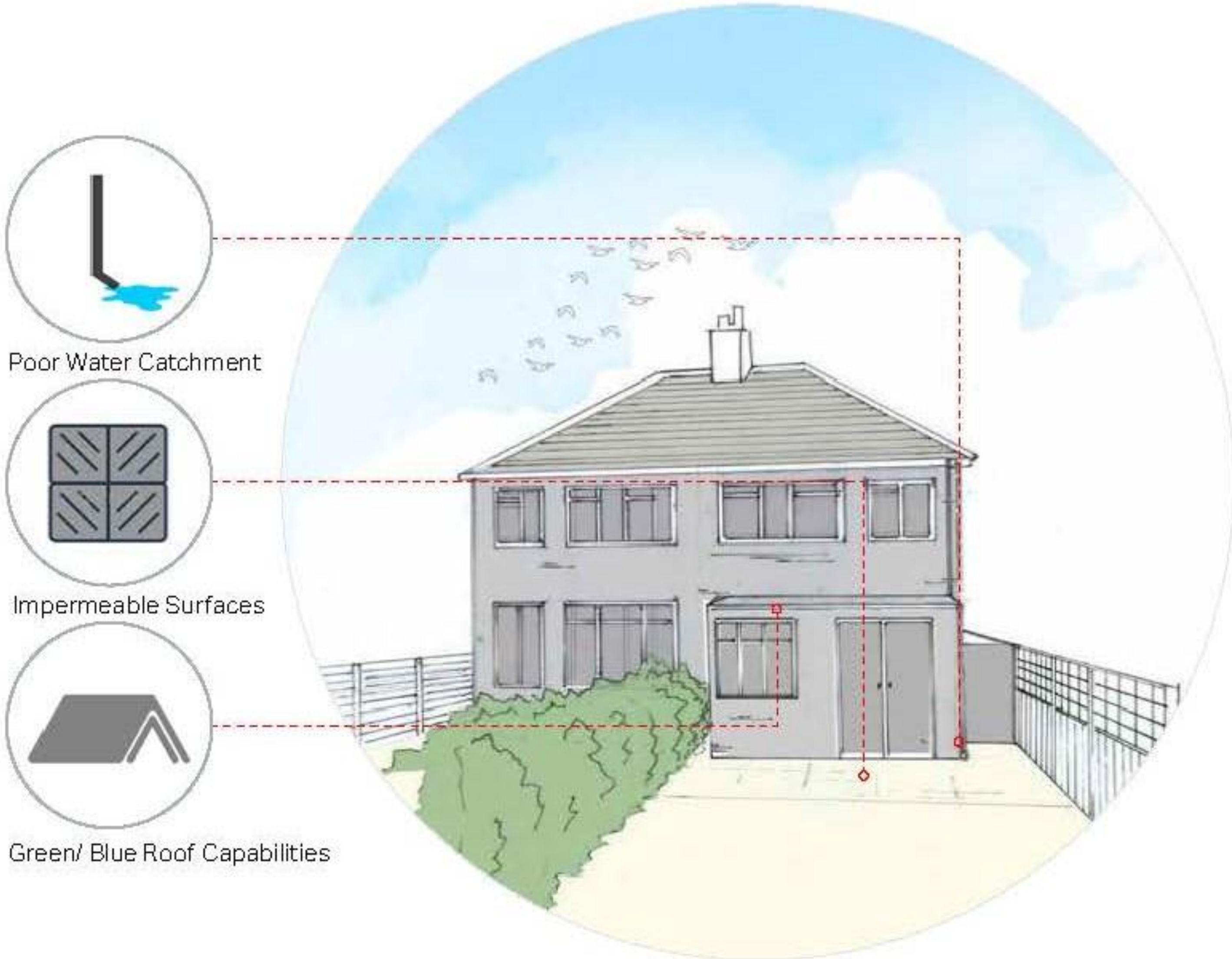


Water Butt

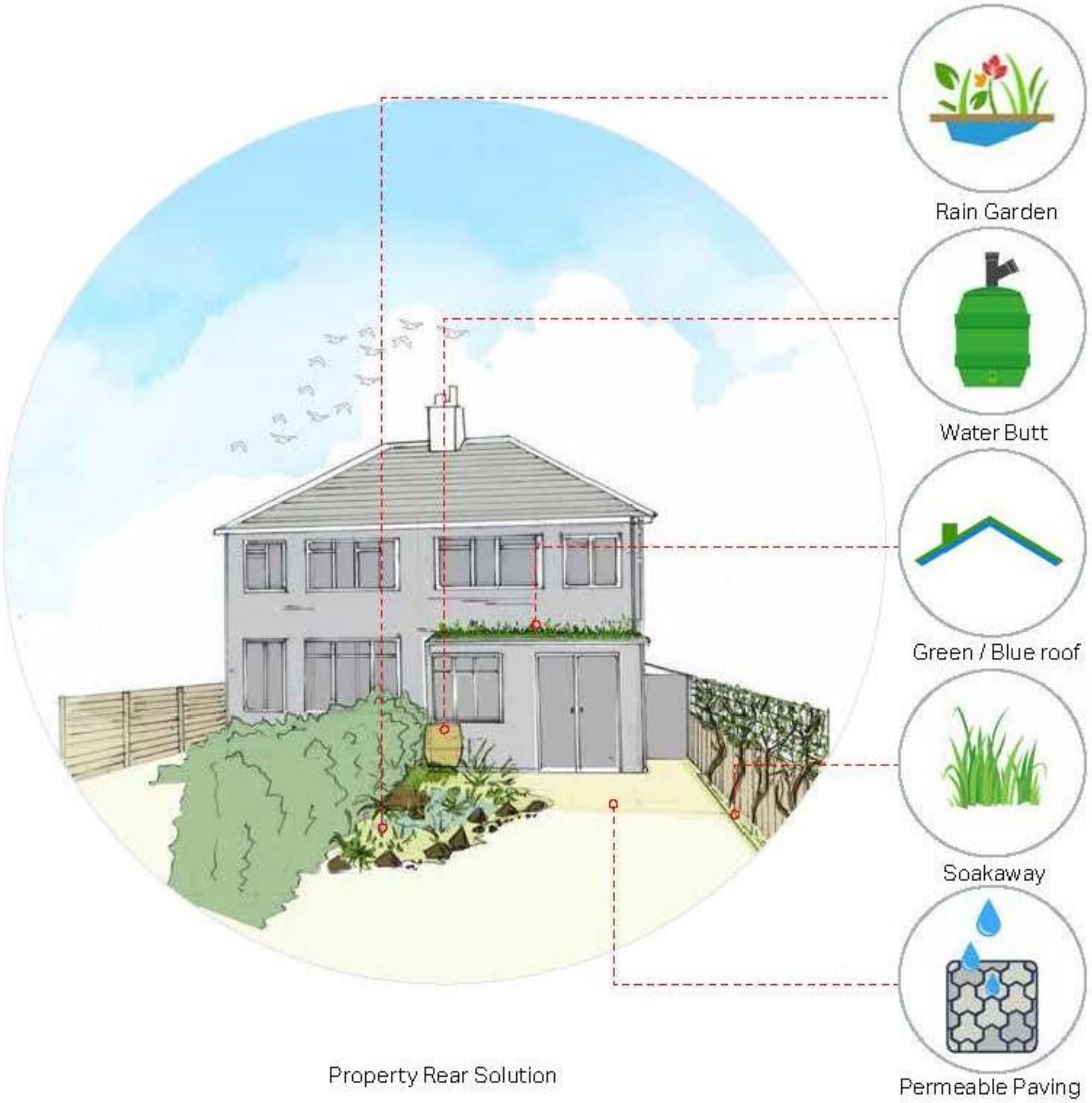


Depaving



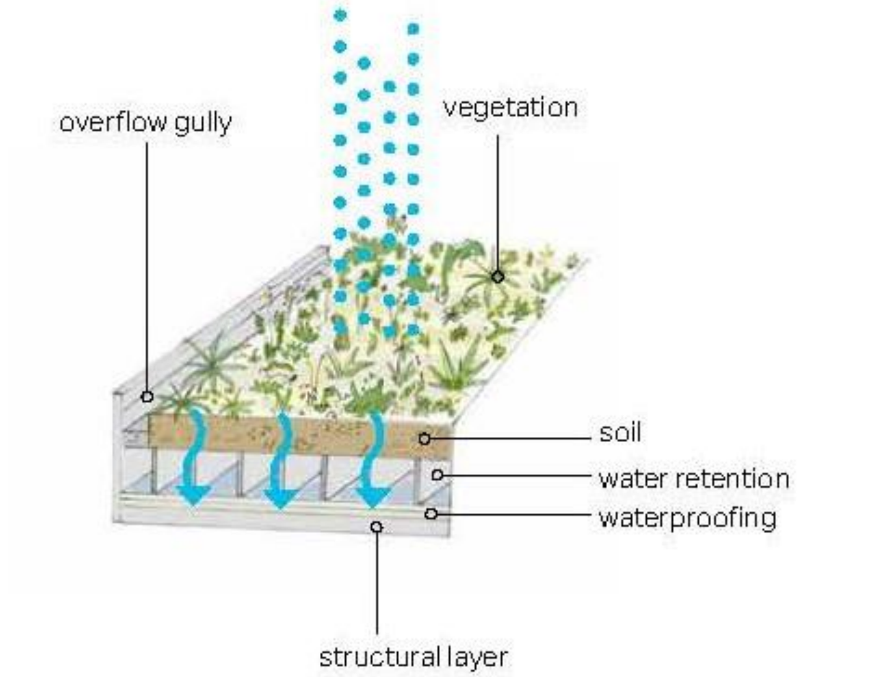


Property Rear Issue

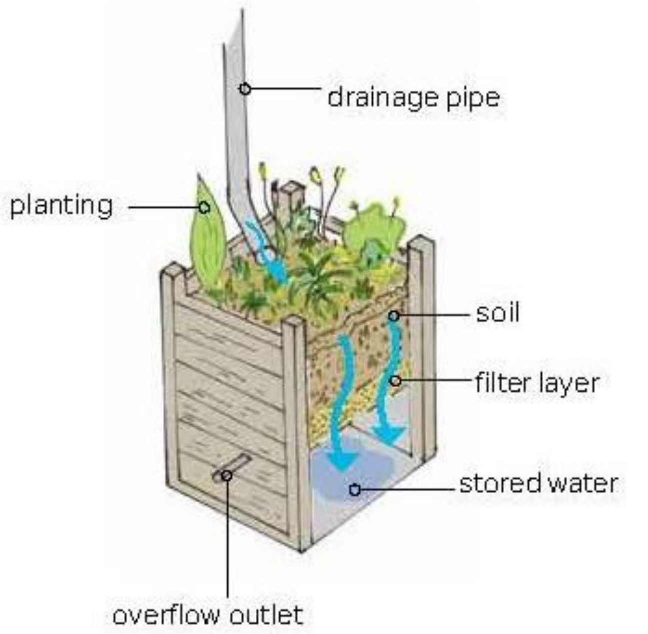


Property Rear Solution

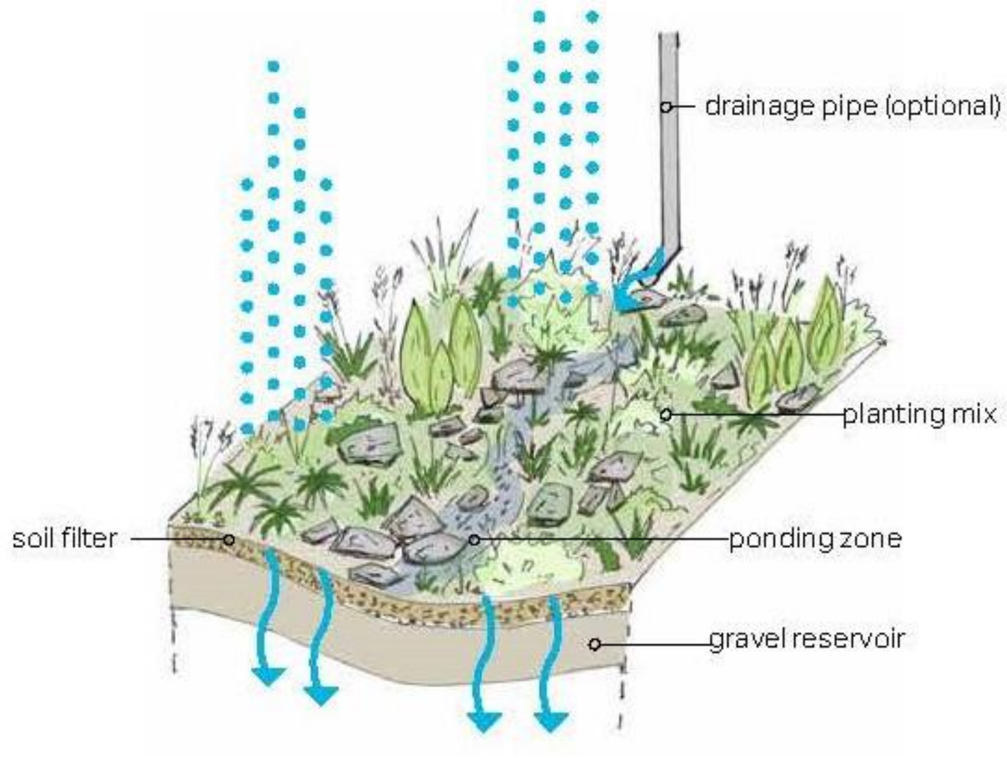
Green/ Blue Roof



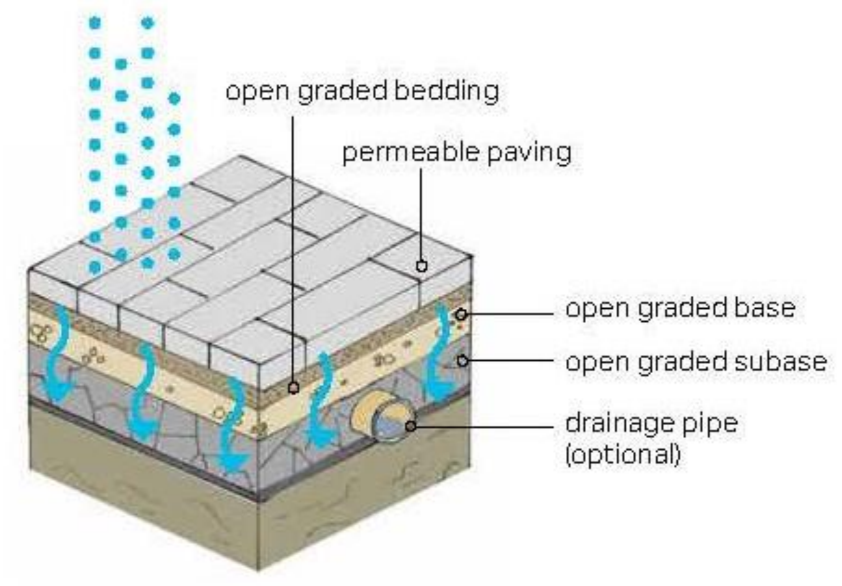
Storm water planter



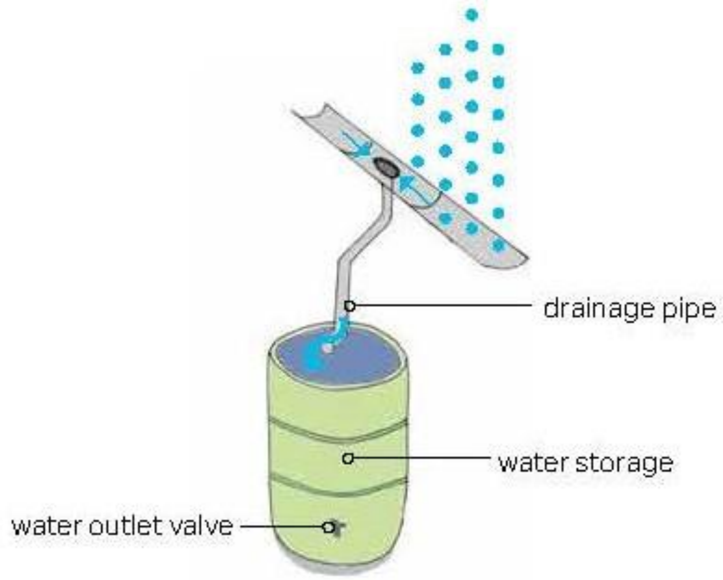
Rain Garden



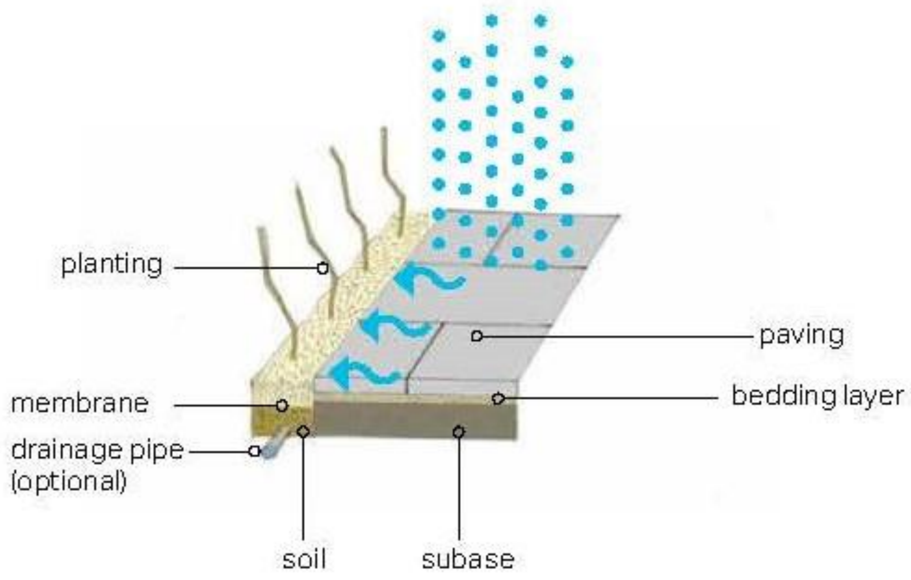
Permeable Paving



Water Butt



Soakaway



Calculating Attenuation Volume

06

6.0 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 flowing 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.

he following tables represent a 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

Design Criteria

Specify volume control approach — This section auto-updates. Leave default values. — 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

IH124 method

IH124 specifically addresses the runoff from the small catchments (Institute 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 requirements 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 (i/s)		
1 in 1 year (l/s)		
1 in 30 year (l/s)		
1 in 100 years (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.

Estimated storage volumes

	My values	Map values
Interception storage (m^3)		
Attenuation storage (m^3)	Required	
Long term storage (m^3)		
Treatment storage (m^3)		
Total storage (m^3)		

Attenuation storage required for proposed impermeable area increase. This is a guidance tool only.

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