Hampshire County Council

Universal Services Directorate

Technical Guidance Note
TG8-1 – Drainage - General

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0	06/03/2023	Initial Publication	Fingal Noguera	David Ryder
1	23/6/2023	Gully requirements amended and minor amendments throughout	Kathie Murray	David Ryder

Amendments are indicated by a bar in the left hand margin

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CONTENTS

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1. Introduction

1.1. This document provides guidance to designers and developers on Hampshire County Council's (HCC) specific requirements for adoptable Highway drainage as the Highway Authority. This guidance applies to drainage which forms part of S38 works or S278 works as well as HCC implemented Highway schemes. This TG does not cover the wider role HCC undertakes as the Lead Local Flood Authority and statutory consultee for planning applications.

1.2. For HCC highway maintenance schemes, the majority of the drainage works will involve maintaining existing systems and replacing them like-for-like. Some elements of the assessment requirements in this TG may not be required for the design of that type of scheme. Designers working on maintenance schemes shall follow the maintenance Detailed Design Checklist (Drainage), referencing this TG where required.

1.3. Figure 1 details the key design steps to be considered during the drainage design.

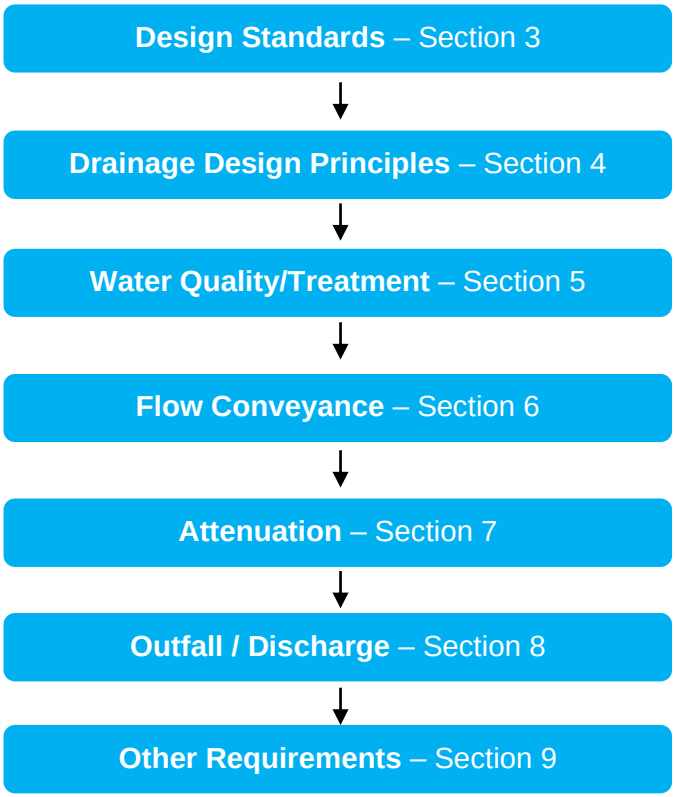

Figure 1 – Key drainage design processes

2. Definitions and Abbreviations

AADT	Annual Average Daily Traffic
CDM	Construction (Design and Management) Regulations 2015
CIRIA	Construction Industry Research and Information Association
DMRB	Design Manual for Roads and Bridges
DWF	Dry Weather Flow
EA	Environment Agency
FSR	Flood Studies Report
FEH	Flood Estimation Handbook
HCC	Hampshire County Council
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
MCHW	Manual Contract for Highway Works
NAV	New Appointments and Variations Company - limited companies which provide a water and/or sewerage service to customers in an area which was previously provided by the incumbent monopoly provider
NNR	National Nature Reserve
Ramsar	Wetland of International Importance designated under the Ramsar Convention
RVEI	Road Verge of Ecological Interest
S38	Section 38 agreement, Highways Act 1980
S278	Section 278 agreement, Highways Act 1980
SAC	Special Areas of Conservation
SANG	Suitable Alternative Natural Greenspace
SHW	Specification of Highway Works. The Specification for Highway Works is published as Volume 1 of the Model Contract for Highway Works.
SINC	Sites of Importance for Nature Conservation
SPA	Special Protection Areas
SSG	Sewer Sector Guidance
SPZ	EA Groundwater Source Protection Zone
SuDS	Sustainable Drainage Systems
SSSI	Site of Special Scientific Interest
TM	Traffic Management

3. Design Standards

3.1 Design Standards

3.1.1 Drainage shall be designed in accordance with this Technical Guidance Note and TG8-2. As directed in these TGs, additional guidance is provided in the following documents:

- The SuDS Manual (CIRIA C753)
- National and Local Planning Policies
- Design Manual for Roads and Bridges (DMRB)

  CG 300 – Technical approval of highway structures

  CG 501 – Design of highway drainage systems

  CD 522 – Drainage of runoff from natural catchments

  CD 523 – Determination of pipe roughness and assessment of sediment deposition to aid pipeline design

  CD 524 – Edge of pavement details

  CD 532 – Vegetated drainage systems for highway runoff

  LA 113 – Road drainage and the water environment

3.1.2 Any proposed deviation or changes to these parameters are to be agreed with HCC as Highway Authority in advance using the Departure from Standard process. Refer to Technical Guidance Note TG17 – Departures from Standard.

4. General Requirements & Key Principles

HCC Highway Drainage systems should be sustainable in terms of materials, maintenance and cost. They should also deliver benefits in terms of water quality, flood alleviation, and environmental biodiversity.

4.1 General Principles

4.1.1 Drainage designs must:

- Be safe to construct, operate, maintain and demolish – designers must ensure they assess health and safety risks associated with each stage and avoid/mitigate those risks through the design as far as reasonably practicable.
- Cater for potential spillages and pollution events – designers to incorporate mitigation strategies / design features as appropriate.

4.1.2 Drainage designs shall:

- Manage water as close to the source as possible using the appropriate discharge point based on the drainage hierarchy:
    1. Discharge to ground
    2. Discharge to watercourse
    3. Discharge to surface water sewer
- Attenuate water flows by sustainable means prior to conveyance
- Minimise impacts on the capacity of existing highway drainage networks
- Minimise whole life costs i.e. minimising operational difficulties and minimising the need for ongoing and regular maintenance
- Maximise secondary benefits e.g. biodiversity, water quality, public amenity, flood alleviation, enhancement etc.
- Include treatment of runoff generated
- Cater for climate change and exceedance ensuring exceedance flows are managed (Sections 4.6 and 4.8)
- Utilise materials/products to minimise the carbon footprint of the design and the construction process
- Be sustainable
- Only be undertaken by a competent drainage designer
- Have a minimum design life of 60 years except for structures and items noted otherwise in this guide which will require a 120 year design life.

4.1.3 The discharge of private water into Highway drainage systems (i.e. systems adopted by HCC as the Highway Authority) will not be permitted.

4.2 Drainage Design Certification

4.2.1 Drainage technical compliance shall be demonstrated for all schemes within the Highway Boundary and highway to be adopted by HCC (including any drainage located outside of the Highway Boundary but maintained/to be maintained by the Highway Authority via an easement) **except** in the following instances:

- A scheme which renews an existing asset or part of an asset and does not require amendments to the drainage system (for example resurfacing of a road using the same or very similar type of material).
- A scheme which has no drainage implications (for example installation of a lighting column)
- A scheme which involves the construction or modification to a highway feature covering an area of land of less than one hectare **and** has an insignificant impact on the local drainage (for example construction of a small traffic island).

4.2.2 The drainage design shall be certified for compliance with HCC's requirements (as outlined in section D1 of the Drainage Design Certificate) and for being undertaken by a suitably qualified engineer with suitable technical knowledge, experience and competence in the design of drainage. The Drainage Design Certificate shall be submitted together with the design.

4.3 Maintainability

4.3.1 Drainage systems must be designed in accordance with CDM to:

a) Minimise the requirement for temporary traffic management for any remedials / repairs / inspections and cleaning activities

b) Provide safe access for inspection, maintenance and operation including maintenance vehicles, plant and operatives

c) Minimise requirement and frequency of maintenance.

4.3.2 The location, long-term maintenance and management of drainage systems must be considered from the outset to ensure that suitable systems and arrangements are put in place and agreed with the appropriate maintaining bodies right from the start of a scheme as the management/maintenance regime will influence the layout, location, and connection of such systems.

4.3.3 For swales immediately adjacent to the carriageway that ONLY receive run-off from the adopted Highway, HCC will take a Commuted Sum and adopt the swale as part of the Highway.

4.3.4 For SuDS elements such as ponds and remote swales where the system ONLY receives run-off from the adopted Highway, the hierarchy for adoption (in order of preference) is:

1) District or Parish Council to adopt and maintain feature (where there are areas of associated landscaping / open space)
2) HCC take a Commuted Sum and adopt and maintain feature

And only as a last resort,

3) Private Management Company to maintain feature and HCC use S100 of the Highways Act to access and clear feature in the event of flooding to the highway (can also take enforcement action under S100)

4.3.5 For SuDS elements such as ponds and swales taking mixed run off, the hierarchy for adoption (in order of preference) is:

1) Statutory Water Undertaker to adopt and maintain feature or a NAV company
2) District or Parish Council to adopt and maintain feature (where there are areas of associated landscaping / open space)
3) Private Management Company to maintain feature and HCC use S100 of the Highways Act to access and clear feature in the event of flooding to the highway (can also take enforcement action under S100).

Evidence will be required in the Design Report and Management Plan that adoption/ongoing maintenance has been sought in the order of preference stated above in 4.3.4 and 4.3.5.

4.4 Design Report and Management Plan

4.4.1 The designer shall provide a Design Report detailing the design strategy, impacts, mitigation and management plan for the drainage proposals for the approval of the Highway Authority. The report shall include and comment on:

- Details of data sources
- Details of field studies/investigations
- Site description including topography (including catchment areas), hydrology (including overland exceedance flow paths), hydrogeology, any existing flood risk and any sensitive receptors
- Design options considered (including why they were rejected) and proposed strategy & design
- Impacts and mitigation proposals
- The drainage Management Plan including details of the maintaining bodies for all of the systems and drainage elements.
- Any residual risks including the possibility of any flooding, pollution or erosion.

- Any residual health and safety risks associated with the construction, operation, maintenance or decommissioning.

The Design Report and Management Plan shall fully comply with CDM and the requirements of this Technical Guidance Note.

4.4.2 For Hampshire Engineering Services-led schemes, the designer shall follow the Design Check and Contract Audit Procedure, producing a Design Report for the whole scheme. For HCC schemes led by other design consultants, it is expected that they will follow their own design checking procedures, ensuring that any drainage design aligns with this TG and liaising with Asset Management accordingly. Where schemes require significant drainage design works, Hampshire Engineering Services can provide technical assistance.

4.4.3 For Developer-led schemes, the Design report should be included as part of the S278/S38 submission documents and will be reviewed as part of the S278/S38 Audit. Refer to:

- S278 Guidance for Developers
- S38 Guidance for Developers

It is key that residual risks for operation, maintenance and demolition are clearly identified in the design proposals.

Hampshire will not adopt designs which it considers to be unsafe for operation, maintenance and/or replacement of the asset.

4.5 Commuted Sums

4.5.1 New drainage infrastructure (excluding standard gullies, pipes and manholes/catchpits, small culverts, ditches and grips) will incur Commuted Sums in accordance with Hampshire County Council's Commuted Sum Policy. These sums cover the additional maintenance liabilities associated with drainage elements.

https://www.hants.gov.uk/transport/developers/commuted-sums

4.5.2 For HCC-led schemes, designers are to minimise additional maintenance cost implications where possible, using the commuted sums policy to influence the choice of drainage design elements.

4.6 Hydrology (Design Durations and Return Periods)

Rainfall Intensity and Profile

4.6.1 Compare Flood Studies Report (FSR) and Flood Estimation Handbook (FEH) and use the worst-case scenario (with the exception of gullies which shall be to CD 526 – Refer to Section 6.1).

Climate Change allowance

4.6.2 The Climate Change allowance to be used in the design shall be derived from the Environment Agency Climate Change allowances charts

https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

Parameters to be used:

- Epoch 2070s, Upper End allowance
- For the 1:30 year return period use the 3.3% Annual Exceedance value
- For the 1:100 year return period use the 1% Annual Exceedance value

Network Design Storm Durations

4.6.3 The following storm durations and return periods shall be checked:

- 15, 30, 60, 120, 240, 360, 480, 960 and 1440 minutes
- Winter and Summer Profiles.

Design Return Period (Years)	Requirements
1:2	No surcharging of the drainage system
1:30+ Climate Change allowance	No flooding of the drainage system
1:100+ Climate Change allowance	• Demonstrate highway will not become impassable (assessed on a case-by-case basis considering the local circumstances/property proximity and levels etc) • Demonstrate no property flooding caused by highway runoff. Refer to Section 4.8 also. • Assess any potential flooding and identification of potential impacts (with a risk assessment where required in accordance with Flood Risk to People FD2321/TR1 and TR2)
Note: For gullies refer to Section 6.1 instead	

4.7 Head Loss

4.7.1 Head loss shall be applied to the design in accordance with CD 523.

4.8 Designing for Exceedance

4.8.1 For events greater than 1 in 30 year + Climate Change allowance, the designer shall consider the following in terms of exceedance:

- Above ground flood pathways
- Whether any changes in levels proposed by the design will impact routes of existing surface water flow paths
- Surface water storage requirements
- Downstream impact of proposals

A drawing showing pre-development and post-development flood exceedance routes (with localised contour mapping) shall be provided with the design.

Please Note: In areas where there is an existing flooding issue, the Highway Authority reserves the right to require a higher design return period to be used than the 1:30 year + Climate Change allowance. Designers of works in areas of flooding should request clarification of the requirements from HCC before starting their design.

4.9 Peak Flow Rate

4.9.1 The designer shall derive the peak flow rate by considering all storm durations: 15, 30, 60, 120, 240, 360, 480, 960 and 1440 minutes for Winter and Summer profiles.

- **New Infrastructure -** Peak flow rates shall not exceed the greenfield runoff rate for the area for the 1 in 1 year, 1 in 30 year + Climate Change and 1 in 100 year rainfall + Climate Change allowance (greenfield rates).
- **Modification of existing highway -** Peak flow rates shall be as close as possible to the equivalent greenfield runoff rate for that area for the 1 in 1 year, 1 in 30 year + Climate Change and 1 in 100 year + Climate Change allowance rainfall events.

The greenfield runoff rate shall be calculated in accordance with Interim Code of Practice for Sustainable Drainage Systems methodology.

4.10 Volume Control

4.10.1 Where reasonably practicable, the runoff volume for the proposed development going into any drain, sewer or surface water body for the 1 in 100 year + Climate Change allowance, 6 hour rainfall event should not exceed the greenfield runoff volume for the same event.

Proposed Development Runoff Volume		**Greenfield Runoff Volume**
1 in 100 year + Climate Change allowance 6 hour event	≤	1 in 100 year 6 hour event volume

4.11 Capacity Checks

Discharge to a watercourse (including ditches)

- Any increase of flows to be kept to a minimum - refer to Sections 4.9 and 4.10
- Ensure that third-party landowner permissions are obtained where work on third party land is required (this includes permission from the riparian owners of the watercourse). It shall be evidenced that this has been obtained before work starts or any approvals are given to proceed.
- Where additional volumes are being discharged to a watercourse (i.e. area is being drained into the ditch that would not have done so before or the amount of impermeable area has increased) then the additional volume shall be mitigated. Either by discharging everything at greenfield Q_{BAR} or by discharging the existing volume at existing rates and the extra volume at 2 l/s/ha. For “Major Development” sites (as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015) this should have been covered by the planning permission. For non-Major sites or sites that do not require planning, it will be particularly important to demonstrate this mitigation through the drainage design, referenced in the Design Report.
- Comply with the requirements of and gain the required approvals from the Environment Agency where the watercourse is a Main River (and providing evidence to confirm this before any work commences).
- Where it is an Ordinary Watercourse, obtain Ordinary Watercourse Consent for any works affecting the watercourse (demonstrating that the capacity will remain the same or be better following the works) – this must be done in advance of any works (including temporary works) being undertaken.
- For the 1 in 100 year event + (Climate Change allowance) any excess flows greater than the 1 in 30 year event + (Climate Change allowance) shall be managed in accordance with Section 4.8.

A ditch located adjacent to a Highway is NOT necessarily a “Highway” adopted ditch. Individual landowners are often the riparian owners of the ditch. Consult the Ordinary Watercourse team for confirmation.

Connecting to non-HCC drainage (Statutory Undertaker adopted drainage network)

- Consult the relevant Statutory Undertaker asset owner and obtain confirmation that the network can accept the flows and volumes from the proposed highway infrastructure for the 1:30 year event + Climate Change allowance (to ensure no surface flooding from the highway drainage system). This confirmation is to be included within the design submission to HCC for S278/S38 schemes.
- For the 1 in 100 year event + (Climate Change allowance) any excess flows greater than the 1 in 30 year event + (Climate Change allowance) shall be managed in accordance with Section 4.8.

Connecting to an HCC Highway drainage network

- Designers should note that most of HCCs drainage network doesn't have capacity to accept additional run-off and in many cases is already beyond capacity. All alternative options should be considered in full before considering discharge to the existing highway drainage network. See Section 4.1.2.
- Designers should check existing flooding risk in the area by reviewing the catchment plans, flood risk and asset management plans:
    - Catchment Plans
    - Flood Risk in Your Area
    - Surface Water Asset Management Register
- Any new connection to the HCC Highway network will need to be reviewed and approved by HCC in advance. For Developer-led schemes, this will be considered as part of the S278/S38 design audit through the Developer Portal. For HCC-led schemes, designers should liaise with the Area team to establish if there are any known existing areas of concern in terms of the drainage network in the area and review the heat map available at I:\Environment Grouping\Open\Highways HQ\GIS\Highway Drainage\Flood Enquiry Density Analysis. They should also check with Hampshire Engineering Services drainage team for advice regarding capacity.
- Any increase in flows to be kept to a minimum - refer to Sections 4.9 and 4.10
- Consult HCC to establish whether there are any existing capacity issues with the network (as detailed above). Connection to existing Highways drainage network is unlikely to be permitted where there are limitations in the available capacity (or flow characteristics).
- HCC may require the design to demonstrate the capacity of the existing downstream network. In particular, that is has sufficient capacity to accept the flows and volumes from the proposed highway infrastructure for the 1:30 year event + Climate Change allowance.

- For the 1 in 100 year event + (Climate Change allowance) any excess flows greater than the 1 in 30 year event + (Climate Change allowance) shall be managed in accordance with Section 4.8.

It should not be assumed that existing HCC Highway drainage networks will have capacity for additional flows generated by new highway infrastructure.

4.12 Sediment Control

4.12.1 Drainage systems shall be designed to manage silt to ensure the systems remain fully functional and operational at all times.

Requirements

- Ensure adequate sediment control is in place to capture sediment and minimise sediment reaching the outfall. The sediment capture system(s) shall be sized to capture the volume of sediment generated over a minimum period of 3 years (refer to Sediment Volumes section)
- The design shall not include gully sumps in the assessment of sediment capture capacity
- Ensure sediment capture systems are not located where extensive and costly traffic management would be required to undertake the routine maintenance to remove the silt e.g.:
  - the middle of a roundabouts
  - between lanes / traffic islands

  In difficult to access locations conveyance of sediment or detritus to a more suitable cleansing point has to be provided i.e. where gullies and catchpits are required in locations where excessive positive traffic management would be required to access them, Type 3 gullies with manholes should be used to send the silt to a location where it can be easily collected without the need for excessive traffic management.
- Ensure that systems can be adequately and safely cleansed where silt cannot be fully mitigated (refer to Section 4.3). This includes ensuring suitable access to enable sediment removal from the whole of the base areas considering the cover size, chamber size and depth.

Sediment Volumes

The following general principle shall be applied:

Volume of catchpit sediment capacity in the system	**≥**	**Volume of sediment generated in 3 years at the feature location***

The designer shall produce calculations to demonstrate that there is enough capacity within proposed catchpits to capture the sediment generated over 3 years. Should there be insufficient capacity, the designer shall consider site specific options to increase the capacity. This may include increasing the number of catchpits, increasing their ring size or increasing their sump, creating scheme specific details for those chambers whilst ensuring maintainability.

**this calculation shall include suitable silt allowance where there are site specific circumstance that generate higher levels of silt e.g. aggregates factory, silt from adjacent farm or fields, etc. HCC Asset Management Team can advise areas where additional cleansing is already required due to high quantities of silt within existing runoff. Refer also to CD 523.*

Refer to Appendix C for Sediment Calculation Procedure.

4.13 Utilities

4.13.1 The designer shall obtain utilities and buried services records following The Highways Authority Utility Committee (HAUC) Code of Practice "Measures Necessary Where Apparatus is Affected by Major Works" and undertaking a utility survey to PAS128 – Underground Utility Detection. Refer to Technical Guidance Notes TG20 – Statutory Undertakers.

4.13.2 Records for the HCC Highway drainage/equipment network can be obtained by contacting highway.asset.management@hants.gov.uk. The designer may need to undertake additional surveys/investigations to confirm all drainage assets.

4.13.3 The designer shall demonstrate on the drainage drawings that there are no clashes between existing/proposed services and the proposed drainage design. Basic C2 information supplied by utility companies cannot be relied on as being 100% accurate. The actual location of utilities should be clarified on site through appropriate surveys/investigations such as reviewing the position of the covers, electronic/electrical tracing, trial holes, ground radar.

5. Water Quality / Treatment

5.1 Applicability

5.1.1 Water quality requirements apply to all new schemes where water is collected and drained from within the Highway boundary. Water shall not be collected from outside the Highway boundary.

5.1.2 For maintenance work and small HCC capital schemes (where existing drained area is maintained or not increased by more than 15%), water quality / treatment principles shall be followed only as far as is reasonably practicable within the constraints of the site.

5.2 Water Quality Assessment Requirements

5.2.1 An assessment of the water quality generated by the highway runoff shall be undertaken and compared against the water treatment measures offered by the proposed drainage system. The assessment shall be carried out in accordance with the type of road being drained as detailed below. The designer must also ensure compliance with any local planning requirements in relation to water quality.

Total SuDS mitigation index (for each contaminant type)	**≥**	**Pollution Hazard Index generated (for each contaminant type)**

Type of Road	Requirements
Roads with traffic <50,000 AADT	• Use Simple Index Approach (Refer to Chapter 26 of the CIRIA C753 SuDS Manual)
Major Roads (>50,000 AADT)	• Follow methodology from “LA 113 Road Drainage and the Water Environment”
Roads Next to Sites with Heavy Pollution Sites with high levels of pollution e.g. highly frequented lorry approaches to industrial estates and waste sites, sites with a presence of chemicals or fuels.	• Follow methodology from “LA 113 Road Drainage and the Water Environment” • Discharge may require environmental license or permit; obtain pre-permitting advice from the Environment Agency • Produce detailed risk assessment (Refer to 26.7.3 CIRIA C753 SuDS Manual) • Liaise with HCC (as Highway Authority) in advance of submitting detailed design

5.2.2 For all sites, the designer shall provide a site-specific environmental risk assessment (undertaken by a suitably qualified ecologist) addressing the likelihood of the scheme impacting on any of the following sites:

a) Sites within an EA Groundwater Source Protection Zone (https://magic.defra.gov.uk/MagicMap.aspx) – refer to EA requirements and Technical Guidance Note TG8-2 Drainage - Infiltration.

b) Sites within a 2km radii (or 5km radii if direct pathway / connection) of SSSIs, RAMSARs, SACs or SPAs.

c) Sites within 1km radii of SINCs, NNR or LNR, including all connectivity (ditches, main rivers, overland flow routes).

d) Sites within sensitive sites, including mapped ecological network areas, habitat supporting protected species, priority habitat, Road Verge of Ecological Interest (RVEI).

- Designers external to HCC need to request a HBIC data search using the following link: https://www.hants.gov.uk/landplanningandenvironment/environment/biodiversity/informationcentre/requestdatasearch

HCC Designers should contact the Ecology team direct to request an ecological screening.

Where risk of impact on these sites is identified, follow the additional requirements detailed in 5.3.

5.3 Extra Measures for Protected Resources (Surface or Groundwater) or Environmentally Sensitive Areas

5.3.1 Where risk is identified, follow precautionary approach as per CIRIA C753 SuDS Manual (Section 26.7.1) Step 3 ‘Consider the need for a precautionary approach where discharges are to protected waters’. Provide additional treatment component “in the event of an unexpected pollution event or poor system performance”.

5.3.2 Comply with relevant regulatory requirements, e.g. Consultation with conservation bodies, planning requirements and local policy requirements. Note that works within / adjacent to SSSI, RAMSAR, SAC, SPA etc may require permitting from Natural England.

5.3.3 Obtain relevant environmental licenses or permits (as required).

5.4 Surface Water Runoff Treatment Methods

5.4.1 The preference is for SuDS-based methods to be used (Refer to CIRIA SuDS Manual and the associated requirements in Sections 6 and 7 of this TG). Where the use of SuDS is not feasible or sufficient on its own to provide the level of treatment required, proprietary products such as Oil Separators and/or Hydrodynamic Vortex Separators may be considered as part of the treatment process. For Oil Separators refer to BS EN 858-1 and BS EN 858-2 . For Vortex Separators refer to CD 528.

5.4.2 Calculations/data from the manufacturer will be required to be submitted with the design proposal to demonstrate the level of treatment provided by the proprietary system(s) e.g. Simple Index Approach calculations in accordance with CIRIA SuDS Manual C753 requirements.

5.4.3 Any proprietary systems shall be installed in accordance with the manufacturer's recommendations.

5.4.4 Proprietary systems shall include a suitable alarm (and/or telemetry); type to be agreed with HCC (refer to Section 9.3). For HCC-led schemes, designer to consult with Asset Management directly. For Developer-led schemes, this shall be undertaken as part of the S278/S38 Design Audit process.

5.4.5 Cleansing methods and frequencies are to be detailed within the design proposals to enable HCC to review suitability of the proposed product(s), assess the likely future maintenance liabilities and calculate the associated commuted sums.

6. Flow Conveyance

6.1 Gullies & Gully Connections

Item	Requirements
Design Standard	DMRB CD 526 Spacing of road gullies including the associated return periods and rainfall intensity for gully design
Maximum Flow width adjacent to kerb	• 0.6m where footway/cycleway is less than 0.5m from the carriageway kerb • 0.75m for all other routes (including routes where the footway/cycleway is 0.5m or more from the kerb)
Spacing between individual gullies	• Minimum 5m
Adoptable design drawing requirements	• Provide drawings showing contributing catchment areas for each gully. • Contour plans and profile/long section to be provided to understand highway gradients and low spots. Slack longfalls should be avoided. • Refer also to TG2 – Alignment Design with regard to longfalls, crossfalls and local adjustments for drainage improvement.
Sumped gullies	To be used by default and to be trapped
Non-sumped gullies	• Only to be used on a site-specific basis subject to HCC Highway Authority agreement. • To be considered where access requires significant temporary traffic management (e.g. inside lane roundabouts). Where non-sumped gullies are used, sediment capture shall be provided downstream e.g. catchpits to be provided downstream.

Item	Requirements
Gully frame and grating	• Strength Class D400 Group 4 in accordance with BS EN 124 as a minimum. • Pedestrian/cycle-friendly mesh gratings (D400 Group 4) shall be used in urban areas including any cycleway or designated cycle route. • Gully grating to be Type R or above i.e. have minimum design value of the Grating Parameter, G of 60 s/m² (DMRB CD 526). • Minimum water opening 1200cm^2 (975cm^2 for pedestrian/cycle friendly mesh gratings). • Solid flanges apart from lifting holes • Refer also to HCC Model Contract Specification
Gully hinge orientation	On the traffic approach side of grating
Min. gully connection diameter	150mm
Max. gully connection length	10 metres
Min. pipe gradient	1:40
Further requirements	Refer to HCC Model Contract Specification

Notes	• Each gully to have an individual outlet and pipe
	• Gullies connected to a pipe system at the head of a run will need to connect to a manhole for maintenance purposes
	• Where drainage is provided by means of a network of gullies:
	  ○ A double gully shall be used at each sag point in the vertical alignment
	  ○ Gullies shall be placed upstream of junctions, pedestrian crossing locations and raised tables

6.2 Combined Kerb Drainage

6.2.1 Due to the difficulties in maintaining these elements and the associated significant costs and risks to those maintaining them, kerb drainage shall not be used except in exceptional circumstances. Designers shall use

other methods to ensure adequate run-off of surface water without the need to resort to combined kerb drainage units. Alternative design options include:

- Careful design of vertical alignments and associated cross falls
- Closely spaced individual gullies
- Double gullies
- Adjusting pavement levels locally to provide suitable fall to gullies i.e. false falls
- Over-the-edge drainage
- Grips.

6.2.2 Where it is absolutely unavoidable, a departure from standard shall be sought with the DfS application including details/calculations of all alternatives considered, demonstrating why alternative design options cannot be used.

Please Note: Application for a DfS does not mean that it will necessarily be approved and any approval should not be relied upon until it has been received in writing.

6.2.3 Where a DfS for combined kerb drainage is approved:

- Plastic combined kerb drainage will not be accepted under <u>any circumstances.</u>
- Capacity to withstand vehicle overrun will need to be demonstrated for the kerb drain units – E600 strength units to be used.
- Sumps should be provided at least every 15m which can be accessed by a 150mm diameter hose for emptying/maintenance.
- Units with plastic liners shall not be used.
- Maintenance methodology must be considered (as required by CDM) with respect to how the system can be safely maintained, including required traffic management, how the silt will be cleared from the drain, how silt/detritus will be prevented from covering the carriageway. Proposals for the method of maintenance shall be included within the Design Report.

6.3 Pipes (excluding gully connections)

Item	Requirements
Min. pipe diameter	225mm
Geometric design	Pipes to be located at least 1m away from kerbline.
Pipe Flow velocities	Achieve self-cleansing velocity • Min. 0.75 m/s (at 1/3 design flow) • Min. 1.0 m/s at full flow • Max. 3.0 m/s at full flow

<table>
<tr><th>Item</th><th>Requirements</th></tr>
<tr><td>Pipe gradients</td><td>

Achieve self-cleansing velocities
Minimum pipe gradient 1:300
Pipe gradients should be constant between manholes
Pipes should be laid to be straight in plan between manholes (no radii, no bends)

 Networks need to have a constant gradient from beginning [highest point in the network] to the lowest point [outfall]. Refer to Section 6.3.1.
</td></tr>
<tr><td>Minimum cover</td><td>
<u>Carriageway (including within 4m of carriageway)</u>
<table>
<tr><th>Depth to Pipe Crown</th><th></th></tr>
<tr><td>1.2m</td><td>Design in accordance with CD 533</td></tr>
<tr><td>1.2-0.9m</td><td>Demonstrate compliance pipe loading calculations (CD 533).</td></tr>
<tr><td><0.9m</td><td>Provide pipe structural assessment as per CD 533.
Type Z surround will be required</td></tr>
<tr><td><0.75m</td><td>Demonstrate system can safely withstand the loads
Special protection measures required e.g. reinforced concrete slab, to be classed as “Special Engineering Difficulty” and require a specific departure from standards approval. Only considered under exceptional circumstances.</td></tr>
</table>
<u>Outside Carriageway (under verges and other areas not subject to loading i.e. over 4m offset from the edge of carriageway or where protected by physical means)</u>
Minimum depth 0.6m
</td></tr>
<tr><td>Pipe Bedding / loading calculations</td><td>To be in accordance with CD 533 and MCHW Highway Construction Detail “Surface Water Drains - Trench and Bedding Details” Drawing F1</td></tr>
<tr><td>Notes</td><td>The use of “nib-nobblers” (rectangular hollow sections) at island buildouts is not acceptable as these are subject to blockage.</td></tr>
</table>

6.3.1 Required Pipe Network Gradient

Pipe networks should have a constant gradient from beginning (highest point in the network) to the lowest point (outfall) to minimise changes in velocity which would increase sedimentation and maintenance issues in the long term.

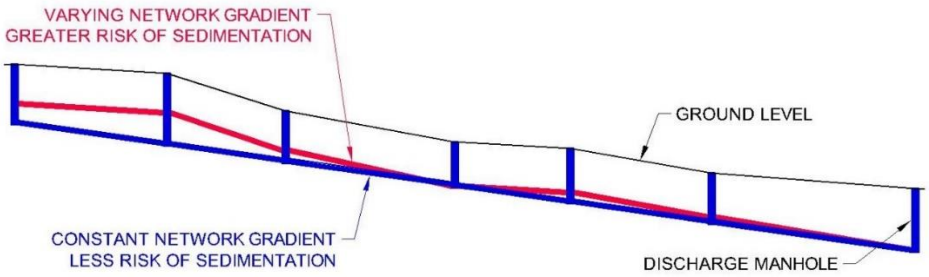

Figure 2 - Required Pipe Network Gradient

6.4 Manholes/Catchpits

6.4.1 Manholes/catchpits shall be provided:

a) At changes of direction/gradient

b) Where access to the network is necessary for inspection or maintenance

6.4.2 Catchpits shall only be used where sediment collection and de-silting is required, i.e. in advance of critical outfalls, attenuation features, soakaways, etc.

Item	Requirements
Maximum distance between linked manholes	90m (designer to consider site conditions and reduce maximum length if site conditions require it).
Cover minimum loading reqs.	Refer to HCC Model Contract Specification
Backdrops	Backdrops are not allowed
Catchpit/Manhole locations	Catchpits / manholes should not be located under kerblines.

Item	Requirements
Cover positions	• Chamber covers to be at least 0.5m away from kerbline and positioned to avoid wheel tracks. Wheel tracks are defined in SHW Cl. 903.30 and 31 which states: • For a 3.65m wide lane, the wheel track zones shall be taken to be between 0.5m and 1.1m and between 2.55m and 3.15m from the centre of the nearside lane markings for each traffic lane (or, in the absence of lane markings, lane edges). • Where the lane width is other than 3.65m then each wheel track zone shall be taken to be 0.6m wide with the inside edges of the wheel track offset from the centre of the lane by 0.72m. • Position to minimise traffic management requirements for future maintenance • To be placed away from junctions (where possible)
Notes	• Step irons shall not be installed within manholes/catchpits to be adopted by HCC. This is to avoid the risk of entry into the confined space by untrained operatives and to remove risk of unsafe rusting step irons. Only confined space trained operatives shall enter catchpits/manholes, following the approved Safe System of Work/ Risk Assessment Method Statements for the specific work being undertaken. • Ground conditions at the proposed location of catchpits/manholes should be assessed to ensure the ground has adequate bearing strength and will not compress as a result of the catchpit/manhole loading (including any concrete surround). Where the ground has insufficient strength, localised foundation improvement will be required.

6.5 Culverts

6.5.1 Culverts are not the preferred design solution. Where possible designers should use natural open channel alternatives e.g. ditches/swales. Where a

culvert is required the designer shall follow the requirements set out within CIRIA C786 - Culvert, Screen and Outfall Manual.

- Connections part way along culverts shall be accessible via a manhole which shall provide adequate features, including rodding and flushing systems to enable the connection into the culvert to be fully maintained.
- Minimum culvert diameter/span shall be 0.450m.
- Use of culverts with diameters/spans between 0.8m and 1.2m should be avoided due to difficulties with safely cleansing/maintaining such items. Should a culvert in this size range be required, it should be increase to 1.2m if possible. However, where site constraints prevent the use of a 1.2m diameter/span culvert, the use of multiple smaller culverts should be considered in preference to culverts in this range.
- Where the culvert length is greater than 12m, an absolute minimum of 1.2m diameter (or height for box culverts) will be required to allow access for maintenance.
- For culverts larger than 0.9m diameter/span refer to Technical Guidance Note TG7 – Adoption of Structures for the structural approval process.

6.6 Headwalls

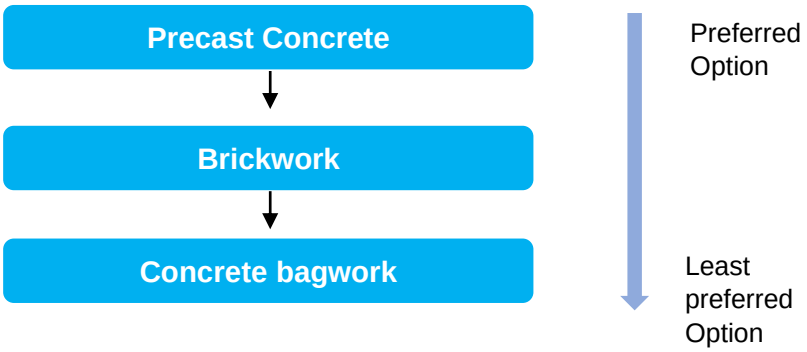

Figure 3 - Headway type preferences (subject to site location/depth)

Item	Requirement
Preferred Type	• Precast concrete to SSG adoptable standards with 120 year design life. • Designer to submit proposals for surface finish.
Alternative Types	Refer to HCC Standard Details

Item	Requirement
Structural Approval	Headwalls greater than 1.5m height are considered a structure and must follow a Structural Approval process (refer to Technical Guidance Note TG7 – Adoption of Structures).
Angle of outfall pipe	To be 30-90 degrees in-line to watercourse direction of flow to suit the site characteristics (except where the headwall is at start/end of the ditch). Refer to Figure 4.
Inlets/Outlet Grills	Refer to Section 6.13
Scour protection	To be utilised where flow velocity exceeds 1.0 m/s or to avoid erosion as required by ground conditions. Type of protection to be agreed with the Highway Authority.
Notes	• Handrail requirement must be considered/assessed (under CDM) if headwall depth (base to top) >1m. Handrail in accordance with TG25 - Fencing, Noise Barriers and Demarcation of the Highway Boundary, HCC Standard details HCC11/M/045 or HCC11/M/050 • Outfall pipe invert to be a minimum of 150mm above surrounding ground to reduce likelihood of blockage where the headwall is for an outfall pipe as opposed to a culvert. Where the difference is above 300mm, consider scour prevention. • Safe access for maintenance included.

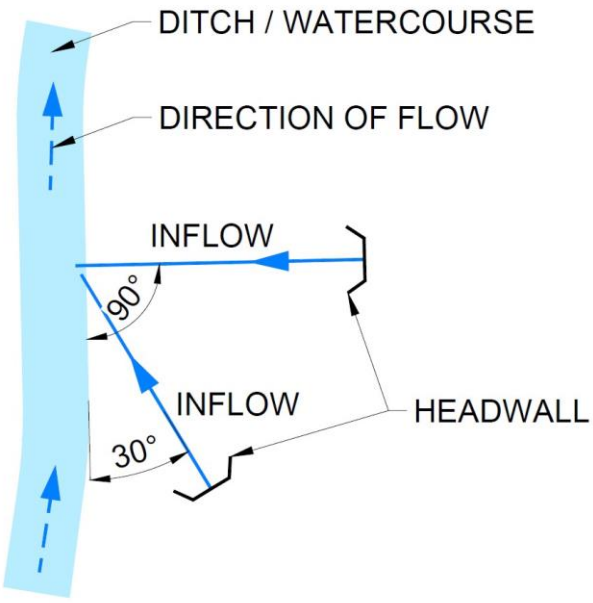

Figure 4 - Acceptable Angle of Headwall Discharge to Ditch / Watercourse

6.7 Filter Strips

Item	Requirement
Design Standard	CIRIA SuDS Manual C753
Longitudinal Slope	1/20 -1/100
Manning's value	Typical values 0.050-0.070 (to be assessed by designer). For Manning's n values refer to Appendix B
Max. Flow Velocity	0.3 m/s for 1:30 year event + CC allowance 1.0 m/s for 1:100 year event+ CC allowance Higher speeds should be avoided and will require erosion control measures.
Treatment time (Time of travel along strip)	Minimum 9 minutes (18 minutes from top of strip)
Design Considerations	Method of safe access for maintenance operations including silt clearance, litter removal, grass cutting etc
Seed mix	Refer to Section 9.4

6.8 Swales

Item	Requirement
Design Standard	CIRIA SuDS Manual C753
Side Slope	Max. 1/3; 1/4 preferred
Longitudinal Slope	1/17* -1/200 *Gradients steeper than 1/17 will require erosion protection (departure from standard)
Check Dams	Refer to CIRIA SuDS Manual C753
Manning's value	Typical values 0.050-0.070 (to be assessed by designer). For Manning's n values refer to Appendix B
Lining of swale	Not permitted. Where contamination from the ground is a concern, consult with the Highway Authority.
Max. Flow Velocity	0.3 m/s for 1:30 year event + CC allowance 1.0 m/s for 1:100 year event+ CC allowance Higher speeds should be avoided and will require erosion control measures. Check dams/stepped swales can be used to slow flow
Treatment time (Time of travel along swale)	Minimum 9 minutes (18 minutes from top of swale)
Half-empty time	1440 minutes
Design Considerations	Method of safe access for maintenance operations including silt clearance, litter removal, grass cutting etc
Seed mix	Refer to Section 9.4

6.9 Ditches

Item	Requirement
Longitudinal Slope	1/17* -1/200 *Gradients steeper than 1/17 will require erosion protection (departure from standard)
Max Flow Velocity	0.3 m/s for 1:30 year + Climate Change allowance 1.0 m/s for 1:100 + Climate Change allowance

Item	Requirement
Manning's value	Typical values 0.050-0.070 (to be assessed by designer). For Manning's n values refer to Appendix B
Shape/Profile	Trapezoidal (for stability) Refer to HCC11/D/115 "Notes for Guidance on the use of the Standard Detail Drawings" Generally (subject to stability assessment): Type 1 – Chalk ground Type 2/3 – Non-chalk ground
Stability Assessment	Stability Assessment required for: a) Ditches deeper than 700mm b) Ditches located within 45° loading angle from vehicle loading/VRS systems, etc. c) Where unstable ground conditions are present Where ditches/swales are being used for flood routing a more detailed stability assessment will be required.
Lining	Lining not permitted apart from scour protection at inlets.
Design Considerations	• Impact of ditch on existing structures • Safety to people • Safe access for maintenance operations particularly given steep side slopes • Max depth 1.2m • Avoid locating ditches at base of embankments • Located a safe distance from the road • Consider lamp columns, street furniture, fencing etc. • Consider need for VRS – Refer to TG14 - Collision Risk Assessment, VRS and Passive Street Furniture.
Seed Mix	Refer to Section 9.4

6.10 Filter Drains and Trenches

- As per HCC Standard details and HCC Notes for Guidance on the use of the Standard Detail Drawings.

- Not acceptable in contaminated land.
- Only to be used where absolutely essential as they cannot be effectively maintained (normally requiring complete replacement).

6.11 Flow Controls

Flow Controls – Manhole/pipe systems

- The preference is for vortex flow controls (e.g. Hydrobrakes, Q-Brake or equivalent) to be used rather than orifice plates as they are considered less likely to block than orifice plates.
- Minimum Flow Control opening size shall be 150mm.

Flow Controls – Ditches/Swales

- These include Check Dams, Weirs, Leaky Dams.
- Proposals to be agreed with HCC Asset Management. Proposals need to provide adequate flow control, be safe to access and minimise maintenance requirements.

6.12 Non-Return Valves

- The preference is for non-return valves to be a metal flapped outfall with a neoprene seal.
- Valves must be accessible to enable maintenance to be undertaken safely and the design must detail the method of maintenance of the pipe to ensure any discharges to the watercourse are of suitable water quality.

6.13 Inlets/Outfall Grills (Pipes/Culverts/Headwalls)

Item	Requirements
Inlets/Outfall Grills	• For inlets/outlets greater than 300mm diameter, designer to carry out risk assessment to determine whether a grill is required (in accordance with "CIRIA C786 Culvert, Screen and Outfall Manual" in particular Sections 4.4-4.6 and Figure 4.1). • To be designed to minimise risk of blockage/siltation and ensure safety of operatives. Designs shall not have vertical grills bolted to the headwall and must ensure safe maintenance access for operatives to remove debris (both clearing from the grill and removing from the ditch). Cage grills are preferred with lockable access.

6.14 Pumped Systems

-  Will only be accepted under exceptional circumstances where no other drainage solution will work. They will require prior discussion with and agreement from HCC Highway Authority to install.
- Redundancy – At least one standby pump is to be provided for each of the pumps in the proposed system to ensure there is adequate redundancy in the event of pump failure (100% redundancy). The extra pump(s) provided as a standby shall be designed to switch on automatically in the event of main pump failure.
- Pump protection – Appropriate filters shall be provided to filter out elements which would interfere with the pump operation or could cause damage to it.
- The system is to be designed to avoid blockage and enable easy and safe access to the pump chamber and pump units/power supplies in order to carry out inspections and maintenance.
- Wet wells will require penstock valves fitted to any incoming pipes to enable maintenance/replacement.
- Alarm requirements – refer to Section 9.3.

7. Attenuation

7.1 General Principles

7.1.1 If using attenuation, it shall be designed to have

1) Adequate flow control with consideration to operation, maintenance and access requirements.
2) A minimum design life of 75 years.
3) Silt capture mechanisms upstream of any attenuation features.
4) Suitable measures to prevent runoff from non-highway land entering the system.

7.1.2 Designs should incorporate “multiple pre-treatment”, using practices such as swales, sediment basins and filter strips in series, upstream of infiltration basins/attenuation ponds.

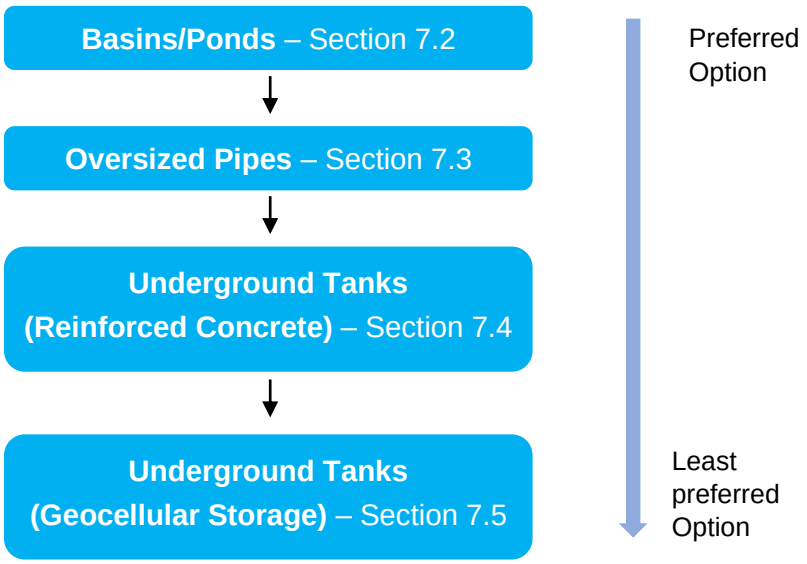

Figure 5 - Hierarchy of Attenuation Systems Preference

7.2 Attenuation Basins/Ponds

Item	Requirement
Design Standard	CIRIA SuDS Manual C753
Pre-treatment	Hydrodynamic vortex separator upstream required
Sediment Forebay	Required - at least 20% of pond volume. Refer to Figure 6. All parts of the sediment forebay shall be accessible by excavator to enable maintenance of the forebay to be undertaken.

Item	Requirement
Risk Assessment	Demonstrate safety of the design. Consider safety of the public and whether fencing, signage or other safety measures are required. Fencing/safety: Risk assessment and design in accordance with CD 532 Consider risk of high groundwater and contamination
Low flow channel	Include a low flow channel within the Pond
Vehicular Access	Suitable vehicular access to carry out maintenance (access track to be provided where necessary including to enable safe access to all parts of the sediment forebay for de-silting operations).
Side Slope	Max. 1/3, 1/4 preferred
Max Water Depth	1.25m.
Lining	Sediment forebay shall not be lined. Lining to main pond/basin not desired but may be needed in some circumstances - to be agreed with the Highway Authority
Max Flow Velocity	0.3 m/s
Time of travel	Minimum 9 minutes
Half-empty time	1440 minutes Consider whether a minimum ecological volume might need to remain
Incoming flow	Energy of incoming flows to be dissipated to minimise scouring and erosion
Geotechnical assessment required	Demonstrate that the basin/pond will not destabilise neighbouring land/structures/highway.
Seed mix	Suitable for Basin/Site conditions – Refer to Section 9.4
Maintenance Plan	To be provided by designers, needs to be agreed in advance with HCC Asset Management. (Refer to Sections 4.3 and 4.4)

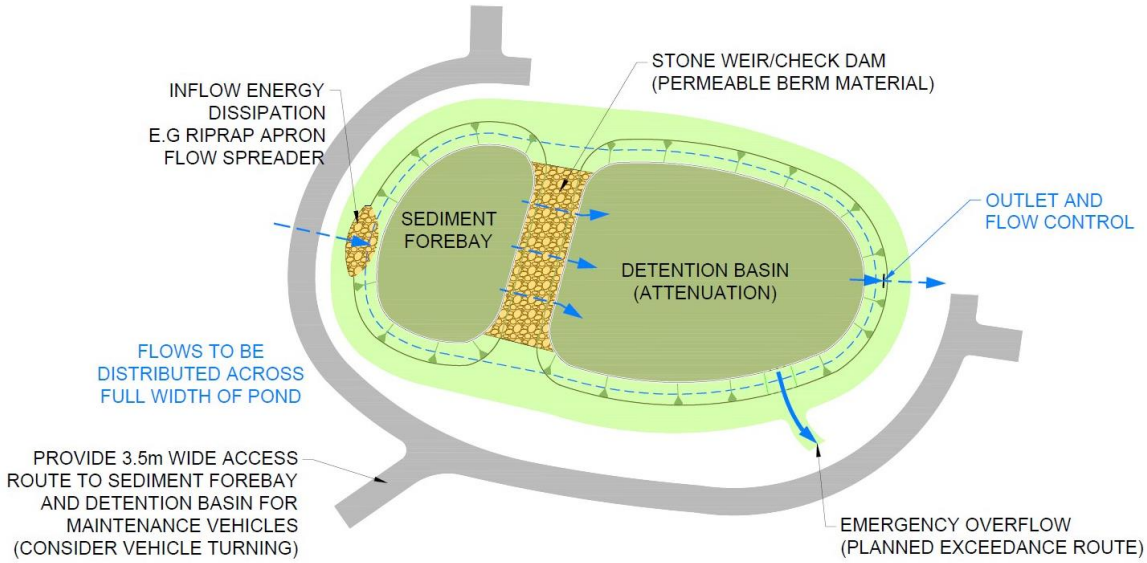

Figure 6 – Attenuation Basin / Pond

7.3 Oversized Pipes

Item	Requirement
Online/Offline Storage	Preference for online storage
Pre-treatment	Catchpit(s) upstream and downstream
Low Flow (DWF) channel	Required for pipes 900mm diameter/span and above
Access and inspection	Suitable for operation/inspection/cleansing - to be agreed with HCC Asset Management
Maintenance Plan	To be provided by designers, needs to be agreed in advance with HCC Asset Management.
Minimum Design Life	120 years

7.4 Underground Tanks (Reinforced Concrete)

7.4.1 Underground Concrete tanks are not preferred. The design shall include the following:

- Be located away from direct highway loading and areas which can be subject to vehicle overruns.
- Require Structural Approval (refer to Technical Guidance Note TG7 – Adoption of Structures)
- Measures to prevent breaking loading / accidental loading where tanks are not designed to withstand such loading (Refer to Technical

Guidance Note TG14 - Collision Risk Assessment, VRS and Passive Street Furniture)

- Venting to be provided in line with manufacturer's requirements and agreed with the Highway Authority
- Maintenance Plan (Refer to Sections 4.3 and 4.4)
- Siltation prevention measures to be provided as part of the design (eg upstream catchpits / hydrodynamic vortex separator).
- Siltation management measures to be provided as part of the design to prevent silt entering the system e.g. advance catchpits and vortex separators. Additional measures to be provided within the system to capture any remaining silt.
- Design resilience methods to prevent blockage of systems
- Provide sufficient access to the units for inspection, maintenance/cleansing (non-man entry systems)

7.5 Underground Tanks (Geocellular Storage)

7.5.1 Geocellular Storage shall not be used. Option 7.2 is the preferred form of attenuation. Options 7.3 or 7.4 should be used where above ground attenuation cannot be achieved.

7.5.2 Where it is absolutely unavoidable, a departure from standard (DfS) shall be sought which includes details/calculations of all alternatives considered, demonstrating why they are not possible.

7.5.3 Please Note: Application for a DfS does not mean that it will necessarily be approved.

7.5.4 Where a DfS for geocellular storage is approved, the design shall include the following:

- Safety Factors for infiltration to Table 25.2 C753
- Compliance with CIRIA C680 and the principles of CIRIA C737
- Be located away from direct highway loading and areas which could be subject to vehicle overruns.
- Require Structural Approval (refer to Technical Guidance Note TG7 – Adoption of Structures)
- Measures to prevent breaking loading / accidental loading where tanks are not designed to withstand such loading (Refer to Technical Guidance Note TG14 - Collision Risk Assessment, VRS and Passive Street Furniture)
- Venting to be provided in line with manufacturer's requirements and agreed with the Highway Authority
- Maintenance Plan (Refer to Sections 4.3 and 4.4)
- Siltation management measures to be provided as part of the design to prevent silt entering the system e.g. advance catchpits and vortex

separators. Additional measures to be provided within the system to capture any remaining silt.

- Design resilience methods to prevent blockage of systems
- Provide sufficient access to the units for inspection, maintenance/cleansing (non-man entry systems)

8. Outfall/Discharge

8.1 General Requirements

- **Surcharged Outfall** – if the outfall is surcharged these conditions need to be applied to the design. Where required, use non-return/flap valves. Both non-return valves and surcharged outfalls need to be factored in to the upstream drainage system flow capacity.
- **Planning** – The design (including the proposals for the outfall and discharge) will need to demonstrate compliance with the drainage strategy submitted at Planning (but also be safe in accordance with CDM).
- **Consents** – Design to have obtained relevant consents (refer to 8.2, 8.3 and 8.4).

8.2 Discharge to an Existing Network

- Discharge will need to be to an adopted highway or statutory sewage undertaker (or NAV/Inset company) network.
- Obtain drainage records of the receiving network (and confirm ownership).
- Agreement to discharge to the receiving network (e.g. S106 agreement or written confirmation from HCC Highways).
- Compliance CIRIA SuDS Manual Simple Index approach / Water Quality requirements within Section 5 of this document.
- Refer also to Capacity Check requirements in Section 4.11

8.3 Discharge to a Watercourse

- Permission is required to discharge / make a connection to a watercourse.
    - For Main Rivers contact EA for permission (EA Main River designation map https://www.gov.uk/government/collections/main-river-map-for-england-proposed-changes-and-decisions)
    - For other watercourses contact the LLFA to seek approval for the connection works to the watercourse using the Ordinary Watercourse Consent process (Making changes to a watercourse)
- Compliance with CIRIA C753 Culvert Screen and Outfall Manual
- Energy dissipation before outfall, provide scour protection if erosion is likely or discharge speed is greater than 1.0m/s
- Headwall requirements (Refer to Section 6.6)
- Compliance with Water Quality Requirements (Refer to Section 5).

- Environmental/ecological assessment carried out (if applicable)
- Refer also to Capacity Check requirements in Section 4.11

8.4 Discharge via Infiltration

8.4.1 Refer also to Technical Guidance Note TG 8.2 – Drainage - Infiltration for further details.

9. Other Requirements

9.1 Acceptable Products/Materials

- Refer to the HCC Model Contract Specification https://www.hants.gov.uk/transport/developers/standard-details for product requirements/suitability of materials.
- Refer to HCC Standard Construction Details
- For any other products/materials:
  - For HCC-led schemes, designers should liaise with Asset Management.
  - For Developer-led schemes, this will be considered as part of the S278/S38 design audit through the Developer Portal.

9.2 Floatation

- In locations where the groundwater can rise above the formation level of the drainage feature, a floatation calculation shall be carried out.
- Calculation to be carried out in accordance with Eurocode 7 BS EN 1997-1:2004 and A1:2013 and the National Annex +A1:2014, Section 10. Consider “Failure by Uplift” in particular but not exclusively.
- Refer to Eurocode 1 BS EN 1991-1-1:2002 for material weights and densities of different construction materials and actions.
- Calculations will need to be supplied and independently checked, in these instances.

9.3 Alarms

- Audible/Visual and telemetry alarms will be required.
- Telemetry requirement – automatic email alarm to alert HCC of a fault/power loss to pump. Power supply for telemetry (Battery or solar panel).
- Specific site requirements to be agreed by HCC Asset Management on a site specific basis. For HCC-led schemes, designer to consult with Asset Management directly. For Developer-led schemes, this shall be undertaken as part of the S278/S38 Design Audit process.

9.4 Planting and Seed Mixes

- Ideally natural regeneration preferred – this will require use of biodegradable geotextile mesh to allow establishment of vegetation during the first year. Where this is not possible consider use of locally sourced seeds.

- Where a seed mix is used varied seed mix to cater for varying levels of moisture within swales, attenuation ponds and ditches. Seed mixes should aim for slow growth. Seed mix/planting proposal for the individual site to be agreed by the Highway Authority prior to seeding. Refer to CD 532.
- Where within or adjacent to SSSIs (or other SINCs and RVEIs as identified by the County Ecologist) and especially within the boundary of the New Forest National Park, specialist advice needs to be sought. Refer to Technical Guidance Note TG15 - Trees, Landscape & Ecology.
- Establishment maintenance shall be required during the first year following seeding, to be followed by routine maintenance after the first year. Refer to CD 532 regarding maintenance requirements, grass heights and removal of arisings.
- With regard to the planting of trees in the vicinity of pipes/sewers, refer to Technical Guidance Note TG15 – Trees, Landscape & Ecology.

10. Further Support

10.1. Should you have a specific query or feedback about any of the content of this Technical Guidance Note, please send an email to Technical.Guidance@hants.gov.uk with the start of the email title as "TG8-1 – [Subject of email]".

10.2. Should you have a query about applying this to your particular project, please contact:

- the Design Audit Engineer dealing with your S278 or S38 application (if you are a Developer or Developer's Consultant)
- the Technical Guidance Note Specialist(s) (if you are working within Hampshire County Council)

10.3. Associated Technical Guidance Notes

- TG2 – Alignment Design
- Interim TG6-4 – Permeable Paving
- TG7 – Adoption of Structures
- TG8-2 – Drainage – Infiltration
- TG14 – Collision Risk Assessment, VRS and Passive Street Furniture
- TG15 – Trees, Landscape & Ecology
- TG17 – Departures from Standard
- TG20 – Statutory Undertakers
- TG25 - Fencing, Noise Barriers and Demarcation of the Highway Boundary

Appendix A – Checklist

Relevant section in TG8-1	Drainage Checklist for Detailed Design Submissions
	Scheme Information
☐ 4.4	Provide a short description of the works and drainage design report for the proposed system.
☐ -	General Arrangement
☐ -	Drainage drawings (pipe references (linked to the design calculations), sizes, invert levels, cover levels and gradients)
☐ -	Drawing showing impermeable areas used for hydraulic model
☐ -	Contour/levels plan for the scheme (include gully positions)
☐ -	Cross-section drawings (where relevant/applicable)
	General
☐ -	Compliance with Planning requirements (where applicable)
☐ -	Assessment of flood risk where applicable
☐ -	Confirmation on the proposed pipe materials, pipe length and bed type (either within drawing or pipe schedule)
	Drainage Design Principles
☐ 4.1	General Principles
☐ 4.2	Drainage Design Certification
☐ 4.3	Maintainability
☐ 4.4	Design Report and Management Plan for the proposed drainage
☐ 4.5	Commuted Sums
☐ 4.6	Hydrology (FSR/FEH Rainfall Intensities/profiles, Climate Change allowance, Storm Duration)
☐ 4.7	Head Loss
☐ 4.8	Designing for Exceedance (Events greater than 1 in 30 + Climate Change allowance)
☐ 4.9	Peak Flow Rate
☐ 4.10	Volume Control
☐ 4.11	Capacity Checks
☐ 4.12	Sediment Control
☐ 4.13	Utility Information
	Water Quality/Treatment
☐ 5.1	Applicability
☐ 5.2	Water Quality Assessment Requirements
☐ 5.3	Extra Measures for Protected Resources (Surface Or Groundwater) or Environmentally Sensitive Areas
☐ 5.4	Surface Water Runoff Treatment Methods

Drainage Checklist for Detailed Design Submissions

	Relevant section within TG8-1	
		Flow Conveyance
☐	6.1	Gullies & Gully Connections
☐	6.2	Combined Kerb Drainage
☐	6.3	Pipes (Excluding gully connections)
☐	6.4	Manholes/Catchpits
☐	6.5	Culverts
☐	6.6	Headwalls
☐	6.7	Filter Strips
☐	6.8	Swales
☐	6.9	Ditches
☐	6.10	Filter Drains and Trenches
☐	6.11	Flow Controls
☐	6.12	Non-Return Valves
☐	6.13	Inlets/Outfall Grills (Pipes/Culverts/Headwalls)
☐	6.14	Pumped Systems
		Attenuation
☐	7.1	General Principles
☐	7.2	Attenuation Basins/Ponds
☐	7.3	Oversize Pipes
☐	7.4	Underground Tanks (Reinforced Concrete)
☐	7.5	Underground Tanks (Geocellular Storage)
		Outfall/Discharge
☐	8.1	General Requirements
☐	8.2	Discharge to an Existing Network
☐	8.3	Discharge to a Watercourse
☐	8.4	Discharge via Infiltration
		Other Requirements
☐	9.1	Acceptable Products/Materials
☐	9.2	Floatation
☐	9.3	Alarms
☐	9.4	Planting & Seed Mixes

Appendix B – Typical Manning's n Values

Source: Table 5-6 Values of the Roughness Coefficient

Chow, V.T. (1959) Open Channel Hydraulics. McGraw-Hill, New York

Type of Channel and Description	Minimum	Normal	Maximum
Natural streams - minor streams (top width at floodstage < 100 ft (~30m))			
1. Main Channels			
a. clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
b. same as above, but more stones and weeds	0.030	0.035	0.040
c. clean, winding, some pools and shoals	0.033	0.040	0.045
d. same as above, but some weeds and stones	0.035	0.045	0.050
e. same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. same as "d" with more stones	0.045	0.050	0.060
g. sluggish reaches, weedy, deep pools	0.050	0.070	0.080
h. very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150
2. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
a. bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
b. bottom: cobbles with large boulders	0.040	0.050	0.070
3. Floodplains			
a. Pasture, no brush			
1.short grass	0.025	0.030	0.035
2. high grass	0.030	0.035	0.050
b. Cultivated areas			
1. no crop	0.020	0.030	0.040
2. mature row crops	0.025	0.035	0.045
3. mature field crops	0.030	0.040	0.050
c. Brush			
1. scattered brush, heavy weeds	0.035	0.050	0.070
2. light brush and trees, in winter	0.035	0.050	0.060
3. light brush and trees, in summer	0.040	0.060	0.080
4. medium to dense brush, in winter	0.045	0.070	0.110
5. medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. dense willows, summer, straight	0.110	0.150	0.200
2. cleared land with tree stumps, no sprouts	0.030	0.040	0.050
3. same as above, but with heavy growth of sprouts	0.050	0.060	0.080

Type of Channel and Description	Minimum	Normal	Maximum
4. heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
5. same as 4. with flood stage reaching branches	0.100	0.120	0.160
4. Excavated or Dredged Channels			
a. Earth, straight, and uniform			
1. clean, recently completed	0.016	0.018	0.020
2. clean, after weathering	0.018	0.022	0.025
3. gravel, uniform section, clean	0.022	0.025	0.030
4. with short grass, few weeds	0.022	0.027	0.033
b. Earth winding and sluggish			
1. no vegetation	0.023	0.025	0.030
2. grass, some weeds	0.025	0.030	0.033
3. dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. earth bottom and rubble sides	0.028	0.030	0.035
5. stony bottom and weedy banks	0.025	0.035	0.040
6. cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline-excavated or dredged			
1. no vegetation	0.025	0.028	0.033
2. light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. smooth and uniform	0.025	0.035	0.040
2. jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds and brush uncut			
1. dense weeds, high as flow depth	0.050	0.080	0.120
2. clean bottom, brush on sides	0.040	0.050	0.080
3. same as above, highest stage of flow	0.045	0.070	0.110
4. dense brush, high stage	0.080	0.100	0.140

Online reference

http://www.fsl.orst.edu/geowater/FX3/help/8_Hydraulic_Reference/Mannings_n_Tables.htm

Appendix C – Sediment Calculations

Catchpits to be sized to be able to capture the volume of sediment generated in 3 years

Vol. of catchpit sediment capacity ≥ Vol. of sediment generated (3 years)

Urban roads are estimated to generate 0.2kg/m^2/per year"[1].

(Sediment density estimated to be ≈ 500kg/m^3 unless indicated otherwise by the Highway Authority for a particular location) [2]

$$Volume\ of\ sediment\ generated\ (V_s) = \frac{0.2 \times Road\ area\ (m^2) \times 3(\text{years})}{500}$$

Standard HCC Catchpits sediment storage volume (based on HCC11/D/040)

Catchpit diam. (mm)	**Depth from lowest pipe invert**	
	300mm	400mm
	Available silt storage volume (m^3)	
1200	0.34	0.45
1500	0.53	0.71
1800	0.76	1.02

[1] (DMRB) CD 523 - Determination of pipe roughness and assessment of sediment deposition to aid pipeline design
[2] Revitt, D. Mike, Lundy, Lian, Coulon, Frédéric and Fairley, Martin (2014) The sources, impact and management of car park runoff pollution: a review. Journal of Environmental Management, 1461

Example Calculation

e.g. for 1000m² of road surface

Sediment Mass generated, S_m = 0.2 x 1000 x 3 = 600kg

$$Volume\ of\ Sediment\ Vs = Sediment\ Mass$$

$$Volume\ of\ sediment\ generated\ (V_s) = \frac{0.2 \times Road\ area\ (m^2) \times 3}{500} =$$

$$Volume\ of\ sediment\ generated\ (V_s) = \frac{0.2 \times 1000\ (m^2) \times 3}{500} = 1.2\text{m}^3$$

Check available catchpit storage volume

Using a 1200mmØ catchpit with 300 depth gives an available volume of 0.34m^3

Sediment volume provided 0.34m^3 < 1.2m^3 (Sediment volume required)

=> Design is NOT Acceptable Additional sediment storage required