Department
for Environment,
Food & Rural Affairs

Guidance

# National standards for sustainable drainage systems (SuDS)

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**Applies to England**

Contents

This publication is available at https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds

# Introduction

The national standards provide information for designers, property developers, local authorities and other interested parties, such as sewerage undertakers and the Environment Agency. They also contain links to additional supporting information relating to sustainable drainage systems (SuDS).

These standards are intended for application in the design of surface water drainage systems for new infrastructure and development, whether on greenfield or brownfield sites. They are not designed to apply to retrofit SuDS designs[footnote 1], which often have different objectives and face broader constraints. However, the standards could serve as a starting point for retrofit design. It is important to acknowledge that constraints specific to retrofit projects may prevent the full application of the standards.

These standards only apply to the management of surface water runoff that is essentially uncontaminated and consists predominantly of rainwater. For some land uses, where there is a higher risk (for example, a large car park), the inclusion of proprietary measures as opposed, or in addition, to SuDS may be needed. However, where there is a risk of pollution, an Environmental Permit or Registration of an Exemption may be required from the Environment Agency.

Although these standards apply for developments which include road drainage, they are not intended to be applied to the trunk road network managed by National Highways. Equivalent provision for SuDS for these roads is contained in the Design Manual for Roads and Bridges.

# How the national standards work

An introductory principles section is included to assist with understanding of the basis for the requirements of these standards. The principles for surface water drainage design explain the objectives and approach for applying the standards.

There are 2 types of standards:

- the hierarchy standard (standard 1) gives criteria for prioritising the choice of final runoff destination
- fixed standards (standards 2 to 7) state the minimum design criteria that all surface water drainage systems should satisfy and how they should be built, maintained and operated

Both types of standards have accompanying requirements which provide detail on how to interpret, deliver and evaluate each standard.

The 7 standards are complementary, and the delivery of each standard should support delivery of the other standards. A surface water drainage system design that delivers multiple benefits will include a range of features and each of these should contribute to the delivery of several, if not all, of the standards.

There may be specific circumstances or constraints, such as the type or size of a development that mean it is not possible to deliver one or more of the standards. In these circumstances the opportunity to meet the standard shall be maximised and justification be developed in consultation with the approving body, who may agree to a departure unless regulatory controls prohibit such a departure.

The standards and accompanying requirements are set out using the following format:

## Requirement heading (sub-heading for standards)

1.1 Requirement text (the primary clause for the requirement)

1.1.1 Requirement sub-text (supportive or explanatory text)

Note: used for advice or statements

Verbal forms have been used purposely throughout the national standards to clarify the requirements as follows:

- must – this is a legislative or statutory requirement set out in regulations at national or international level
- shall – this indicates a performance or method-based requirement of the standards which can only be varied through a departure agreed with the approving body
- should – this is a recommendation, providing advice on how a requirement should be satisfied. A recommendation indicates that, among several different options, one is recommended as particularly

suitable without mentioning or excluding others. A departure is not required to be agreed with the approving body provided that an appropriate justification is recorded

- may – this is a permissible option or approach, providing clarity on specific options which are permitted to satisfy a requirement
- can – this is a clarification of a concept or statement of fact, and is generally presented as a note

Please note that the glossary at the end of this document aims to explain and clarify any unfamiliar terms or specialist words used in this document.

# Principles

This section provides the principles which underpin the standards and the approach that surface water management schemes shall follow to meet them.

## Natural approach to managing water

**Principle 1**
Surface water drainage systems shall be designed, constructed, maintained and operated following a natural approach to managing water. This should mimic natural drainage, manage surface runoff at or close to the surface and as close to its source as practicable. This approach should also control the flow of runoff and provide a range of additional benefits. It contrasts with traditional drainage techniques, which are based on underground pipes to convey runoff away from the development as quickly as possible. By following this natural approach, surface water shall be utilised as a resource on site with multiple benefits to the environment and society, helping to combat climate change, meet future water needs[footnote 2] and protect receiving waters and their associated ecology.

**Principle 2**
The most effective surface water drainage systems use a series of different drainage features, operating as close to the source of runoff as practicable. These should work as a SuDS management train to control flow rates and reduce volumes of runoff, providing water quality benefits and opportunities to encourage biodiversity and amenity.

**Principle 3**
This is referred to as the ‘SuDS Approach’ throughout the standards and is defined as:

- mimicking natural drainage systems and delivering surface water management that recognises the value of rainfall and runoff as a resource
- managing surface water flooding and the rates and volumes of runoff from developments now and in the future
- contributing to cleansing diffuse particulate and chemical substances that may be found in surface water runoff
- using drainage features in combination as a management train, which integrates these throughout the development and its landscape to help create healthy and resilient spaces for people and habitats for wildlife
- managing runoff close to its source, prioritising features that lie on the surface and incorporate vegetation
- meeting the requirements for delivering multiple benefit SuDS over the lifetime of the development by planning for a changing climate and ensuring long-term maintenance
- being sustainable, considering both construction and long-term maintenance and the additional environmental and social benefits afforded by the system

## Early and integrated design

**Principle 4**
Surface water management should be considered at the very earliest stages of site appraisal, planning and design to support and be integrated with:

- the existing topography, hydrology and watercourses on the site
- the water supply strategy
- the layout of the roads, buildings and public open spaces

- any remediation strategy needed for land contamination associated with existing or previous land uses
- any biodiversity, amenity and green infrastructure delivery strategy
- climate resilience options for the development

**Principle 5**
Planning of a new site layout should be informed by the requirements of the surface water management systems to both effectively drain and ensure all areas of the site are served by SuDS where possible. Opportunities should be maximised to help cleanse runoff prior to discharge to the water environment of diffuse particulate and chemical substances that may have been entrained. Consideration of the presence of any existing watercourses, ditches and other drainage features, both within and adjoining the site, should inform proposals. By doing so, biodiversity, amenity and cost-effectiveness can be maximised. This should be done by using areas of land throughout the development for a range of multifunctional purposes in addition to surface water management (for example, landscaping, recreational areas, streets and rainwater harvesting).

**Principle 6**
Conveyance systems should follow the natural drainage routes through the site, resulting in exceedance routes doing the same. This ensures exceedance flows can be captured further downstream and minimises the risk to buildings and people. The design process should include professional planning, urban design, landscape and ecology considerations delivered in an integrated and co-ordinated way. This will deliver the greatest amenity and biodiversity outcomes from these standards.

**Principle 7**
Development design should take account of existing flood risk policies in local plans, alongside local flood risk management strategies (LFRMS), the relevant local authority adopted SuDS guidance, any flood risk assessments, surface water management plans, the flood risk management plan and the river basin management plan (RBMP).

**Principle 8**
Early engagement with the local planning authority (LPA) should be undertaken to agree design, construction, operation and maintenance considerations to support an efficient application process. The LPA should be able to direct the applicant to relevant local plans, strategies and guidance.

## Links with development planning

**Principle 9**
Developers should demonstrate compliance with the national standards from the conceptual stage of the planning application process and that a ‘SuDS Approach’ has been integrated throughout the development and its landscape design.

**Principle 10**
All appropriate planning applications should demonstrate how the national standards have been met in the site design.

**Principle 11**
Where a development is phased, the design of the surface water drainage system should ensure that each of the standards will be delivered for each phase of the development. The proposals should consider the effects of each stage of site development, as well as the performance of the surface water drainage system. This is to ensure risks are mitigated and both short-term and long-term benefits are maximised.

# Standard 1: runoff destinations

1.1 A ‘SuDS approach’ shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.

1.2 Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- priority 1: collected for non-potable use
- priority 2: infiltrated to ground
- priority 3: discharged to an above ground surface water body

- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer

Note 1: priority 1 is the highest priority and priority 5 is the lowest.

Note 2: for the purposes of this standard, a combined sewer is a sewer intended to receive both foul sewage and surface runoff and does not include a sewer intended to receive only foul sewage, even if it has the capacity to accommodate additional flows or has an element of surface water in it already.

1.3 To utilise a lesser priority final destination, appropriate evidence shall be provided that demonstrates all higher priority final destinations have been utilised to the maximum extent practicable. Higher cost alone shall not be a reason to utilise lower priority final destinations.

1.4 Where more than one final destination is utilised, each final destination's ability to accept runoff shall be maximised in order of priority.

## General requirements

1.5 The use of higher priority final destinations shall not be discounted because the development site is, or was, contaminated where practicable remediation strategies can be developed in conjunction with the drainage system design[footnote 3].

1.6 Where access to third party land is required to facilitate discharge to a final destination, evidence that any necessary easements are in place for the lifetime of the development shall be provided to the approving body.

1.6.1 Where an applicant demonstrates they cannot obtain the right to discharge, the local authority may be able to obtain such a right through its powers under paragraph 29(1) of Schedule 2 of the Flood and Water Management Act 2010. These allow it to construct and maintain new works for the purpose of flood risk management.

1.7 The runoff from development shall not increase the risk of flooding elsewhere from any source[footnote 4].

1.8 The runoff from the development shall not cause a risk of pollution of groundwater or surface water bodies, in accordance with standard 4.

1.9 The surface water drainage design shall not contribute to the depletion of surface waters or groundwater beyond safe environmental levels. For example, as set out in the Water Environment (Water Framework Directive) Regulations 2017[footnote 5] (WFD) or measured by the hydrological regime element[footnote 6].

1.10 Surface water runoff from the development shall not discharge to a foul drainage system.

Note: this is not applicable to runoff from areas integral to a foul water pumping station.

## Non-potable use

1.11 Rainwater harvesting shall be considered in all circumstances where any of the following apply.

1. There is a demand for non-potable water and available contributing catchment area that will deliver safe and efficient water savings.
2. There is a need for landscape irrigation.
3. The development is in an area identified as seriously water stressed[footnote 7].

Note: examples for 1.11.1 include industrial, commercial, horticultural, educational, public sector, residential and multiple-occupancy buildings.

1.12 Rainwater harvesting systems intended for the management of large rainfall events shall be designed in accordance with BS EN 16941[footnote 8]. Rainwater harvesting systems shall be designed in accordance with adopted best practice guidance and tools and demonstrate performance against an appropriate rainfall time series as set out in BS EN 16941[footnote 8]. Reference should be made to the Environment Agency's Rainwater harvesting: regulatory position statement[footnote 9].

1.13 Any communal rainwater harvesting system not within the same curtilage of the property that it serves shall consider public health and security.

## Infiltration to ground

1.14 The use of infiltration drainage shall be dependent on the ground conditions being suitable and adequate infiltration rates being identified using the assessment methods detailed in standard 3.

1.14.1 The approving body may consider appropriate industry mapping[footnote 10] to form an initial evidence base on the appropriateness of infiltration and whether further ground investigations are necessary.

1.15 The base of infiltration drainage features shall not be within 1m of the maximum likely groundwater level on the site with levels determined in accordance with requirement 4.16.1.

1.15.1 Consideration should be given to both pre and post-development groundwater hydrology, building platforms and drainage features.

1.16 The use of infiltration drainage shall not result in an unacceptable risk of instability through ground movement or subsidence in accordance with standard 7. This includes the stability of riverbanks and coastal features[footnote 11].

1.17 The use of infiltration drainage shall not result in an unacceptable risk of groundwater and surface water pollution, groundwater flooding, or ingress to combined or foul sewers.

1.18 The use of deep-bore infiltration features is not considered to follow a ‘SuDS Approach’ and shall be by exception and an agreement in principle with the relevant risk management authority provided to the approving body.

## Discharge to an above ground surface water body

1.19 The principle to discharge to the receiving above ground surface water body, including flow parameters, for example, discharge rates and volumes, shall be agreed in writing with the relevant risk management authority.

Note: the purpose of this requirement is to agree a discharge of runoff to the surface water body in principle. This does not remove the need to obtain regulatory permits or consents.

## Discharge to a surface water sewer or another piped surface water drainage system

1.20 The principle to discharge to the receiving surface water sewer or another piped surface water drainage system, including flow parameters, for example, discharge rates and volumes, shall be agreed in writing with the relevant risk management authorities and owner (if different) for the downstream system. Confirmation that the receiving system has capacity to accommodate the additional flows and the location a connection is to be made, shall be provided to the approving body.

## Discharge to a combined sewer

1.21 Where runoff from the development is not being discharged to a higher priority final destination (requirement 1.2) it shall be discharged to a public combined sewer.

1.22 The principle to discharge to the combined water sewer, including flow parameters, for example, discharge rates and volumes, shall be agreed in writing with the relevant risk management authorities and owner (if different) for the downstream system. Confirmation that the receiving system has capacity to accommodate the additional flows and the location a connection is to be made, shall be provided to the approving body.

1.22.1 Where there is insufficient capacity now (or in the future) in the receiving combined sewer or wastewater treatment works as defined by the sewerage undertaker either in writing or their published drainage and wastewater management plan (DWMP), the developer should collaborate with the sewerage undertaker and other risk management authorities. The developer should identify and fund opportunities to create sufficient capacity within the relevant receiving system where this can be provided prior to construction.

1.23 The risks of possible pollution from surcharging or flooding from the receiving combined sewer shall be assessed and mitigation provided to demonstrate the risk is not increased due to the development.

### Pumping requirements

1.24 The use of pumping within surface water drainage systems shall be by exception only and agreed with the approving body due to the associated carbon, energy and maintenance implications, and the risks associated with failure and exceedance.

1.25 The need for pumping should be assessed against the use of a lower priority final destination which is achievable by gravity.

1.25.1 The assessment should consider the cost effectiveness of pumping and risk of pump failure, including mitigation against pollution and flooding.

1.26 Pumping shall only be utilised for any parts of the development that cannot be drained by gravity.

1.27 Pumping stations shall be designed and built to industry recognised guidance[footnote 12], unless an alternative requirement is agreed in writing with the proposed adoption organisation and the approving body (if different).

1.28 Where the final destination drainage system has a pumping station downstream of the development discharge location, the developer shall provide confirmation in writing from the asset owner that adequate capacity is available to manage anticipated post-development flows.

## Standard 2: management of everyday rainfall (interception)

2.1 Apply a ‘SuDS approach’ so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems.

2.2 Evidence shall be provided that the approach to managing runoff from ‘everyday’ rainfall has been developed alongside and in support of the management of runoff quality (standard 4) and the delivery of amenity and biodiversity benefits (standards 5 and 6).

### General requirements

2.3 For developments that incorporate rainwater harvesting so no runoff leaves the development for lower order design storm events, the surface water drainage system is deemed compliant with standard 2. Evidence of this approach shall be provided in the form of calculations to BS EN 16941[footnote 8].

2.4 For developments that infiltrate entirely to ground so no runoff leaves the development for storm events with a 1 in 1 or greater chance of occurring each month, the surface water drainage system is deemed compliant with standard 2. Evidence of this approach shall be provided in the form of calculations and infiltration testing results.

2.5 Interception shall be delivered within the development for the first 5mm of rainfall for the majority of rainfall events, for both winter and summer seasons. This is to prevent runoff from the site for the majority of small (frequent) rainfall events and for the initial depth of rainfall for larger events. For compliance to be demonstrated, 80% interception shall be achieved during the summer (May to October) and 50% in winter (November to April).

2.6 Evidence shall be provided to demonstrate that the runoff from each positively drained surface, for at least 5mm of rainfall, is either collected for use, infiltrated into the ground, or else captured, conveyed and stored within SuDS features. These features shall naturally absorb or retain runoff and from these the runoff will be ‘lost’ to soils or the atmosphere and will not discharge off the site.

2.6.1 Demonstration of compliance should be provided with the use of industry recognised guidance[footnote 13], adherence to relevant policies that are within adopted publications, and using hydraulic models, which model infiltration and evapotranspiration, to demonstrate the effectiveness within any drainage design for meeting the interception requirements.

2.6.2 When undertaking the assessments where hydraulic modelling software is not being utilised, a simplified approach to delivering interception may be acceptable with the agreement of the approving body. Where an individual feature or a combination of features listed below are delivered, this shall be considered compliant with standard 2.

2.6.3 In circumstances where individual SuDS features do not provide adequate capacity for interception on their own, additional capacity can be provided by downstream features. Detailed calculations shall be provided to demonstrate compliance in these circumstances.

2.7 The interception methods below shall be considered to be compliant for zero runoff for the first 5mm rainfall for 80% of events during the summer and 50% in winter, with the following presumptions for each system.

**Green roofs or walls**
All surfaces that have green roofs or green walls that drain their own surface area only.

**Rainwater Harvesting (RWH) systems**
All surfaces drained to rainwater harvesting systems designed to BS EN 16941[footnote 8], whether for surface water management or just water supply, provided the RWH system design is based on regular daily demand for non-potable water from surface water runoff.

The inclusion of water butts is not considered to comply with standard 2 where they are limited to garden use during dry periods. They do not guarantee that storage will be available unless designed as such, in which case detailed calculations shall be provided to demonstrate compliance.

**Soakaway or infiltration systems**
Areas of the development drained to systems that are designed to infiltrate runoff for events with a 1 in 1 or greater chance of occurring each month. Design of the infiltration system should be in accordance with industry recognised guidance.

**Permeable surfaces**
All permeable surfaces, whether lined or not, shall be assumed to comply provided there is no additional area drained to the permeable pavement.

Where the surface also drains an adjacent impermeable area, compliance shall be assumed for all soil types where the system is unlined if the additional impermeable area is no greater than the permeable area.

Where the infiltration capacity of the ground below the permeable surface is greater than $1x10^{-6}$ m/s and unlined, up to 5 times the permeable surface area may be added as additional contributing area. For example, to comply with standard 2 for an impermeable surface area of $100m^2$, the area of the permeable surface shall be $20m^2$.

Where the permeable surface also drains an adjacent impermeable area and is lined, compliance shall not be deemed to have been achieved, and additional downstream interception features will be required.

**Swales**
As a minimum, where the longitudinal gradient of a swale is less than 1:100 and has at least 500mm of suitable base material, swales are suitable for interception for impermeable surface areas up to 5 times the base of the vegetated surface area receiving the runoff, whether lined or unlined. For example, to comply with standard 2 for an impermeable surface area of $100m^2$, the area of the vegetated base shall be $20m^2$.

Any swale which is unlined and has a longitudinal fall which is less than 1:100 and an infiltration capability greater than $1x10^{-6}$ m/s shall be assumed to comply with interception for a contributing area up to 25 times the base area of the swale. For example, to comply with standard 2 for an impermeable surface area of $500m^2$, the area of the vegetated base shall be $20m^2$.

Swales with longitudinal falls steeper than 1:100 shall not be deemed to provide interception unless additional effective interception design can be demonstrated.

Interception shall not be deemed to have been provided for impermeable areas draining to an unlined swale within 5m from the swale outlet, unless the swale is flat and has a slightly raised outlet to create a temporary storage zone to encourage infiltration before runoff takes place.

Greater interception capacity may be achieved by providing flat swales with greater temporary storage and infiltration, but these require detailed design based on the use of appropriate modelling.

**Infiltration trenches**
Roads drained by infiltration trenches shall be considered to provide interception.

**Detention basins**
Areas of the development drained to detention basins with a flat unlined base, for example, can infiltrate to ground (without specific provision for routing low flows directly to the outlet), shall be assumed to comply

where the drained impermeable surface area is up to 5 times the vegetated detention basin surface area receiving the runoff for any soil type.

The area of the basin that is assumed to contribute to interception of runoff shall be below the outlet level of the basin. For example, to comply with standard 2 for an impermeable surface area of 100m$^2$, the area of the flat unlined basin base shall be 20m$^2$.

Areas of the development drained to detention basins with a flat unlined base where infiltration rates are greater than 1x10$^{-6}$ m/s shall be assumed to comply where the drained impermeable surface area is up to 25 times the base area of the basin. For example, to comply with standard 2 for an impermeable surface area of 500m$^2$, the area of the flat unlined basin base shall be 20m$^2$.

Higher loading ratios may be achieved where specific provision is made for water being stored below the outlet pipe and higher infiltration rates exist. Where a basin is designed to infiltrate runoff, specific provision shall be made for the upstream control of sediments to minimise risks of waterlogging, high maintenance costs and reduced component amenity value.

**Bioretention areas and rain gardens**
Areas of the development drained to unlined bioretention features shall be assumed to comply where the impermeable surface area is up to 5 times the vegetated surface area of the bioretention component receiving the runoff. For example, to comply with standard 2 for an impermeable surface area of 100m$^2$, the area of the unlined bioretention feature shall be 20m$^2$.

**Attenuation ponds**
Areas drained by attenuation ponds (with a permanent water pool, which is effectively maintained by the outlet structure) are assumed not to deliver interception.

# Standard 3: management of extreme rainfall and flooding

3.1 A ‘SuDS approach’ shall be adopted to address the management of development runoff during extreme rainfall, including allowances for climate change and urban creep to:

- protect people and property on the development from flooding of the surface water drainage system
- mitigate any increased flood risk to people and property adjacent to or downstream of the development
- protect the receiving water body from morphological damage or minimise the impact on sewer capacity

3.2 When discharging to an infiltration feature, the system shall be appropriately sized to accommodate the design event based on ground conditions and contributing areas.

3.3 When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff (rate and volume) for the 1% annual exceedance probability (AEP) event shall be controlled to ensure the runoff from the development does not increase flood risk elsewhere.

3.4 When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff rate for the 50% AEP event shall be controlled to ensure development runoff from an event of this magnitude has no negative impact.

3.5 Any flooding from the surface water drainage system for events up to the 1% AEP event shall be managed within the development.

3.6 Any flooding from off-site sources for the 1% AEP event should be managed on site or safely routed through the site, ensuring any downstream risks are not increased compared to the pre-development scenario.

3.7 The risks (both on and off the development) associated with flooding from the surface water drainage system for exceedance events greater than the 1% AEP event shall be appropriately managed.

## General requirements

3.8 The most up to date guidance on climate change allowances[footnote 14] shall be used for the 3.3% AEP and 1% AEP design events unless stated otherwise. The Upper End Allowance shall be used for the relevant epoch based on the design lifetime of the proposed development.

3.9 Where runoff from the development is to an above ground surface water body that can accommodate uncontrolled surface water discharges without any associated environmental impact, then requirements 3.3 and 3.4 of this standard may not need to apply, subject to written approval by the relevant risk management authority.

Note: examples include the sea, large tidal estuaries or another surface water body specifically identified in the relevant RBMP and flood risk management plan.

3.10 Where local evidence supports an approach to managing surface water runoff from developments (for example, defining specific discharge controls for the location of development) that is more stringent than this standard, the local approach shall take precedence.

3.11 The design of surface water drainage systems shall take into consideration historical information on all forms of flooding and groundwater levels. Groundwater levels should be confirmed across the site through site investigation during high groundwater level periods.

3.12 The surface water drainage system should incorporate attenuation at multiple points across the development, rather than a single attenuation feature located prior to the point of discharge, unless justification is provided to the approving body.

3.13 Surface water drainage features shall not be located in areas identified at risk of flooding in the 1% AEP event from pluvial or fluvial sources unless designed to be and demonstrated to operate under flood conditions.

Note: areas identified as solely being at residual risk of flooding in the event of a reservoir dam failure or flood defence breach are not relevant to requirement 3.13.

## Infiltration

3.14 Geotechnical investigations shall be undertaken to ensure that the ground conditions are suitable for infiltrating surface water runoff in accordance with industry recognised guidance[footnote 15] and infiltration testing methods[footnote 16].

3.15 Discharge of runoff using point infiltration features shall not be fully relied on to discharge all runoff where the rates of infiltration are less than $1x10^{-6}$ m/s.

3.16 Infiltration features shall be designed so that rainfall events up to the 3.3% AEP event shall half empty their runoff volume within a maximum of 24 hours.

3.17 To account for uncertainties with soil infiltration rates, their possible reduction in performance over time, and the consequence of inadequate performance when using the RP 156 (CIRIA)[footnote 16] method, a factor of safety shall be used in sizing the infiltration feature or assessing its performance in accordance with Table S3.1.

**Table S3.1 – Factors of safety for use in the hydraulic design of infiltration systems when using the RP 156 (CIRIA) method[footnote 13]**

| Size of area to be drained | No damage or inconvenience from flooding | Minor inconvenience from flooding | Damage to buildings or structures, or major inconvenience (for example, flooding of roads) |
|---|---|---|---|
| Less than $100m^2$ | 1.5 | 2 | 10 |
| $100m^2$ to $1000m^2$ | 1.5 | 3 | 10 |
| More than $1000m^2$ | 1.5 | 5 | 10 |

## Runoff rates and volumes to surface waters or sewers

3.18 The peak allowable discharge rate from the development to surface waters or sewers for the 50% AEP event shall be limited to the equivalent 50% AEP greenfield runoff rate, or 3 l/s/ha, whichever is the greater.

3.19 Where the volume of runoff discharged from the development to surface waters or sewers for the 1% AEP, 6-hour rainfall event is greater than the volume of greenfield runoff for the same rainfall event, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 50% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater.

3.20 Where the volume of runoff discharged from the development to surface waters or sewers for the 1% AEP, 6-hour rainfall event is less than or equivalent to the volume of greenfield runoff for the same event, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater.

Note: runoff volume can be reduced so it is less than or equivalent to the volume of greenfield runoff through infiltration and interception methods which will also result in lower attenuation volumes.

3.21 For previously developed sites a ‘relaxation factor’ shall be applied to the target 50% and 1% AEP greenfield runoff rates where evidence is provided that demonstrates why greenfield runoff or 3l/s/ha rates cannot be achieved and this is agreed with the approving body.

3.21.1 This relaxation factor shall be no greater than 5 times the greenfield runoff rate.

3.22 Where the peak allowable discharge rate requires flow controls with orifices (or equivalent) with a diameter of less than 50mm, the flow control shall be robustly protected from blockage risks. Regardless of this, the risk of blockage for all flow controls shall be assessed and mitigated against.

3.23 In determining the maximum water levels, flows and attenuation storage volumes, the critical duration rainfall event should be used.

Note: different critical durations may apply to different storage features used on a development.

3.24 The surface water drainage design shall include analysis of the effects on the surface water drainage system if the outfall is likely to be surcharged.

3.25 Detailed non-technical summaries of the design approach, hydraulic calculations and results, and conclusions with respect to the surface water drainage system shall be provided.

## Calculation of greenfield runoff

3.26 Greenfield runoff rate(s) for the appropriate AEPs shall be estimated using the Environment Agency’s Flood Estimation Guidelines[footnote 17].

3.27 The 50% AEP greenfield runoff rate can be considered equivalent to the calculated $Q_{BAR}$ (mean annual flood) or $Q_{MED}$ (median annual flood) for the site.

3.28 The greenfield runoff volume for the 1% AEP 6-hour rainfall event shall be estimated using one of the approaches set out in the industry recognised guidance[footnote 13].

3.29 The entire development area that could potentially drain to the proposed surface water drainage system in an extreme event shall be used for estimating greenfield runoff rates and volumes (including both permeable and impermeable surfaces).

3.30 Climate change allowances should not be applied when calculating the baseline greenfield runoff rates and volumes from the site.

3.31 The soil parameters[footnote 18] used to calculate greenfield runoff rates and volumes shall be confirmed as representative of the site’s soil type by geotechnical investigation.

## Calculation of post-development runoff

3.32 Calculation of runoff from developments, including coefficients and other parameters, should follow industry best practice. Contributing pervious surfaces, including footprints of any SuDS features, should not be ignored.

3.33 Within developments an urban creep uplift factor shall be applied by adding a percentage increase to the calculated area of the impermeable area within the property curtilages. This shall be 10% for all

developments unless there are no external private permeable spaces, for example, flats and apartments, when it shall be 0%.

3.34 The most up to date rainfall data[footnote 19] for drainage design shall be used.

## Management of surface water flooding from the drainage system

3.35 The surface water drainage system shall be designed so that, unless an area is designated to hold or convey water as part of the design, flooding does not occur on any part of the development for rainfall events up to the 3.3% AEP event.

3.36 The surface water drainage system shall be designed so that flooding does not occur during rainfall events up to a 1% AEP event in any part of: a building (including a basement); any utility plant susceptible to water (for example, pumping station or electricity substation) within the development; or any route designed to provide safe access and escape during flooding.

3.37 Freeboard against flooding of any building, utility plant susceptible to water or route designed to provide safe access and escape during flooding shall be provided and should reflect the uncertainty in providing the level of protection required and the consequence of the flooding occurring.

3.38 The use of temporary flooding within the drainage design of any area which has multifunctional use, for example, recreation areas, shall be considered in terms of risk and impact during a period of flooding and rehabilitation requirements following an event and be appropriately mitigated. Any temporary flooding within highways shall be shallow, slow flowing and represent a low hazard[footnote 20] and shall not affect any route designed to provide safe access and escape.

3.39 The design of the surface water drainage system shall take account of surface water runoff from adjacent sites that could flow onto the site during a storm event.

3.39.1 Provision to convey such flows into the development drainage system should be made and the subsequent impact assessed, including the performance of the drainage system, water quality and permit implications. There is no requirement to provide attenuation for such flows, unless interacting with the surface water drainage system.

3.39.2 The design shall consider the potential for flood-locking to affect the operation of the system, which may bring about the need for additional storage. Causes of flood-locking could include high water levels in watercourses, estuaries, the sea or groundwater.

3.40 The surface water drainage system shall be assessed for exceedance events in excess of the 1% AEP event with expected exceedance routes identified across the development to confirm there is no adverse flood risk to the development or elsewhere.

# Standard 4: water quality

4.1 Apply a ‘SuDS approach’ that protects surface waters, groundwater and coastal waters by managing the quality of the surface water runoff to adequately address water quality risks from the development.

4.2 The proposed SuDS management train(s) shall be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters, reflecting industry recognised guidance[footnote 21] or other quantitative assessment as agreed with the approving body and permitting requirements[footnote 22].

## General requirements

4.3 A suitable water management train shall be provided for within the development that uses source, site and regional control measures as required.

4.4 Evidence shall be provided to demonstrate that a pollutant risk assessment has been undertaken and appropriate management of the risk from diffuse particulate and chemical substances in the surface water runoff has been provided in accordance with recognised industry guidance[footnote 23].

4.5 SuDS features located in publicly accessible or visible locations shall be designed and maintained to provide a suitable quality of water for aesthetic and amenity reasons and to support biodiversity whilst being safe to the public and not environmentally polluting.

4.5.1 Attenuated water should generally be clear, well oxygenated, avoid any strong or unpleasant odours or significant oil sheen[footnote 24], discolouration, or contain debris, excessive organic detritus or litter. Nutrient inputs may also need to be controlled.

4.6 The surface water drainage design shall consider whether there are local opportunities to support improvements to receiving or nearby groundwater, surface waters, or delivery of nutrient neutrality objectives in affected catchments where reasonable and practical to do so, and proportional to the scale of development. Consideration should be given to:

- the relevant RBMP
- DWMPs
- local water cycle studies
- conservation objectives for designated ecological sites
- other local published and adopted strategy for improving the receiving water bodies (for example, local nature recovery strategies)

4.7 Surface water runoff from land uses with a higher risk to surface and groundwaters are likely to require proprietary treatment products as part of the management train to ensure adequate treatment (for example, from large car parks or more heavily trafficked roads)[footnote 24]. These products shall be supported by sufficient evidence of their likely performance to the satisfaction of regulators to ensure they will provide the necessary treatment for the lifetime of the development with appropriate maintenance (for example, oil separators or vortex flow separators).

4.8 The pollution risk to surface water and groundwater from some land uses is so high that it is unlikely to be appropriate for them to drain to surface water or groundwater using a ‘SuDS approach’. Appropriate self-contained and discrete storage or treatment facilities will be required. Where possible the runoff from these land uses should be discharged to the public foul sewer under consent from the sewerage undertaker or removed by an appropriate waste management contractor for offsite disposal at a licenced waste facility. Examples of land uses where this may apply include vehicle refuelling facilities or washing operations, or small areas handling hazardous or highly polluting materials.

4.9 Where discharge to the public foul sewer or off-site disposal is not practical or possible, and the runoff therefore needs to be discharged to the environment, an Environmental Permit is likely to be required from the Environment Agency in accordance with the Environmental Permitting (England and Wales) Regulations 2016. Examples may include industrial and waste management facilities, but also potentially lorry and bus or coach parking and turning sites. In these circumstances, the Environment Agency should be consulted as part of a permit pre-application process[footnote 25].

4.10 The surface water drainage design shall consider and mitigate the risks of sediments and associated chemical substances being remobilised into receiving waters during higher flow events. This is to minimise the washout of chemical substances as far as is reasonably practicable and ensure they are retained in the SuDS. An appropriate maintenance regime should be implemented to support management of this risk.

4.11 The design of the surface water drainage design shall ensure as far as is reasonably practicable that there is the ability to intercept and contain a pollution incident whilst allowing for the practical removal of any contaminated water and system rehabilitation. Where there is a high risk, such as discharge into a designated site, this may require the provision of penstocks or other proprietary measures.

4.12 The proposed surface water drainage system shall provide resilience to climate change to ensure that the SuDS features continue to operate as intended. The SuDS features shall support the cleansing of particulate and chemical substances entrained in surface water runoff and biodiversity benefits, as well as maintain suitable aesthetics where positioned in publicly accessible or visual locations.

4.13 Where runoff is collected within rainwater harvesting features, designs shall incorporate the treatment required for any proposed usage with reference to industry published guidance[footnote 8].

4.14 The design of new outfalls should ensure that pollution tracing remains possible and have access covers indicating the nature of the water and flow direction.

## Discharging surface water runoff to ground

4.15 When discharging surface water runoff to ground, guidance in industry published guidance[footnote 13] shall be followed and appropriate assessment undertaken, consistent with the Environment Agency’s groundwater protection guidance[footnote 26].

4.16 The risk assessment should demonstrate the suitability of a specific drainage system design in reducing pollutants to acceptable levels prior to infiltration into the unsaturated zone together with the protection afforded by the unsaturated zone to the groundwater. The risk assessment approach should follow the guidance set out in industry published guidance[footnote 13].

4.16.1 For SuDS wholly relying on infiltration there shall be a minimum depth of unsaturated ground of 1m between the base of any infiltration feature and the maximum likely groundwater level to provide protection to the groundwater from pollution.

4.16.2 The design of systems which discharge surface water runoff to ground should accommodate wet winter conditions and evidence from groundwater records at or in the vicinity of the site should be used to demonstrate the maximum likely groundwater levels. This should include sufficient data collected to demonstrate seasonal groundwater levels to inform the assessment and design.

4.17 Proposed infiltration of surface water runoff through land which is identified as contaminated shall be assessed and will only be allowed where there is no risk of mobilising pollutants into groundwater or surface water[footnote 22].

## Discharge to surface water sewers and combined sewers

4.18 Standard 4 shall apply to discharges of runoff to surface water sewers and combined sewers, unless more stringent water quality requirements are set out within sewerage undertaker standards.

## Discharge to surface water

4.19 Where a proposed surface water drainage system discharges to a surface water body it should do so using the following hierarchy and justification.

1. Existing or new appropriately vegetated channels with the removal where possible of any redundant, existing structures.
2. The reuse of existing engineered drainage outfalls.
3. New engineered drainage outfalls[footnote 27] designed taking account of the hydromorphology of the receiving watercourse and including appropriate mitigation or compensation measures as agreed with the approving body and other relevant risk management authorities.

# Standard 5: amenity

5.1 A ‘SuDS approach’ shall be adopted that maximises benefits for amenity through the creation of multi-functional places and landscapes.

## Multifunctionality

5.2 The design of the surface water drainage system shall demonstrate multifunctional solutions to water management in accordance with appropriate relevant guidance[footnote 28].

5.3 The surface water drainage design should seek to positively contribute to placemaking and environmental enhancement by keeping surface water runoff at or close to the ground surface.

5.3.1 A series of interventions across a development may be used to achieve a SuDS design that enhances the green infrastructure network[footnote 29] and supports implementation of the local nature recovery strategy.

Note: the multifunctional benefits of the SuDS can be captured using appropriate relevant qualitative and quantitative tools[footnote 30] and assessments to help measure and adaptively manage the interventions accordingly.

## Visual amenity and landscape character

5.4 SuDS feature selection and design shall take influence from the site's topography, existing flow routes, geodiversity, landscape or townscape character, wildlife and habitats, cultural and historical associations and potential for infiltration and surface water discharge.

5.4.1 Where SuDS features are on the surface, high quality visual impact should be of equal importance as functionality. This is to ensure public acceptability and maximising of amenity benefits.

5.5 The SuDS design shall be informed by relevant LPA specific landscape guidance, landscape character assessments, Green Infrastructure strategies, design policies and design codes.

## Climate resilience and adaptation

5.6 Where water is being kept at or close to the ground surface, vegetation, including trees should be included within the SuDS design as far as reasonably practicable to help combat the urban heat island effect and increase shade provision.

5.6.1 Vegetation species selection shall be location and context-driven and informed by tolerance to temperature, waterlogging and drought conditions.

Note: though the use of native vegetation is usually preferable, non-native species may be more appropriate in selected environments, such as dense urban streets where resilience and tolerance are critical, and biodiversity value can be maximised.

5.6.2 Guidance on tree and plant selection should be followed for both the national and local scale[footnote 31].

5.6.3 Proposed vegetation should always be sourced in a manner which minimises the biosecurity risks[footnote 32].

Note: this includes ensuring appropriate plant health controls and certifications are in place and plant passporting and listed quarantine plant pests are included.

5.7 The soil and aggregate specification for all SuDS amenity features shall be in accordance with appropriate relevant guidance[footnote 28] and reviewed on a case-by-case basis.

5.7.1 Soil testing methods should be in accordance with BS 1377-2[footnote 33].

## Health and wellbeing

5.8 Surface water runoff shall be conveyed or attenuated utilising features that maximise the opportunity for public appreciation.

5.9 To support both mental and physical health, where SuDS proposals form part of a streetscape or public space, leisure and recreation opportunities shall be included where reasonably practicable.

5.9.1 SuDS should help deliver spaces for walking, cycling, informal and formal play and sports where reasonably practicable.

## Education and safety

5.10 Within community spaces, signage and interpretation boards should be provided and include information explaining the flood control function of all features within a development, public safety risks, the range of environmental and social benefits and contact details for relevant risk management authorities.

Note: community communication and engagement are actively encouraged and should be incorporated into the design process to build awareness of the proposals and the impact of development on the natural environment.

5.11 Good practice design principles[footnote 28] that assess and manage risk shall be applied in all cases.

5.12Where attenuation features are proposed, shallow slopes, benching and margins should be applied to allow safe access and minimise erosion. Boundary treatments surrounding surface SuDS features may be used where applicable to manage safe public access, whilst still facilitating the movement of wildlife and providing visual amenity value.

# Standard 6: biodiversity

6.1 A ‘SuDS approach’ shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.

6.2 The surface water drainage system shall add biodiversity value by:

- creating diverse, self-sustaining, resilient local ecosystems[footnote 34] which contribute to net gains in biodiversity
- supporting and promoting natural local habitat and species, for example, through local nature recovery strategies (LNRS)[footnote 35]
- contributing to the delivery of local biodiversity strategies
- contributing to habitat connectivity

## General requirements

6.3 Evidence of consideration and inclusion of biodiversity, proportionate to both the scale and ecological sensitivity of the site, shall be provided to the approving body.

6.4 At the outset of the development design, a biodiversity risk and opportunity assessment shall be produced and agreed with the approving body.

6.5 The biodiversity risk and opportunity assessment shall consider:

- existing flora and fauna on site including reference to site specific ecological surveys
- ecological sensitivity (including any relevant designated sites and water quality entering the SuDS)
- size and complexity of the development
- review of local biodiversity strategies, frameworks, LNRS, RBMP[footnote 36] and action plans
- opportunities to consider integration with biodiversity net gain (BNG) metric calculations
- potential direct and indirect impacts on biodiversity to and from the development and the wider catchment
- the impact on aquatic and terrestrial habitats due to deterioration or depletion of a water body as a result of a change in the discharge points, rates and volumes from the site
- significance of the impacts to and from the development and the wider catchment
- level and scope of mitigation required to ensure biodiversity enhancement

Note: habitat created through SuDS may be able to contribute towards any BNG totals, subject to relevant BNG planning requirements.

6.6 The assessment shall both identify where SuDS are being incorporated as mitigation to identified impacts and consider whether there are any local opportunities to support improvements to biodiversity.

6.7 Following completion of the biodiversity risk and opportunity assessment, the applicant shall provide evidence to show the final SuDS design demonstrates:

- following the mitigation hierarchy (avoid, mitigate, compensate) to investigate if impacts can be avoided in the first instance
- integration of the design with statutory BNG requirements (for example, BNG Metric calculations, BNG Plan) if the development is within BNG scope
- creation of new ecologically valuable habitat and enhancement and restoration of existing habitats
- increasing habitat and species diversity
- increasing site appropriate habitat features

- changes in the discharge points, rates and volumes from the site will not contribute to the depletion of surface waters or groundwater beyond safe environmental levels – for example, as set out in the WFD[footnote 5] or measured by the hydrological regime element [see footnote 6]
- supporting the delivery of local biodiversity strategies
- meeting the requirements of any relevant designated sites
- justification that the ecological network corridors will be resilient and self-sustaining
- increasing habitat connectivity
- appropriate management of invasive species
- including educational opportunities on biodiversity to the users of the development, for example, information boards
- biodiversity enhancement and mitigation has been developed alongside and in support of requirements to avoid negative impacts on hydrology (standard 1), manage flood risk (standards 2 and 3), deliver water quality (standard 4) and amenity benefits (standard 5)

6.8 Where SuDS are created as green infrastructure and contribute to BNG, LNRS or nutrient neutrality credits, evidence shall be provided that current best practice techniques set out in industry published guidance for both SuDS and biodiversity have been applied.

# Standard 7: design of drainage for construction, operation, maintenance, decommissioning and structural integrity

7.1 A ‘SuDS approach’ shall be adopted to ensure that surface water drainage systems are designed[footnote 37] so they can be easily and safely constructed, operated and maintained taking account of the need to minimise negative impacts on natural resources and the environment.

7.2 The designer shall provide a management and maintenance plan[footnote 38] that supports the design objectives detailed in standards 1 to 6 and ensures the performance of the surface water drainage system with regards to runoff destinations, everyday and extreme rainfall, water quality, amenity and biodiversity is maintained throughout the lifetime of the development.

7.3 Surface water drainage design shall examine for the likelihood and consequences of potential failure scenarios that may occur during the operation phase and safely manage the associated risks.

7.4 The surface water drainage system shall be designed to ensure structural integrity of all components under anticipated loading conditions for the design life of the development so that it does not affect the structural integrity of any existing or proposed components within, or adjacent to, the development.

## General requirements

7.5 The Construction (Design and Management) Regulations 2015[footnote 39] include requirements for designers to take account of the health and safety risks associated with the construction, operation and maintenance and decommissioning of the drainage system and to minimise these risks as far as reasonably practicable.

## Construction

7.6 The design should consider the method of construction for all components of the surface water drainage system, to avoid the potential for poor construction. Components should be simple and designed to minimise the risk of failure.

7.7 The designer shall provide information to those responsible for construction on how drainage features should be managed, protected and commissioned during construction to ensure the functionality of the completed surface water drainage system is not compromised. This information will help inform the contractor’s SuDS construction method statement (CMS). Guidance on the production of a SuDS CMS is provided in industry recognised guidance[footnote 40].

7.8 For phased developments the designer shall provide a phased management plan to demonstrate how the surface water drainage design will operate during each phase of construction. This should include detail on how flow control (satisfying standard 3) will be managed across the phases.

7.9 The materials specified by the designer, including products, components, fittings or naturally occurring materials, shall be of a suitable nature and quality for their intended use, having regard to the need to preserve natural resources and minimise embedded carbon. The materials specified should not have any adverse impact on health and safety, water quality or the ecological performance of the completed drainage system.

## Maintenance and management plan

7.10 Within the management and maintenance plan provided by the designer the management section should advise the owners, occupiers and operators or maintainers of the completed development of:

- parties responsible for the management of the surface water drainage system throughout the lifetime of the development
- the role of the drainage system in draining the site and protecting the environment
- what they should expect to observe when the system functions as designed during different rainfall conditions, in particular any areas that are intended to be used for temporary storage of surface water runoff in addition to any other use
- any operational requirements for the system
- instructions on necessary steps to be taken in the event of a pollution incident
- matters which, if they occur, should be brought to the attention of the adopting authorities or the Environment Agency (for example, pollution incidents)
- details of land ownership on which the surface water drainage system and corresponding easements will be located

7.11 The maintenance section of this plan should advise the owners, occupiers and operators or maintainers of the completed development site of:

- parties responsible for the maintenance of the surface water drainage system throughout the lifetime of the development
- likely inspection and maintenance regime required for the system to function as designed to meet the performance levels set by compliance with these standards
- remedial requirements and the criteria for which these will be required, including any occasional maintenance such as blockage clearance
- inspection and maintenance regime required during the establishment of vegetative components and for the management of that vegetation during the lifetime of the development
- inspection and maintenance regime required for the pollution control measures in the management train during the lifetime of the development
- locations where sediment removal is necessary to ensure sediment control measures continue to function as designed, together with the anticipated frequency and appropriate means of sediment removal and disposal
- the frequency of inspection and maintenance regimes and who will be responsible for maintenance – this should include details of any restrictions on maintenance duties (for example, vegetation clearance during bird nesting seasons) and it should be shown, where necessary, that an agreement has been made with those in charge of the maintenance
- rehabilitation requirements for SuDS features and multifunctional areas serving as SuDS following a flood on the development to bring them back into effective use

## Operation and maintenance

7.12 The surface water drainage design shall allow free, safe, and easy access (including easements where required) for all personnel, vehicles and machinery required to undertake maintenance of the drainage features and for emergency response such as a pollution incident. Care should be taken to ensure that the design enables easy access to components which are at greater risk of being subject to pollution or becoming clogged or blocked, such as soakaways, outfalls and trash screens or are critical in extreme events, such as flow controls.

7.13 The surface water drainage design should ensure that all features which are intended to promote infiltration should incorporate or be preceded by a pre-treatment component which effectively protects the infiltration surface from clogging.

7.14Sediment control systems that can be easily emptied, replaced or rehabilitated should be provided wherever deposited sediment could otherwise adversely affect the performance or design life of the SuDS component.

7.15 The surface water drainage design shall ensure sediment, detritus and debris can be easily removed from the system [footnote 41] and [footnote 42].

Note: if sediment is found to be contaminated, an environmental permit will need to be sought from the Environment Agency to dispose of it[footnote 41].

7.16 The surface water drainage system shall be evaluated for flood risk and water quality impacts associated with potential system failure during the operation phase due to blockage of any structures and flow controls or failure of pumps.

7.16.1 The design of the surface water drainage system should ensure that if there is a risk that blockage or clogging could cause the system to fail, then this should be apparent by visual inspection from the surface.

7.17 The design of the surface water drainage system shall, so far as reasonably practicable, minimise the use of energy over the design life of the system (such as minimising use of pumping).

7.18 Where the surface water drainage system incorporates motorised equipment such as pumps, or proprietary below ground products such as separators, provision shall be made for automatic monitoring of the component's function and transmission of failure warnings to the body responsible for maintenance.

7.19The performance of the surface water drainage system may require monitoring depending on the scale of development and the risk associated with the surface water drainage system not performing as designed. This may include the provision of access into the drainage design suitable for future monitoring. The requirement for monitoring and any necessary additions to the design shall be agreed with the approving body.

7.20 When planning the maintenance of the surface water drainage system, any ecological surveys carried out as part of the development shall be referenced to identify important or protected species that may impact the maintenance regime and methods. SuDS will have been designed to account for species noted within the site, to ensure compliance with standard 6, and suitable mitigation included.

7.21 In the absence of local guidance to the contrary, slow growing vegetation suited to the site's environment should be specified, to reduce the need for maintenance and replacement.

7.22 Prevention of the spread of invasive species and other biosecurity measures shall be considered as part of all vegetation management operations.

7.23 While SuDS features are generally unlikely to be large enough to be classified as large, raised reservoirs[footnote 43], design shall prioritise source control features to minimise large attenuation ponds at the downstream end of the system which have safety critical maintenance requirements[footnote 44].

## Structural integrity

7.24 All materials and components within the surface water drainage system shall be demonstrated to either have a minimum design life equivalent to the design life of the development, including an appropriate factor of safety, or details of required rehabilitation or replacement to be accounted for within the maintenance plan, refer to requirement 7.11.

7.25 All materials and components shall be demonstrated to be suitable to resist all imposed design loadings with appropriate factors of safety.

7.26 Where infiltration systems lie beneath trafficked surfaces, consideration should be given to structural loading and any likely weakening of the soil due to saturation.

7.27 Where runoff is discharged into a point infiltration system within 5m of any existing or proposed buildings, roads, embankments or other infrastructure, the risk of instability shall be assessed and appropriate mitigation provided if required.

7.27.1 Infiltration systems within geology which may be unstable may need to be further than 5m from a building or road and shall be assessed and appropriate mitigation provided if required.

7.27.2 Diffuse infiltration at or near the surface using permeable surfaces (or other similar approaches taking direct rainfall or very small catchments with a similar area to the infiltration surface) close to any existing or proposed building or road should not normally pose a risk to the structure. Any such proposals within 3m of a building shall be assessed and appropriate mitigation provided if required.

7.28 The construction and operation of any SuDS shall be assessed and confirmed to not have any detrimental effect on nearby infrastructure, including roads, railways and pipelines.

# The regulatory framework

Sustainable drainage systems are a key part of the measures designed to reduce flood risk, protect water quality, and encourage biodiversity and amenity. It is for this reason that consistent SuDS are a government priority. Developments which could affect drainage on or around the site should incorporate SuDS for surface water to reduce the pressure on the sewerage network, reduce the use of storm overflows and reduce the risk of flooding from surface water and other sources.

As part of the planning and design of any surface water drainage system, a range of relevant legislation should be considered, including:

- the Land Drainage Act 1991
- the Water Industry Act 1991
- the Flood and Water Management Act 2010
- The Building Regulations 2010
- The Environmental Permitting (England and Wales) Regulations 2016 (EPR)

## Design and pre-application discussions

It is important to consider and plan the surface water drainage design at the earliest stage of a development, in particular for major development where there are likely to be more planning matters to consider but greater SuDS opportunities. Early engagement with the LPA would be beneficial in agreeing the principles and most appropriate scheme.

The developer should consider the implications of any local planning documents, guidance and any constraints considerations of designated sites when undertaking an initial appraisal of the issues and costs associated with developing the site, including in the context of drainage.

Pre-application engagement between the developer and the LPA may help to identify the most cost-effective way to integrate SuDS within the emerging scheme design. Although there may be a charge for the pre-application service, early engagement has significant potential to improve the efficiency and effectiveness of the planning application system for all parties. Good quality pre-application discussion enables better coordination between public and private resources and improved outcomes for the community.

In addition to early consultation with the LPA, the developer should seek to liaise with other relevant stakeholders and risk management authorities such as the lead local flood authority (LLFA), Environment Agency, Natural England, Highways Authorities, Internal Drainage Boards (IDBs), the sewerage undertaker and the Canal and River Trust as appropriate to identify constraints to the surface water drainage design.

## Flood risk management

Developers are encouraged to engage with LLFAs prior to submitting an application to obtain relevant flood risk and drainage information for incorporation into the surface water drainage design. This includes reference to the LFRMS for the area, developed by the LLFA, which provides an overview of local flooding sources, including surface water, and takes account of environmental characteristics, development pressure, geology, soils and the interaction with river and coastal flooding.

In addition to the LFRMS for the area, the strategic flood risk assessment, developed by the LPA, should be reviewed and information included in the planning and design of the development and surface water drainage system.

Flood risk information for England can be found online[footnote 45] which will help identify sites that are potentially at risk of flooding from rivers and the sea as well as from surface water and reservoirs.

Developers may, depending on the size of the development site and the risk of flooding, be required to submit a flood risk assessment[footnote 46] to address risks associated with the proposed development.

## Environmental permitting requirements

An Environmental Permit in accordance with the EPR is required if liquid effluent or wastewater[footnote 47] is discharged to inland freshwaters or coastal waters. In addition, a permit is required if pollutants present within the effluent or wastewater result in, or might lead to, any indirect or direct input of that pollutant to groundwater. In these circumstances, formal water treatment measures are likely to be required. Sustainable drainage techniques may form part of this treatment process but are unlikely to be the principal treatment (for example, SuDS may be used for a final 'polishing' treatment or for attenuation prior to discharge to a surface water or groundwater body). The design of formal treatment processes and the approach to assessing their suitability will be in accordance with the permitting application process[footnote 48] and [footnote 25] and not these standards. This should be guided by consultation with the Environment Agency as part of a permit pre-application process.

A permit may not be required to discharge uncontaminated water, such as clean rainwater from roofs, small areas of hardstanding, public roads[footnote 49] and small parking areas that have been appropriately treated (for example, provision of an oil separator that is subsequently maintained by the operator of the car park) and subject to an appropriate pollution risk assessment [footnote 13].

Other permits or consents may be required for activities affecting ordinary watercourses[footnote 50], including those in IDB districts. The relevant LLFA and IDB are the regulatory bodies respectively and can advise on the requirements for assessing each activity and location.

## Building Regulations

Section H3 of Approved Document H (Drainage and waste disposal) of the Building Regulations 2010 provides guidance on meeting the technical requirements of surface water drainage for buildings and the surrounding areas. Building Regulations will continue to apply within the curtilage of properties and developers should be aware of these requirements.

Applications for consent under the Building Regulations generally occur after planning approval. It is therefore important that developers consult at an early stage with the building control body to ensure that the surface water drainage system also meets Building Regulations.

## Adoption and maintenance

It is fundamental that arrangements are put in place for the future maintenance of SuDS features. Where they serve a single property, such as a dwelling, business or retail complex, maintenance will remain the responsibility of the property owner, unless another appropriate body is to adopt the SuDS features. For surface water drainage systems serving more than one property, an appropriate body will need to adopt and be responsible for the maintenance of the SuDS features and ensure that they continue to comply with the national standards. To be adopted by an appropriate body, the surface water drainage system shall be designed, constructed and function as approved in accordance with the national standards.

Under Ofwat's Code for Adoption Agreements, surface water drainage assets can be presented to sewerage companies for adoption. Since 1 April 2020, this includes SuDS which are considered to be sewers. The Sewerage Sector Guidance[footnote 51], including Model Sewer Adoption Agreements and Design and Construction Guidance, sets out the procedures, standards and requirements for any SuDS which are to be adopted by sewerage companies.

## Register of structures

Following adoption of the SuDS features by an appropriate body, the LPA shall inform the LLFA, who shall include the surface water drainage system (including any non-adopted part) within the register of structures and features likely to have a significant impact on flood risk[footnote 52].

## Access

Access for operation and maintenance is required for all SuDS. While many SuDS will be on public land, some may be on private property or require access through private property. On these occasions, it is best practice that notification and access arrangements are confirmed and agreed at an early stage.

Property owners with SuDS features on their properties need to understand their function and how they operate under normal and extreme conditions to prevent features being altered or impacted in any way which would have a detrimental impact on performance or increase risks.

## Environment Act 2021

It is government policy that “planning policies and decisions should contribute to and enhance the natural and local environment by minimising impacts on and provide net gain for biodiversity”[footnote 4]. The Environment Act introduced Schedule 7A into the Town and Country Planning Act 1990, which made provision for mandatory BNG in the planning system in England. This requires all relevant development granted planning permission to be subject to the condition that the development needs to achieve a minimum 10% net gain in biodiversity value (relative to the site’s baseline biodiversity value). BNG became mandatory from 12 February 2024.

The Environment Act[footnote 53] imposes a legal obligation on sewerage companies to prepare, publish and maintain DWMPs. These plans should be used to improve the understanding of the current and future wastewater capacity, resilience and environmental risk associated with its exceedance, for example, storm overflow.

## Troubleshooting

In instances where surface water drainage systems cause nuisance or damage to neighbouring properties, local authorities have powers to act through enforcement or repair and recharging the owner[footnote 54].

Any undertaker of works affecting SuDS on public land should leave the drainage system in a state approved by the approving body. If, because of an undertaker’s activities, a problem was to arise due to the malfunctioning of SuDS on public land, the approving body may need to undertake corrective actions and seek compensation from the undertaker.

## Water quality

Surface water drainage is not a discrete element of water management for the purposes of the WFD[footnote 5]. However, surface water discharges must be suitably managed to mitigate their impact on the receiving WFD water body and must therefore be designed considering its environmental objectives (for example, Good Ecological Status). The inclusion of SuDS, instead of using traditional drainage, will support protection of the water environment and the objectives of the WFD as delivered through RBMP.

# Glossary

## Amenity

Something intended to make life more pleasant or comfortable for people.

## Attenuation

Reduction of peak flow and increased duration of a flow event.

## Annual Exceedance Probability (AEP)

The probability, typically expressed as a percentage, of a flood event of a given magnitude being equalled or exceeded in any given year. For example, a 1% AEP flood event has a 1%, or 1 in 100 chance of occurring or being exceeded every year.

## Attenuation storage

Volume in which runoff is stored when the inflow to the storage is greater than the controlled outflow.

## Basin

A ground depression that is normally dry, designed to store surface water and provide attenuation prior to discharge.

## Biodiversity

The diversity of plant and animal life in the world, an area, or a particular habitat – a high level of which is usually considered to be important or desirable.

## Bioretention area

A shallow planted depression that allows runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils prior to collection or infiltration. In its simplest form it is often referred to as a rain garden. Engineered soils (gravel and sand layers) and enhanced vegetation can be used to improve treatment performance.

## Boundary treatments

Means by which areas are enclosed including but not limited to fencing, railing, walls, hedges and other vegetation.

## Catchment

The area contributing surface water flow to a point on a drainage or river system. Can be divided into sub-catchments.

## Climate change uplift factors

Factors included to account for different climate scenarios over different periods of time, over the coming century.

## Coefficient of Volumetric Runoff (Cv)

The proportion of rainfall falling on the catchment that enters the storm drainage system as surface runoff.

## Combined sewer

A sewer intended to receive both foul sewage and surface water runoff and does not include a sewer intended to receive only foul sewage, even if it has the capacity to accommodate additional flows or has an element of surface water in it already.

## Critical duration rainfall event

The duration of rainfall event likely to cause the highest peak flows, maximum volume or highest level at a particular location, for a specified return period event.

## Curtilage

An area of land around a building or group of buildings which forms a single common enclosure with it and is for the private use of the occupants of the building(s).

## Deposition

A natural process where material, for example, silt or sediment, carried by water is laid down.

## Design criteria

A set of parameters agreed by the developer, planners, and regulators that the proposed development should satisfy.

## Detention basin

A vegetated depression that is normally dry except following storm events. Constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.

## Diffuse infiltration

Infiltration feature designed to aid infiltration of surface water into the ground over a large area (for example, infiltration below permeable paving).

## Evapotranspiration

The process by which the Earth’s surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.

## Final destination

The destination that represents the point of discharge from the development site to the environment or downstream drainage system, following management of runoff.

## Flow control

A practice or device used for the control of surface water from an attenuation facility, for example, a weir, vortex device or orifice.

## Flow Conditions

Set of parameters that determine how water flows through a pipe or culvert, or across overland surfaces.

## Foul sewage

Wastewater that is from a toilet, bathing and washing facilities or has been used for food preparation.

## Foul sewer or drainage system

The infrastructure that drains the water and sewage that is discharged from developments.

## Freeboard

Distance between the design water level and the threshold of a structure, provided as a precautionary factor of safety.

## Greenfield runoff

The runoff that would occur from the site in its undeveloped and undisturbed state. Greenfield runoff characteristics are described by peak flow and volumes of runoff for rainfall events of specified duration and frequency of occurrence.

## Greenfield runoff rate

Rate of runoff from the site as it was before any previous development.

## Greenfield runoff volume

Volume of runoff from the site as it was before any previous development.

## Green Infrastructure

The living network of high-quality green spaces, water and environmental systems in, around and beyond urban areas. It should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities.

## Groundwater

Water which is below the surface of ground in the saturation zone and in direct contact with the ground or sub-soil.

## Groundwater body

Distinct body of water below ground.

## Hydraulic modelling

A collection of mathematical calculations that give a simple representation of reality. They can be used to estimate flow, water level and velocity in river channels, pipe networks, tidal systems and floodplains.

## Impermeable

Will not allow water to pass through it.

## Infiltration

The passage of surface water into the ground.

## Infiltration trench

A trench, usually filled with permeable granular material, designed to promote infiltration of surface water to the ground.

## Interception

The prevention of runoff from the site for the majority of small (frequent) rainfall events (or for the initial depth of rainfall for larger events).

## Interception storage

The capture and storage of small rainfall depths prior to infiltration, evapotranspiration or use.

## Landscape

An area, as perceived by people, whose character is the result of the action and interaction of natural or human factors.

## Landscape character

A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.

## Management train

The sequence of drainage features that collect, convey, store and manage quality of surface water runoff as it drains through the development.

## Morphology (hydromorphology)

The physical characteristics of the shape, boundaries and content of a water body, including the pattern of flow in response to rainfall.

## Multifunctional

A feature that fulfils more than one function (for example, a playing field that may provide storage for excess water in flood conditions).

## Non-potable

Water that is not suitable for human consumption.

## Permeable surface

A surface that is formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration of water to the sub-base through the pattern of voids, for example, concrete block paving.

## Pervious surface

A surface that allows inflow of rainwater into the underlying construction or soil.

## Point Infiltration

Infiltration feature designed to aid infiltration of surface water into the ground at a single point (for example, ring soakaway).

## Pollution

Pollution is defined in the Environmental Permitting (England and Wales) Regulations 2016 in relation to a water discharge activity or groundwater activity, as “the direct or indirect introduction, as a result of human activity, of substances or heat or biological entities or micro-organisms into air, water or land which may (a) be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems, (b) result in damage to material property, or (c) impair or interfere with amenities or other legitimate uses of the environment.”

## Pond

Permanently wet depression designed to temporarily store surface water runoff above the permanent pool and permit settlement of suspended solids and biological removal of pollutants. Where a pond holds or has the potential to hold significant volumes of water above ground level it may qualify as a reservoir under the Reservoirs Act 1975.

## Practicality or What is ‘reasonably practicable’

To determine what is reasonably practicable on a particular site involves gathering data and working through a structured series of decisions. Includes the process for determining whether and to what extent solutions are reasonable and appropriate.

## Previously developed land

Land which has been lawfully developed and is or was occupied by a permanent structure and any fixed surface infrastructure associated with it, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed). It also includes land comprising large areas of fixed surface infrastructure such as large areas of hardstanding which have been lawfully developed. Previously developed land excludes: land that is or was last occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill, where provision for restoration has been made through development management procedures; land in built-up areas such as residential gardens, parks, recreation grounds and allotments; and land that was previously developed but where the remains of the permanent structure or fixed surface structure have blended into the landscape.

## Rainfall event

A single occurrence of rainfall before and after which there is a dry period that is sufficient to allow its effect on the drainage system to be defined.

**50% AEP**
Equivalent to a 1 in 2 chance of occurring each year. The highest frequency event to be considered to ensure that flows to the surface water body are tightly controlled for frequent events. Controlling post development flows to the equivalent greenfield rate at this level aims to ensure stream channels are not damaged by the development runoff.

**3.3% AEP**
Equivalent to a 1 in 30 chance of occurring each year. An intermediary event to assess system performance as it is used in the design of public sewer systems. New public sewer systems are designed so that surface flooding does not occur at this frequency. Compliance with the greenfield discharge rate for this event is only required where the surface water is discharged to a public sewer.

**1% AEP**
Equivalent to a 1 in 100 chance of occurring each year. Used as the basis for making flood risk assessments. Controlling post development flows to the greenfield rate at this event level aims to minimise increases in flood risk because of the development.

## Rainwater harvesting system (RHS)

A system for collecting rainwater from surfaces to be used, which consists of collection, treatment, storage and distribution elements It includes water that is collected within the boundaries of a property, from roofs and surrounding surfaces.

## Rehabilitation

Restoration of a component that has been damaged to its former condition.

## Retrofit

Where SuDS are incorporated after the initial development of an area or are used to improve the existing drainage situation.

## Return Period (also see AEP)

Refers to how often an event occurs. A 1 in 100-year storm refers to the storm that has an annual probability of exceedance of 1 percent (1 in 100).

## Runoff

Water flow (including flow from snow and other precipitation) over the ground surface which has not entered the drainage system. This occurs if the ground is impermeable, is saturated or rainfall is particularly intense.

## Sediment control

Practice or device designed to keep eroded soil on a construction site, to ensure it does not wash off and cause a water pollution event.

## Sewerage undertaker

Collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.

## Soakaway

A sub-surface structure into which surface water is conveyed, designed to promote infiltration.

## Sub-catchment

A division of a catchment, to allow runoff to be managed as near to the source as is reasonably practicable.

## Surface water sewer

Designed to carry surface water directly to a watercourse, soakaway or other water body.

## Surface water body

Any body of water above ground, including watercourses, rivers, lakes and reservoirs.

## Suspended solids

General term describing material suspended in water. Used as a water quality indicator.

## Swale

A shallow vegetated channel designed to convey and retain water but may also permit infiltration.

## Treatment

Improving the quality of water by physical, chemical and biological means.

## Visual amenity

Overall enjoyment of a particular area, surroundings, or views in terms of people’s activities – living, recreating, travelling through, visiting, or working.

## Watercourse

A term including all rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, and passages through which water flows.

## Wetland

Flooded area in which water is shallow enough to enable the growth of bottom-rooted plants.

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1. C713F Retrofitting to manage surface water (CIRIA)
2. Meeting our future water needs: a national framework for water resources (Environment Agency) (https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources)
3. An Environmental Permit may be required under Paragraph 3 (1) (c) of Schedule 22 of The Environmental Permitting (England and Wales) Regulations 2016
4. National Planning Policy Framework (Ministry of Housing, Communities & Local Government) (https://www.gov.uk/government/publications/national-planning-policy-framework--2)
5. Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 which also transposes the Groundwater Directive 2006/118/EC in England and Wales
6. Find information on relevant water bodies using Catchment Data Explorer (Environment Agency and Defra) (https://environment.data.gov.uk/catchment-planning/) and refer to Check if you need a licence to impound water (Environment Agency) (https://www.gov.uk/guidance/check-if-you-need-a-licence-to-impound-water)
7. Water Stressed Areas 2021 (Environment Agency and Defra) or subsequent editions (https://www.gov.uk/government/publications/water-stressed-areas-2021-classification)
8. BS EN 16941-1:2024 Rainwater Harvesting Systems (British Standards)
9. Rainwater harvesting: regulatory position statement (Environment Agency) (https://www.gov.uk/government/publications/rainwater-harvesting-regulatory-position-statement/rainwater-harvesting-regulatory-position-statement) to check when harvested rainwater can be used without a water

abstraction licence and when a water abstraction licence may be needed to abstract or transfer harvested rainwater

10. British Geological Survey mapping, including Infiltration SuDS Map, Ground Water Level Information, BGS Geosure datasets, Borehole Records, Superficial Geology and Bedrock Geology
11. Find the relevant Shoreline Management Plan and view coastal erosion risk information on Shoreline Management Plan Explorer (Environment Agency) (https://environment.data.gov.uk/shoreline-planning)
12. Design & Construction Guidance for Sewerage Undertakers (Water UK) or subsequent editions
13. C753 The SuDS Manual (CIRIA) or any future version
14. Flood risk assessments: climate change allowances (Environment Agency) (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)
15. BS EN 1997-2:2007 Eurocode 7 — Geotechnical design — Part 2: Ground investigation and testing and BS 5930:2015+A1:2020 Code of practice for ground investigations (British Standards Institute)
16. Digest 365 Soakaway Design (Building Research Establishment), RP 156 Infiltration Drainage: Manual of Good Practice (CIRIA) and BS EN ISO 22282-2: 2012 Geotechnical investigation and testing. – Part 2 Geohydraulic testing - Water permeability tests in a borehole using open systems (British Standards Institute)
17. Flood Estimation Guidelines (Environment Agency) (https://www.gov.uk/government/publications/flood-estimation-guidelines)
18. BS EN 1997-2:2007 Eurocode 7 - Geotechnical Design - Part 2: Ground Investigation and testing (British Standards Institute)
19. As of the publication date this is FEH 22
20. Flood risk assessment guidance for new development (Defra) (https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/flood-risk-assessment-guidance-for-new-development)
21. As set out in Chapter 4, Chapter 26 and Chapter 27 of C753 The SuDS Manual (CIRIA) or any future version
22. An Environmental Permit may be required under Paragraph 3 (1) (c) of Schedule 22 of the Environmental Permitting (England and Wales) Regulations 2016 if there is a risk of mobilising existing contamination
23. Such as the Simple Index Approach as described in C753 The SuDS Manual (CIRIA) or any future version
24. Pollution prevention for businesses (Defra and Environment Agency) (https://www.gov.uk/guidance/pollution-prevention-for-businesses)
25. Discharges to surface water and groundwater: environmental permits (Environment Agency and Defra) (https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits)
26. Groundwater Protection Guidance (Environment Agency and Defra) (https://www.gov.uk/government/collections/groundwater-protection)
27. Check if you need permission to do work on a river, flood defence or sea defence (Environment Agency) (https://www.gov.uk/permission-work-on-river-flood-sea-defence) and Regional flood defence and land drainage byelaws (Environment Agency) (https://www.gov.uk/government/publications/regional-flood-defence-and-land-drainage-byelaws)
28. This includes, but not limited to, the industry recognised guidance such as C753 The SuDS Manual (CIRIA) or any future version
29. In accordance with appropriate relevant guidance, such as the Natural England Green Infrastructure Framework (https://designatedsites.naturalengland.org.uk/GreenInfrastructure/Home.aspx) - Principles and Standards for England 2023 (Natural England)
30. Such tools include the Natural England Green Infrastructure Framework (https://designatedsites.naturalengland.org.uk/GreenInfrastructure/Home.aspx) - Principles and Standards for England 2023 (Natural England)
31. This includes but is not limited to Tree Species Selection for Green Infrastructure: A Guide for Specifiers, Issue 1.3. (Trees & Design Action Group)
32. All planting operations shall be in accordance with BS 3936-1:1992 Nursery Stock – Specification for trees and shrubs, BS 3936-10:1990 Nursery Stock – Specification for ground cover plants and BS 8545:2014 Trees: from nursery to independence in the landscape. Recommendations (British Standards Institute)
33. BS 1377-2:2022 Methods of test for soils for civil engineering purposes - Part 2 Classification tests and determination of geotechnical properties (British Standards Institute)
34. The UK Climate Resilience Programme (UKRI and Met Office) (https://www.ukclimateresilience.org/)
35. Local Nature Recovery Strategies: how to prepare and what to include (Defra) (https://consult.defra.gov.uk/land-use/local-nature-recovery-strategies/)

36. River basin management plans 2022 (Environment Agency) (https://www.gov.uk/guidance/river-basin-management-plans-updated-2022)
37. BS EN 752:2017 Drain and sewer systems outside buildings. Sewer system management (British Standards)
38. Guidance on the production of Management and Maintenance Plans is contained within C753 The SuDS Manual (CIRIA) or any future version
39. Construction (Design and Management) Regulations 2015 (UK Government) and all future versions of these Regulations
40. C753 The SuDS Manual (CIRIA) or any future version and C768 Guidance on the Construction of SuDS (CIRIA)
41. Dewatering and depositing silts from sustainable drainage systems (SUDS): Regulatory Position Statement 55 (Environment Agency) (https://www.gov.uk/government/publications/deposit-and-dewatering-of-non-hazardous-silts)
42. Check if you need a permit (Environment Agency) (https://www.gov.uk/guidance/waste-environmental-permits)
43. Reservoirs: owner and operator requirements (Defra) (https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements)
44. Reservoirs: How to manage your large raised reservoir (Environment Agency) (https://www.gov.uk/guidance/reservoirs-how-to-manage-your-large-raised-reservoir)
45. Flood Map for Planning (Environment Agency) (https://flood-map-for-planning.service.gov.uk/) and the Check the long term flood risk for an area in England (Environment Agency) (https://www.gov.uk/check-long-term-flood-risk) service together provide information on the risk of flooding from river, sea, surface water and reservoirs in England.
46. Flood risk assessments: applying for planning permission (Environment Agency) (https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications)
47. Includes: Poisonous, noxious or polluting matter, polluting substances, waste matter and trade or sewage effluent.
48. Check if you need permission to do work on a river, flood defence or sea defence (Environment Agency) (https://www.gov.uk/permission-work-on-river-flood-sea-defence)
49. Roads managed by Highway Authorities do not require an Environmental Permit under the Highways Act 1980 providing they do not cause pollution.
50. For work on or near watercourses other than main rivers or sea defences, an Ordinary Watercourse consent will be required. Section 23 of the Land Drainage Act 1991 (https://www.legislation.gov.uk/ukpga/1991/59/section/23).
51. Sewerage Sector Guidance (Water UK) (https://www.water.org.uk/sewerage-sector-guidance-approved-documents)
52. Flood and Water Management Act 2010 Section 21 (UK Government) (https://www.legislation.gov.uk/ukpga/2010/29/section/21)
53. Section 79 of the Environment Act 2021 (UK Government) (https://www.legislation.gov.uk/ukpga/2021/30/section/79)
54. Flood and Water Management Act 2010 amendment to the Building Act 1984 (UK Government) (https://www.legislation.gov.uk/ukpga/2010/29)