CTSDESIGN
CONSULTING ENGINEERS

Proposed development at Former PRINCE OF WALES SOLIHULL

Sustainable Drainage and Maintenance Guide

August 2023

MACC Group Ltd

PROJECT REF: CS230702-RP02

1 Maintenance Responsibilities:

Maintenance of the system is the responsibility of the property owners.

Contact details are provided below of a suitably qualified company capable of providing maintenance assistance of the drainage network designed on this site.

2 Contact Details

Drainage Maintenance

Company name	Sewer Connections Limited
Registered No.	09270740
Address	9 Quitondale, Harwood Grove
	Shirley, Solihull, West Midlands
Post Code	B90 4AP
Tel No.	07843 385 617
Email	info@sewerconnectionsltd.co.uk

3 Introduction

The intention is for this handbook to be used as a reference guide by adopting parties, management company, or those responsible for the maintenance of the SuDS features within the proposed development. This handbook sets out each type of proposed SuDS features within the scheme and provides a schedule of how that system should be operated and maintained to ensure the surface water system operates as it was originally intended and minimise performance deterioration.

For the purposes of this manual, maintenance refers to:

- Inspections required to identify performance issues and plan appropriate maintenance needs;
- Operation and maintenance of the surface water drainage system;
- Landscape management;
- Waste management associated with contaminated silt and other waste materials resulting from maintenance.

All maintenance will need to take the protection of habitats and associated ecology into account. Maintenance regimes should be regularly assessed (i.e. once per year) to make sure that the approach is still achieving objectives in terms of drainage, landscaping, amenity and biodiversity.

4 What is Sustainable Drainage (SuDS)?

Approaches to manage surface water that takes into account water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants) and amenity are collectively referred to as Sustainable Drainage Systems (SuDS). The main purpose of SuDS is to replicate the natural local drainage regime and typically manage rainfall close to where it falls. SuDS are more sustainable than traditional drainage methods because they:

- Manage runoff volumes and flow rates from hard, impermeable surfaces, reducing the impact of urbanisation on flooding;
- Provide opportunities for using runoff where it falls;
- Protect and / or enhance water quality (reducing pollution from runoff);
- Protect natural flow regimes in watercourses;
- Are sympathetic to the environment and needs of the local community;
- Provide an attractive habitat for wildlife in urban watercourses;
- Provide opportunities for evapotranspiration from vegetation and surface water;
- Encourage natural groundwater/aquifer recharge (where appropriate);

5 Sustainable drainage used on this development:

When assessing how to drain a site there is a hierarchy to follow to ensure the most sustainable solution is chosen first, not simply the easiest.

1. Rainwater Re-use
2. Infiltration to Ground
3. Discharge to watercourse
4. Discharge to public surface water sewer
5. Discharge to public combined sewer.

SuDS also talks about treatment trains, which filters and removes particulates from the discharged water.

PRIMARY TREATMENT – to remove litter and coarse particle sedimentation

SECONDARY TREATMENT – to remove fine particle sedimentation and filtration

TERTIARY TREATMENT – Very fine particle removal, filtration and biological processes.

Permeable paving is provided to all parking bays, and driveways. The permeable paving allows water to pass down into the subbase layer, ensuring rainwater, which may contain pollutants from vehicles, is passed through the subbase material, acting as a filter media. This removes particles and pollutants before being collected in filter pipes and drained away through the sewer network.

Building roof areas are also routed through the permeable paving subbase where it is viable to do so.

An **attenuation tank** is provided within the drainage design to allow a reduced from rate from the site. When rainfall enters the drainage network it reaches a flow restrictor, which forces water back up the system towards the storage area. When rainfall rates are higher than the rate of permitted discharge, the attenuation tank provides adequate storage volume for the rainfall event. Allowing the rain to stop, and the water within the system to continually discharge into the river until the system is empty again.

The type of attenuation tank specified on this site provides a mixture of both open storage and granular material, with a 30% void ration, also providing storage. The rainwater is passed through the granular material providing a filtration system to increase water quality before leaving the site.

Water Butts are provided to each dwelling for reuse of rainwater. This is intended only for garden irrigation.

6 Additional SuDS Features

When assessing which sustainable drainage feature to utilise on the scheme, various types are assessed for practicality / feasibility for thus implementation and operation.

Due to the nature of the development and the limit of available space within the proposed works there is no further opportunity to provide additional sustainable drainage features.

These would typically be:

- Rainwater harvesting — No requirement for water re-use
- Open attenuation features — No suitable space within development
- Swales — No suitable area within site.
- Soakaways — Ground conditions are not suitable on this site

7 Benefits of SuDS

The general principal is to improve water quality prior to it leaving the site, and to mitigate adverse impacts to water quality of the receiving water environment. CIRIA C753 'The SuDS Manual' (2015' sets out guidance and recommendations for mitigating pollution issues generated by site use.

Peak discharge of water is reduced by attenuating flows within a underground storage tanks and flow control chambers, these restrict the maximum flow of water from the system to match the condition of a green field site reducing the impact of development on the receiving water body.

All driveway / parking areas are surfaced with a permeable paving material to encourage runoff interception at the primary rainfall location, supplementary runoff from adjacent impermeable areas (roofs and tarmac access road) is also directed onto these permeable surfaces to maximise the benefit of this feature.

Pollution from the proposed development captured within the surface runoff will pass through this permeable surface and filter through the sub strata before being released into the drainage system.

Runoff from roofs are classified as a **'very low'** pollution risk and individual driveways and low traffic roads are classified as a **'low'** pollution risk.

Low pollution levels require the application of a 'simple index approach' for water quality mitigation.

The pollution generated by the development is listed in the below table:

Pollution hazard	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Very Low (roofs)	0.2	0.2	0.05
Low (drives & low traffic roads)	0.5	0.4	0.4

Referenced from Table 26.2 of the CIRIA SuDS Manual

By providing permeable paving to the private areas, those areas benefiting from the permeable paving sub strata filtration will be fully mitigated. (Compare with below table)

Mitigation provided by SuDS features are listed in the table below

SuDS Componend	Mitigation Benefits of SuDS		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7
Vegetation (300mm)	0.6	0.5	0.6

Referenced from Table 26.3 and 26.4 of the CIRIA SuDS Manual

By comparing the pollution hazard value against the higher mitigation value it is evident that by providing the SuDS features listed, that pollution hazards are mitigated against and that the water quality leaving the site complies with the water quality requirements of the SuDS Standards

8 Maintenance of SuDS:

Maintenance of the system is vital to the continued performance of the system. It is important that the original design intent is achieved throughout the lifespan of the development otherwise the likelihood of flooding increases as the performance of the system decreases.

Refer to the site-specific drawings contained within the Appendix to familiarise with the arrangement of SuDS features on the site.

This site consists of several components in the design of the drainage network:

1. Permeable Paving
2. Silt Trap chamber
3. Underground stormwater storage tank
4. Flow Control
5. Water Butts

Permeable Paving

Permeable paving is provided to each property within the private driveways. The drainability of permeable paving is greater than all but the most extreme rainfalls. Though it is prone to weeds and in a sever storm, the grit (between the block paving) being washed loose.

The subbase material also acts like a filter, removing contaminants from the water before it is collected and passed through the drainage system.

Schedule of Maintenance Tasks

Within 1 month of being laid	When first laid the blocks there can often be settling of the jointing material so it is important to top this up with 6.2 – 2mm grit. Do not use sand as this will block the joints and prevent the system from working efficiently.
6 Monthly	Treat with suitable weed killer to prevent unwanted weeds growing between the blocks.
Regular Sweeping	Sweeping will prevent the build-up of detritus and general silt which can block up the joints. Fallen leaves should be swept away before they decompose.
Pressure Washer	Tyre marks and oil spills will require more maintenance and may be cleaned via a jet washer on medium pressure. Avoid holding too close, or using on high pressure as this will cause the grit to become dislodged increasing your maintenance works.
Yearly	Jointing material checked it is full, and top up where necessary with 6.2-2mm grit. Do not use sand as this will block the joints and prevent the system from working efficiently.
Sub Base	It is strongly advised not to disrupt the granular material below the block paving. This sub base is specially designed, if you need to alter the sub base speak to a manufacturer for advise on reinstatement.
Vacuum Sweepers	Do not use mechanical sweepers as they can suck up the jointing material. If they are used, ensure that all joints a fully bedded to prevent the blocks becoming loose.

Silt Trap

A Silt trap is the inspection point at which visual checks and maintenance is carried out on the adjacent attenuation tank. The inspection chamber also includes a sump at the base of the chamber, which is a 450mm deep chamber base, designed to catch silt and detritus before it enters the attenuation tank.

The silt trap area is designed to be easily removable to allow cleaning.

Schedule of Maintenance Tasks

First 3 months	Soon after site works have completed, a large amount of build up is normally expected within the drainage system. Lift the cover to the Silt Trap Chamber and assess any silt build up. Any build up should be removed and disposed of.
Annually	This chamber should be emptied yearly to prevent build-up of silt from entering the tank and reducing its performance efficiency.
Following severe storms	Inspect the chambers for silt / blockage and remove as necessary.

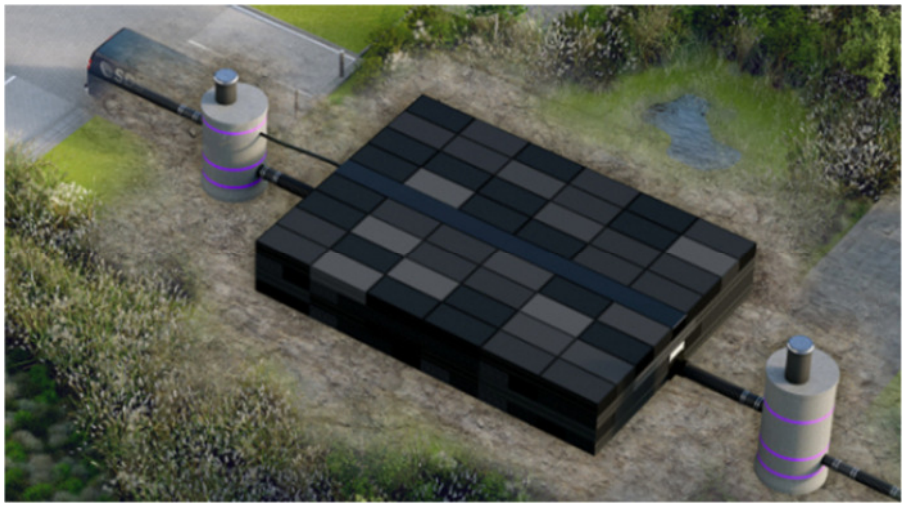
Attenuation Tank

The flow of water through the attenuation network has been carefully designed to balance flows as it passes through the drainage network.

The type of tank crates used on the site are of a large open void structure, which allows for a visual camera inspection through the tank system, together with ready access for jetting by the maintenance crew. The large open nature of the tank crate means maintenance duties are reduced as the passage of water is free flowing with little chance of blockages.

Schedule of Maintenance Tasks

First 3 months	Inspect the performance of the system and advise a drainage engineer of any problems with water levels. The system should only reach full capacity during a very severe storm. Water levels should reduce consistently to nil shortly following a storm.
Annually	Ensure all road gullies and silt traps are clear from blockage and silt build up and clear as required. Excessive build up could enter the tank and reduce the efficiency of the system. A maintenance company can be called out to pressure jet the system and clear out any issues.
Following severe storms	Inspect the drainage network and ensure the system is operating as designed. In the majority of cases no overland flooding should occur. Any flooding will be an indication of blockage reducing the performance.



Soakaway Tank

A soakaway is where rainwater is gathered into a central underground storage tank, to allow the rainwater to slowly infiltrate into the underlying ground.

Not all sites are suitable for ground infiltration. Ground conditions that are predominantly sands and gravels are ideal.

The size of the underground tank is related to the rate the ground can receive water verses the rate at which rainwater is gathered at the surface. The resulting tank size is calculated to balance inflow and outflow to ensure no flooding occurs.

Schedule of Maintenance Tasks

First 3 months	Inspect the performance of the system and advise a drainage engineer of any problems with water levels. The system should only reach full capacity during a very severe storm. Water levels should reduce consistently to nil shortly following a storm.
Annually	Ensure all road gullies and silt traps are clear from blockage and silt build up and clear as required. Excessive build up could enter the tank and reduce the efficiency of the system. A maintenance company can be called out to pressure jet the system and clear out any issues.
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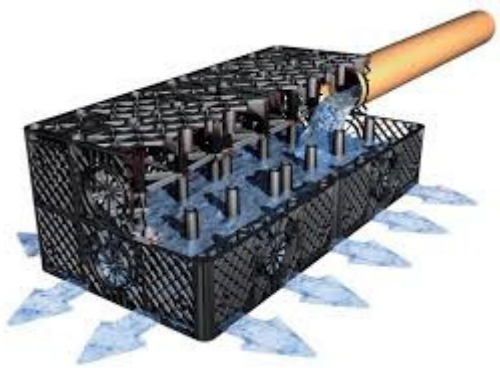

Flow Control Chamber

The flow control chamber, is a large chamber housing a flow restrictor. This device is simple in function, in that the hole is specifically sized to allow a certain amount of water to pass through it. The device creates a vortex as water passes through it to create a steady and controlled rate at which the water can pass.

The flow restrictor has no moving parts, and thus has very little chance of failure.

Schedule of Maintenance Tasks

First 3 months	Inspect the performance of the system and advise a drainage engineer of any problems with water levels. The system should only reach full capacity during a severe storm.
Annually	Inspect the chamber and ensure no debris is present, which may cause blockages. Remove as necessary.
Following severe storms	Inspect the drainage network and ensure the system is operating as designed. In the majority of cases no overland flooding should occur. Any flooding will be an indication of blockage reducing the performance. Inspect the chambers either side of the tank for silt / blockage and remove as necessary.

Water Butts

A water butt is a plastic container, attached to a rainwater pipe, that collects and stores rainwater. The water butt will have a tap at the base to allow water to be drained off for use in irrigating the garden. Water butts come in a variety of styles though the primary function remains the same.

Schedule of Maintenance Tasks

Weekly	Rainwater can become stagnant and smelly if left untouched, frequent use of the water within a Water Butt will aid in refreshing the water supply preventing stagnant water.
6 Monthly	Plastic connectors can become damaged over time from use. A visual inspection should be undertaken to ensure the efficient operation. Any faulty apparatus being suitably replaced.

Appendix A:

Site Drainage Plan

KEY

- Existing Foul Sewer
- Existing Storm Sewer
- Private Sewers Abandoned
- Private Foul Drains
- Private Storm Drains
- DC — Drainage Channel
- RG — Gully
- RE — Storm Rodding Eye
- Porous Paving
- Porous Paving Filter Pipe
- Attenuation Tank
- WB — Water Butt

Drainage Strategy
Sustainable Drainage:

The principals of providing sustainable drainage is to manage water quantity, which is achieved through the use of a below ground attenuation basin, and secondly to improve water quality prior to the point water leaves the site.

Due to site constraints, some SuDS features are unviable to be implimented on this development, refer to SuDS Statement for an assessment of each type.

The primary SuDS feature used on this development is permeable paving, with adjacent roof areas draining through the substrata filter pipe, which allows the first 5mm of rainfall to pass through and into the paving sub base, which provides water quality improvements.
The parking area levels are designed to shed water from the impervious aisle onto the permeable parking bays, providing maximum benefit to water quality for all vehicular areas.

REV	DESCRIPTION	BY	DATE

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CLIENT: MACC Group

PROJECT: Redevelopment of former Prince of Wales, Shirley

PHASE: PLANNING

DRAWN BY: DMcC | DATE: 08.08.2023

CHECKED BY: | DATE:

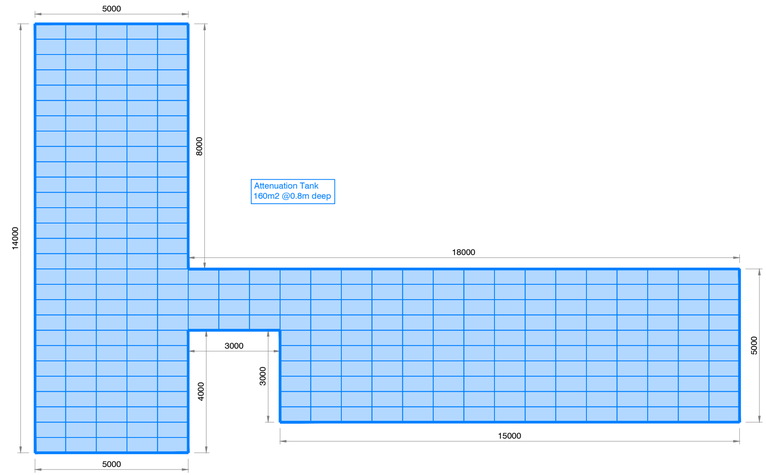
SCALE: 1:250 @ A1

DRAWING: Drainage Strategy

DWG No: CS230702 - 102 | REV:

Appendix B:

Attenuation Tank Details

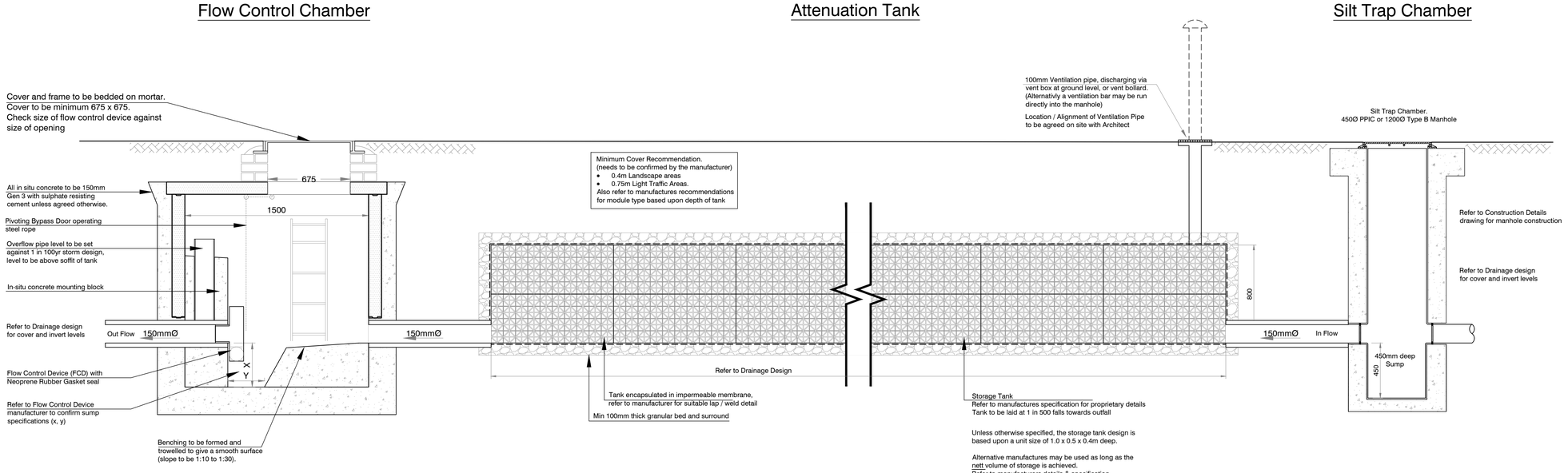


Plan of Attenuation Tank Arrangement

Flow Control Chamber

Attenuation Tank

Silt Trap Chamber



Flow Control Device
Hydro-International Hydrobrake
Model - MD-SHE-0069-2000-0850-2000
Max Discharge = 2.0 l/s
Operating Head = 850mm

For details of manhole minimum size and flow control device size, refer to FCD manufacturers details

The attenuation volume is based upon a proprietary 'Vortex' control device.
The use of any other flow control will invalidate the design indicated on this drawing, which may lead to:
1. Adverse hydraulic effect, including loss of upstream storage efficiency and increased potential for flooding.
2. Increase in storage volume required
2. Different chamber dimension and construction requirements.

1. Refer to manufacturers requirements and recommendations for tank construction.
2. Exact arrangement of entry and exit manholes and other manifold elements to be confirmed following confirmation of manufacturers details and requirements.
3. Provide smooth level base to construct the system
4. Health and Safety - consider working in deep excavations.
5. Prevent heavy works traffic traversing over the tank.
6. Joints between adjacent sheets of membrane should be sealed correctly using proprietary welding techniques.
7. Backfill and cover fill should be compacted to specifications for highway works and should be Type 1 or Type 2 sub-base.
8. All backfill must be carefully compacted to avoid penetration of impermeable membrane.
9. In conditions of high water table / poor ground conditions refer to Engineers / Manufactures for special requirements.
10. This drawing must be read in conjunction with the site investigation report.
11. Before work commences, the contractor shall liaise with all Statutory Authorities to determine the exact location of all apparatus and take all precautions deemed necessary to locate, protect and where necessary divert such equipment.
12. All manhole and drainage covers shall comply with BS.EN124. Manhole covers within block paved area and buildings shall be recessed. Cover strengths to be:-
13. Class E600 in areas of heavy loading.
14. Class D400 in heavy trafficked areas (roads, services yards).
15. Class C250 Lightly trafficked areas (car parks).
16. Class B125 in landscape and non trafficked areas (min. 100mm deep frame).
17. All works to be carried out in accordance with Building Regulations 2002 Part H.
18. In areas of poor ground conditions and to prevent differential settlement, special foundation treatment is required. i.e. Type 1 layer with geogrid.
19. When units are placed below the groundwater table floatation may occur. To prevent this the weight in backfill must be greater than the uplift force, if this cannot be achieved a concrete slab above the units will be required.
20. With a high ground water table, shoring and pumping of inflows required to prevent collapse of excavation

REV	DESCRIPTION	BY	DATE

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CLIENT
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PROJECT
Redevelopment of former Prince of Wales, Shirley

PHASE
PLANNING

DRAWN BY	DATE
DMcC	08.08.2023
CHECKED BY	DATE

SCALE
1:20 @ A1

DRAWING
Attenuation Tank Details

DWG No	REV
CS230702 - 105	

Appendix C:

Maintenance Log

Date	Works Undertaken	Person / Company