Independent
Water Networks

IWNL Sustainable Drainage Systems (SuDS) and Attenuation features adoption guidelines

Document Review – Latest Update

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IWNL Sustainable Drainage Systems (SuDS) adoption manual	
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Contents

1.0 Executive Summary

IWNL SuDS/Attenuation Feature adoptions should be agreed in the commercial offer with the relevant BUUK sales representative. This is an additional item to the standard agreement and before submission developers should ensure this is part of the agreement.

Independent Water Networks Limited (IWNL) cannot adopt these features when the site is serving less than 100 plots.

This manual outlines IWNL specific design guidelines required for a Sustainable Drainage Systems (SuDS) and other Attenuation Features, that can be adopted by IWNL under a S104 submission. This should be read in conjunction with the Water UK's Sewerage Sector Guidance, Appendix C – Design and Construction Guidance (DCG) and CIRIA -C753 the SuDS manual.

IWNL will consider the adoption and maintenance of SuDS/ Attenuation features in public open space where developers can demonstrate:

- Upstream source control measures.
- Outfall, i.e. to ground, watercourse, or surface water sewer.
- Effective exceedance design; and
- Maintenance schedule.

Where agreed to adopt a structure, the land surrounding the structure must have access (easement) to allow for maintenance. We will also require discharge easements, and protection of exceedance routes from future changes in land use. All systems should have appropriate accreditations, i.e. WRc UKWIR, BSEN.

IWNL can adopt the following structures when plot level drainage discharges into:

- Detention basins
- Ponds and wetlands
- Infiltration systems
- Geocellular Structures / oversized pipes / attenuation tanks
- Swales
- Proprietary Treatment Systems **(**silt removal/petrol interceptor)

IWNL do not adopt the following structures: -

- Filter strips
- Bioretention areas / raingardens
- Filter drains and trenches
- Permeable pavements
- Deep bore soakaway
- Green Roofs
- Rainwater Harvesting
- Tree Pits

This document applies only to sites operating wholly or mainly in England.

2.0 Introduction

2.1 General information

This manual outlines IWNL specific design guidelines required for a Sustainable Drainage Systems (SuDS) and other Attenuation Features, that can be adopted by IWNL under a S104 submission. This should be read in conjunction with the Water UK's Sewerage Sector Guidance, Appendix C – Design and Construction Guidance (DCG) and CIRIA -C753 the SuDS manual. All systems should have appropriate accreditations, i.e. WRc, UKWIR, BSEN.

This guide is for the planning, design, construction, and operation of Sustainable Drainage Systems (SuDS) and Attenuation features intended for adoption by IWNL under an Agreement made in accordance with Section 104 of the Water Industry Act (WIA).

- IWNL SuDS adoptions should be agreed in the commercial offer with the relevant BUUK sales representative.
- This is an additional item to the standard agreement and before submission developers should ensure this is part of the agreement.
- IWNL do not adopt SuDS when the site is serving less than 100 plots.
- As part of the technical review process, the designer will submit a detailed design of the SuDS to IWNL.
- The design of the SuDS should meet the design criteria set out in the Water UK CIRIA -C753-the-SuDS-manual.
- The 100 year +CC volume can be stored in the same storage systems as the 1 in 30 year.
- Once IWNL are satisfied with the design details and any queries raised regarding the design have been answered, technical approval of the design will be issued.
- During construction IWNL Asset Surveyors will be on site to witness construction of the main structures and the installation.
- IWNL will undertake a detailed onsite inspection, once the building works have been completed as part of the adoption process.
- At the commissioning stage, IWNL will inspect control levels, build quality, and confirm the design has been followed. If the design complies with the necessary standards, IWNL will need to do a final check of all historic and current operational data, ensure that after 50% upstream occupancy, all remedials are completed prior to adoption.
- Following this final check and inspection and providing the design and SuDS performance is satisfactory, then the developer's 12-month maintenance period can start. After this 12-month period is satisfactorily completed, vesting phase can be undertaken.
- Once a full detailed set of maintenance reports, incident reports and details of all remedial works undertaken, is issued to IWNL, the SuDS will come under IWNL ownership as per the Section 104 adoption process.

2.2 Adoptable Features

Where SuDS are fully within a property boundary then the feature is the responsibility of the property owner. Private property SuDS, i.e. SuDS located within property boundaries, are the responsibility of the property owner; it includes green roofs, permeable driveways, water butts, garden soakaways and rain harvesting.

Intermediate SuDS (ManCo / Highways) – SuDS located within a development that control surface water runoff at or near source; it includes filter strips, bioretention raingardens, filter drains, permeable pavement and other local infiltration systems.

IWNL currently adopt the following structures where plot level drainage discharges into: -

- Detention basins
- Ponds and wetlands
- Infiltration Systems
- Geocellular Structures / oversized pipes / attenuation tanks

IWNL do not adopt the following structures: -

- Filter strips
- Bioretention areas / raingardens
- Filter drains and trenches
- Permeable pavements - adoptable sewers (foul and surface water) should not be located under permeable paving
- Deep bore soakaway
- Green Roofs
- Rainwater Harvesting
- Tree Pits

3.0 Discharges

3.1 Headwalls

Headwalls are located at the inlet or outlet of a piped network. Headwalls should be designed appropriately as per Design and Construction Guidelines.

Figure 1 - Headwall with railings and grate

A stainless-steel guard rail should be included for health and safety purposes.

A flap valve should be included where a free discharge under extreme storm conditions is not possible. Where this is the case modelling is required to prove that the network can cope with the reduced discharge.

Guard Rails are required when pipe diameters are greater than 350mm in size.

3.2 Flow Controls

Flow controls limit the discharge from the surface water into the receiving watercourse or downstream sewer. Flow controls limits should be agreed with the responsible party of the downstream receiving waterbody, e.g. Environment Agency, LLFA, Incumbent Water Authority, Canal and Rivers Trust. When necessary, a headwall consent or a S106 agreement should also be secured for the connection.

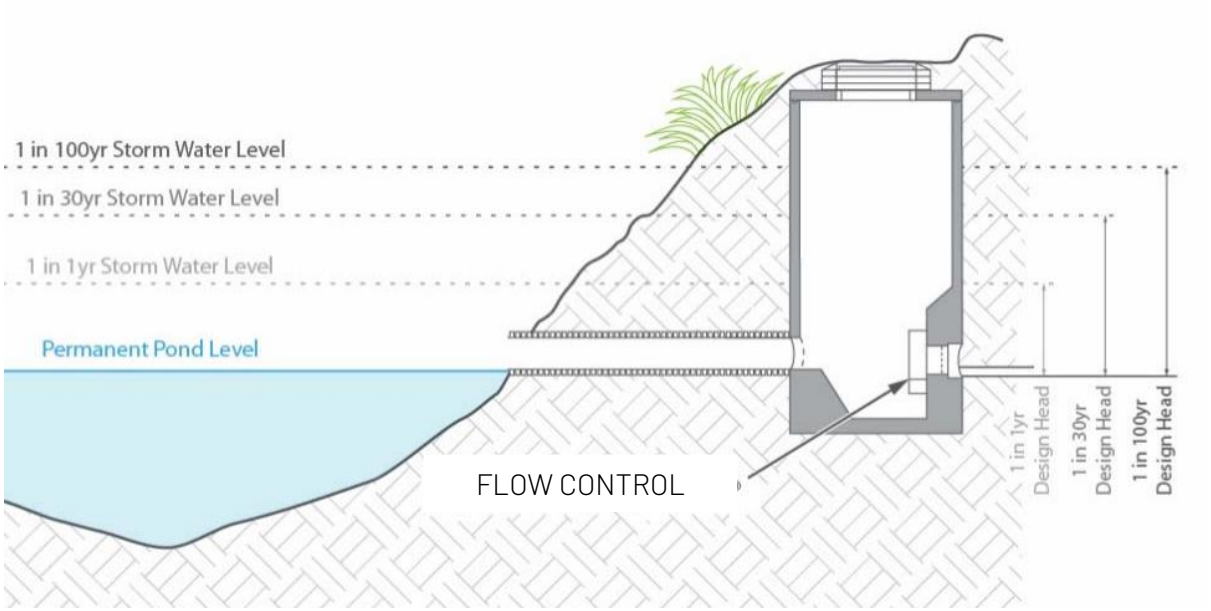

Figure 2 – Typical Vortex Flow Control on a Pond

The most typical flow controls are Vortex Fow controls, Pumping Stations and Orifices Vortex Flow controls and Orifices are included in the standard S104 agreement and commercial offer, and IWNL will adopt the flow controls in most instances. Surface Water Pumping Stations will need to be included as an additional in the commercial agreement, for further details on pumping station adoption please see IWNL Pumping Station Guidance.

3.3 Infiltration

Infiltration is the direct discharge from the Surface water network including the SuDS/Attenuation features into groundwater table. Infiltration is the preferred method of discharge according to the Surface Water Hierarchy. The performance of infiltration systems is dependent on the infiltration capacity of the surrounding soils and the depth to groundwater.

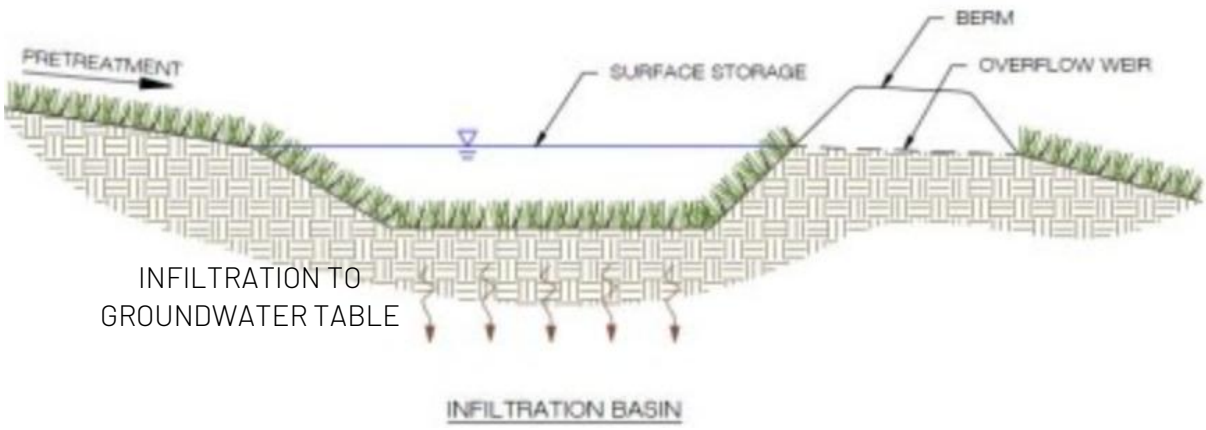

Figure 3 – Infiltration Discharge from a Detention Basin

Soil conditions have to be appropriate for discharge via infiltration, the below table highlights what are considered 'good' soil conditions for infiltration.

Typical infiltration coefficients based on soil texture (after Bettess, 1996)		
Soil Type/Texture	ISO 14688-1 description (after Blake, 2010)	Typical infiltration coefficients (m/s)
Good infiltration media • gravel • sand • loamy sand • sandy loam	 Sandy GRAVEL Slightly silty slightly clayey SAND Silty slightly clayey SAND Silty clayey SAND	 3×10^{-4} to 3×10^{-2} 1×10^{-5} to 5×10^{-5} 1×10^{-4} to 3×10^{-5} 1×10^{-7} to 1×10^{-5}
Poor infiltration media • loam • silt loam • chalk (structureless) • sandy clay loam	 Very silty clayey SAND Very sandy clayey SILT N/A Very clayey silty SAND	 1×10^{-7} to 5×10^{-8} 1×10^{-7} to 1×10^{-5} 3×10^{-8} to 3×10^{-6} 3×10^{-10} to 3×10^{-7}
Very poor infiltration media • silty clay loam • clay • till	 - - Can be any texture of soil described above	 1×10^{-8} to 1×10^{-6} $< 3 \times 10^{-8}$ 3×10^{-9} to 3×10^{-6}
Other • rock* (note mass infiltration capacity will depend on the type of rock and the extent and nature of discontinuities and any infill)	N/A	3×10^{-9} to 3×10^{-5}

Table 1- Soil Conditions for Infiltration

The groundwater table must be at minimum 1m below the bottom level of the discharge during winter/wet conditions. Infiltration systems should always have a maximum half drain down time of 24 hours.

Silt management should be considered prior to any infiltration discharge, this should include proprietary treatment upstream of an underground asset and catchpits upstream of open asset.

3.4 Maintenance requirements

The below table provides the anticipated maintenance requirements including frequency and the organisation responsible for managing the maintenance activities

Feature Description	Maintenance Activity	Maintenance managed by ManCo. and undertaken by	Maintenance by IWNL and undertaken	Frequency
Infiltration Discharge to groundwater	Access security - covers	GMC		Six Monthly
	Walkover survey	GMC		Six Monthly
	Structural inspections and operation review		Chartered Engineer (Internal or External)	As/if required
	Silt Removal		Specialist (E.g. Lanes for Drains)	Anticipated as max 12 monthly more likely 24 monthly.

Table 2 – Discharge Maintenance

4.0 Detention Basins

4.1 Introduction

Detention basins are depressions in the ground designed to store surface water runoff and either allow it to soak into the ground via infiltration or flow out at a controlled rate. Within development, these basins are usually small, grassed areas.

Figure 4 –Detention Basin with vegetated low flow channel

For full details of Detention Basin design please see Ciria 753 The SuDS Manual - Part D, Chapter 22.

4.2 Design specification

The maximum depth of water in the basin should not exceed 2 m in the most extreme design event.

A site-specific Health and Safety Risk assessment should be produced when the water level is above 1.2m deep, consideration should be made to mitigate as best possible the risk including such actions as:

- Fencing
- Signage
- Slopes
- Berms
- Landscaping
- Accessibility

Where fences are required, they should be low (toddler-proof) but allow movement of wildlife.

A liner or 0.5m depth of puddling clay is required to prevent infiltration of groundwater into the network.

Side slopes should be no steeper than 1 in 3.

Freeboard from the 1 in 100 year plus CC to the top of the basin should be a minimum of 300mm.

There should be appropriate access routes for sizeable vehicles to the detention basin for maintenance activities such as grass cutting and sediment removal to be undertaken, and to all inlets, outlets, and control structures.

4.3 Maintenance requirements

Designers should provide detailed specifications and frequencies for the required maintenance activities along with likely machinery requirements and typical annual costs – within the Maintenance Plan. Adequate access should be provided to all detention basin areas for inspection and maintenance, including for appropriate equipment and vehicles.

The below table provides the anticipated maintenance requirements including frequency and the organisation responsible for managing the maintenance activities.

Feature Description	Maintenance Activity	Maintenance managed by ManCo. and undertaken by	Maintenance managed by IWNL and undertaken by	Frequency
Landscape depression for rainfall event attenuation.	Grass Cutting	Ground Maintenance Contractor (GMC)		Every two weeks in Summer, monthly in winter. Cut the meadow grass in Spring, before nesting season, and Autumn
	Litter Removal	GMC		Every two weeks in Summer, monthly in winter
	Bank Strimming	GMC		Six Monthly
	Vegetation management	GMC		Annually tidy all dead growth before start of growing season and manage wetland plants in outlet pool - where provided
	Fence Repair	Minor - GMC	Fencing Contractor	As/if required (Every 12 mths for minor)
	Structural inspections		Chartered Engineer (Internal or External)	As/if required.
	Bank Repair/Silt Removal		Specialist (E.g. Lanes for Drains)	Anticipated as max 12 monthly more likely 24 monthly.
	Headwall Repair		Specialist (Groundworks Contractor)	As/if required (Every 36 mths for minor)

Table 3 – Detention Basin Maintenance

5.0 Ponds

5.1 Introduction

Ponds and wetlands are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff.

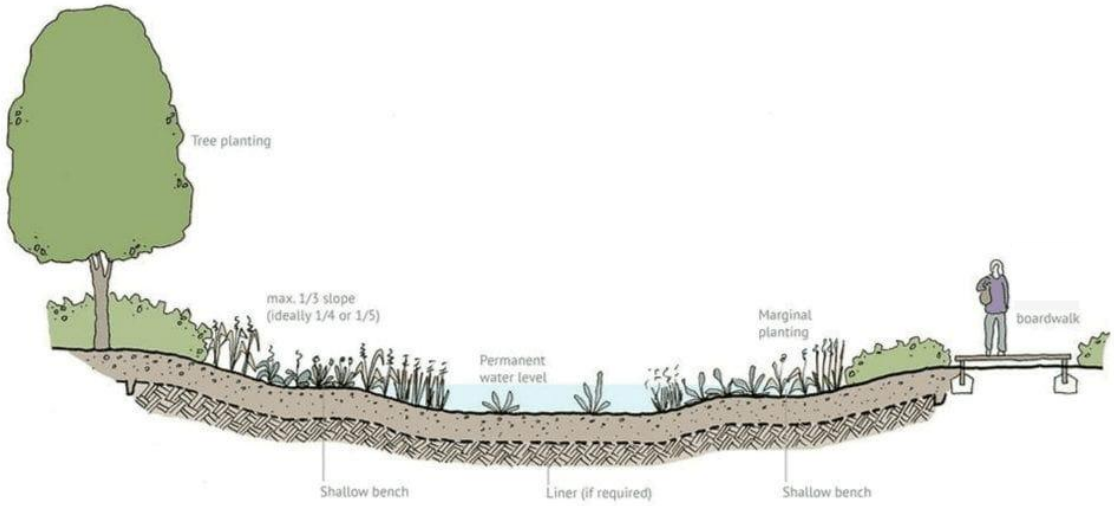

Figure 5 –Typical Pond details

For full details of Ponds and Wetlands design please see Ciria 753 The SuDS Manual - Part D, Chapter 23.

5.2 Design Requirements

The maximum depth of water in the Pond should not exceed 2 m in the most extreme design event.

A site-specific Health and Safety Risk assessment should be produced when the water level is above 1.2m deep, consideration should be made to mitigate as best possible the risk including such actions as:

- Fencing
- Signage
- Slopes
- Berms
- Landscaping
- Accessibility

Where fences are required, they should be low (toddler-proof), but allow movement of wildlife.

A liner or 0.5m depth of puddling clay is required to prevent infiltration of groundwater into the network.

Freeboard from the 1 in 100 year plus CC to the top of the basin should be a minimum of 300mm.

There should be appropriate access routes for sizeable vehicles to the detention basin for maintenance activities such as grass cutting and sediment removal to be undertaken, and to all inlets, outlets, and control structures.

Any erosion protection must be reflected in the hydraulic model by applying a headloss of 0.5 at the point of outfall. The same headloss value of 0.5 should be to be applied for catch pits where applicable. The maximum water level must be at least 500mm below the lowest FFL of any adjacent properties.

The side slopes confirmed to be no greater than 1 in 3 between the aquatic bench and safety bench and no greater than 1 in 4 where mowing access is required.

5.3 Maintenance requirements

The below table provides the anticipated maintenance requirements including frequency and the organisation responsible for managing the maintenance activities.

Feature Description	Maintenance Activity	Maintenance managed by ManCo. and undertaken by	Maintenance by IWNL and undertaken	Frequency
Permanent pool of water. Designed to promote vegetation.	Grass Cutting	Ground Maintenance Contractor (GMC)		Every two weeks in Summer, monthly in winter. Spring, before nesting season, and Autumn
	Litter Removal	GMC		Every two weeks in Summer, monthly in winter
	Bank Strimming	GMC		Six Monthly
	Pond vegetation management	GMC		Annually remove 25% of bank vegetation from water's edge to a minimum of 1m above water level. Annually tidy all dead growth before start of growing season
	Fence Repair	Minor - GMC	Fencing Contractor	As/if required (Every 12 mths for minor)
	Structural inspections		Chartered Engineer (Internal or External)	As/if required.
	Bank Repair/Silt Removal		Specialist (E.g. Lanes for Drains)	Anticipated as max 12 monthly more likely 24 monthly. Inspect silt accumulation rates Six Monthly in any forebay and in main body of pond, undertake contamination testing once some build-up has occurred
	Headwall Repair		Specialist (Groundworks Contractor)	As/if required (Every 36 mths for minor)

Table 4– Ponds and Wetlands Maintenance

6.0 Attenuation Tanks

6.1 Introduction

Attenuation storage tanks are structures that create a below-ground void space for the temporary storage of attenuated surface water before discharge. Typical structures include concrete, plastic crate systems or large pipes.

To align with design standards, step rungs are a requirement for access chambers less than 3m deep. When deeper than 6m, fixed ladders are a requirement below the intermediate landing slab(s) only.

Flow control devices should not be housed within the attenuation tank itself; they should be installed in a separate manhole downstream of the attenuation tank.

For full details of Attenuation Tanks design please see Ciria 753 The SuDS Manual - Part D, Chapter 21.

6.2 Design specification

LEAP areas should not be located on top of a tank or its easement (3m around the location).

Flotation calculations should be supplied to confirm no issues will arrive from a groundwater event.

Concrete Tanks

Concrete Tanks should be designed by an appropriate chartered Structural Engineer preferably by a specialist concrete manufacturing company such as Carlow Tanks, FP McCann or similar.

Figure 6 –Concrete Tank under construction

Geocellular Tank Systems

The storage structure is formed by assembling the required number of individual units and wrapping them in either a geotextile or a geomembrane.

Figure 7 –Crate System Tank under construction

Complex shapes should be avoided, as it would increase the risk of sediment being trapped and make the installation of any geomembrane more difficult - increasing the risk of groundwater ingress occurring.

Guarantees should be provided during the construction phase and passed over to the IWNL Asset Surveyor.

All systems should have appropriate accreditations, i.e. WRc UKWIR, BSEN. Jetting and maintenance access should clearly show and a desilting routine provided including H&S risk assessment and requirements.

Large Pipes

A pipe system may be used where several large pipes are laid in parallel to provide offline attenuation. These systems should be designed by a specialist contractor and appropriate bedding materials should be specified.

Figure 8 –Parallel Pipe System under construction

Online Oversized Pipes do not need to be included as a separate component in the commercial agreement and will not need to include SuDS/Attenuation features add on to be adopted.

Where appropriate low flow channels should be used to convey flows with less silting.

6.3 Maintenance requirements

Effective upstream treatment is an important consideration to control the risk of the system performance being compromised by sediment build-up. Regular inspection and maintenance are required to ensure the effective long-term operation of below ground storage systems.

The below table provides the anticipated maintenance requirements including frequency and the organisation responsible for managing the maintenance activities.

Feature Description	Maintenance Activity	Maintenance managed by ManCo. and undertaken by	Maintenance by IWNL and undertaken	Frequency
Large below ground voided spaces for temporary storage.	Access security - covers	GMC		Six Monthly
	Walkover survey	GMC		Six Monthly
	Structural inspections and operation review		Chartered Engineer (Internal or External)	as/if required.
	Silt Removal		Specialist (E.g. Lanes for Drains)	Anticipated as max 12 monthly more likely 24 monthly.

Table 5– Detention Basin Maintenance

7.0 Swales

7.1 Introduction

Swales are shallow, flat bottomed, open channels designed to convey, treat and attenuate surface water runoff.

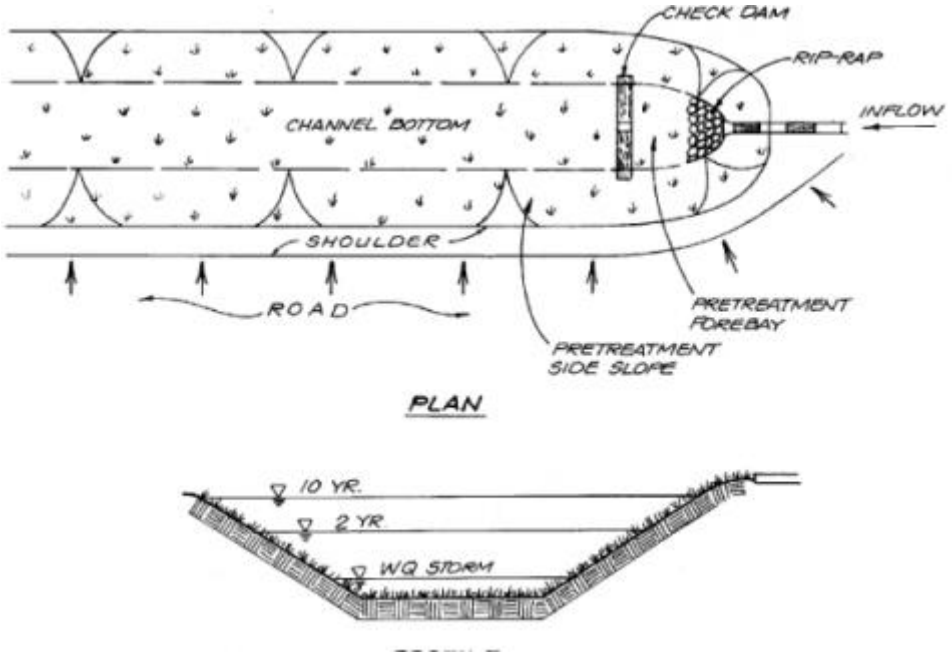

Figure 9 –Swale typical detail

For full details of Swale design please see Ciria 753 The SuDS Manual - Part D, Chapter 17.

7.2 Design specification

Swales will only be considered adoptable to IWNL if plot drainage discharges into the asset. Highway only swales should be adopted by the local authority.

A maximum slope of 1 in 3 but a 1 in 4 is preferred where space permits as this makes the ground safer.

Perforated pipes running below swales should be considered part of the SuDS asset and shall only be adopted by IWNL when the commercial agreement includes for SuDS/Attenuation Features.

Connections into the piped drainage networks should be clearly shown and easily accessible and maintainable.

7.3 Maintenance requirements

The below table provides the anticipated maintenance requirements including frequency and the organisation responsible for managing the maintenance activities of a Swale.

Description	Maintenance Activity	Maintenance managed by ManCo. and undertaken by	Maintenance by IWNL and undertaken	Frequency
Vegetated Channel to convey and treat runoff. (Wet or dry design).	Grass Cutting	Ground Maintenance Contractor (GMC)		Every two weeks in Summer, monthly in winter. Inspect vegetation coverage (monthly for 6 months, quarterly for 2 years, then half yearly)
	Litter Removal	GMC		Every two weeks in Summer, monthly in winter
	Bank Strimming	GMC		Six Monthly
	Channel Clearance	GMC		Six Monthly
	Structural inspections		Chartered Engineer (Internal or External)	As/if required.
	Bank Repair/Silt Removal		Specialist (E.g. Lanes for Drains)	Six Monthly inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.

Table 6– Swales Maintenance

8.0 Proprietary Treatment Systems (silt removal/petrol interceptor)

8.1 Introduction

Treatment systems are manufactured products that remove specified pollutants from surface water runoff. They will often be used prior to a larger storage attenuation feature to remove sediments before entering said asset.

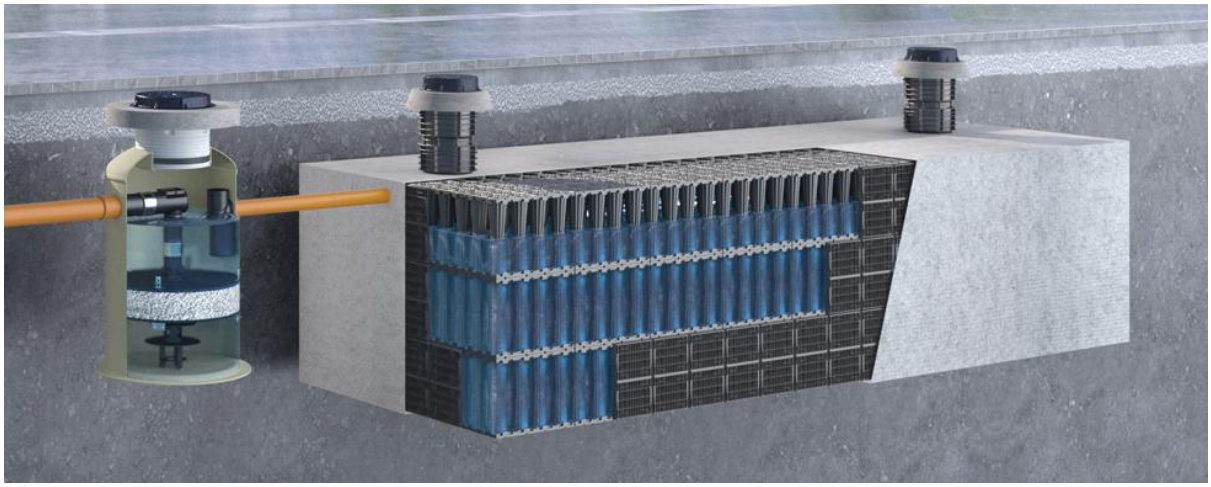

Figure 10 – Proprietary Treatment System prior to discharge into crate system

For full details of Proprietary Treatment Systems design please see Ciria 753 The SuDS Manual - Part D, Chapter 14.

8.2 Design specification

Proprietary treatment systems are not a preferred option on IWNL adoptable networks and will only be adoptable when the SuDS/Attenuation feature is included in the commercial agreement.

These are considered necessary when an infiltration discharge is utilised and no other way of desilting is possible prior to the discharge.

8.3 Maintenance requirements

The below table provides the anticipated maintenance requirements including frequency and the organisation responsible for managing the maintenance activities of Proprietary Treatment systems.

Feature Description	Maintenance Activity	Maintenance managed by ManCo. and undertaken by	Maintenance by IWNL and undertaken	Frequency
Hard Engineered underground chambers designed for silt removal.	Access security - covers	GMC		Six Monthly
	Walkover survey	GMC		Six Monthly
	Structural inspections and operation review		Chartered Engineer (Internal or External)	as/if required.
	Silt Removal		Specialist (E.g. Lanes for Drains)	Anticipated as 6 monthly

Table 7– Proprietary Treatment Systems Maintenance