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FORD LANE, YAPTON

MANAGEMENT AND MAINTENANCE MANUAL



FORD LANE, YAPTON

MANAGEMENT AND MAINTENANCE MANUAL
ON BEHALF OF CLIENT

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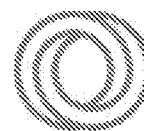


DOCUMENT CONTROL SHEET

Project Name Ford Lane, Yapton

Project No. 18-344

Rev	Issue Purpose	Author	Checked	Reviewed	Approved	Date
-	Planning	SG	LH	SG	LH	16/09/2020
A	Flow control maintenance details added	SG	LH	SG	LH	28/01/2021
B	Updated to suit Client comments	SG	LH	SG	LH	29/01/2021
C	Surface Water Catchment and Implementation Plan updated	SG	LH	SG	LH	29/01/2021

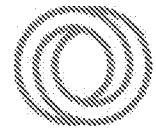


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1.0 INTRODUCTION

1.1.1 This document outlines the proposed management and maintenance regimes of the drainage systems at the proposed residential development site at Ford Lane in Yapton. It also aims to support the discharge of Condition 11 which is set out below:

Condition 11

'No development shall take place until details of the implementation, maintenance and management of a sustainable drainage scheme have been submitted to and approved in writing by the LPA. The scheme shall be implemented and thereafter managed and maintained in accordance with the approved details. Those details shall include:

- i) A timetable for the scheme's implementation; and
- ii) A management and maintenance plan for the lifetime of the development which shall include the arrangements for the adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.

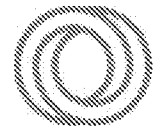
1.1.2 The drainage features on site comprise of a mixture of traditional and sustainable drainage systems. Permeable paving, cellular attenuation crates, infiltration basin and infiltration swales will receive run-off either directly or from piped systems and direct flows to infiltrate into the ground below. Piped networks will convey flows from roof run-off to the permeable paving or cellular attenuation crates.

1.1.3 The surface water systems and SuDS features on site are to remain private and will be maintained by a private management company.

1.1.4 This report sets out the management and maintenance of the site's drainage system throughout its lifetime. All drainage features will be maintained by a private management agreement which will incorporate the recommendations in this document. In all cases, reference should be made to the manufacturer's inspection and maintenance recommendations.

1.1.5 The following text has been divided into sections which correspond to each relevant drainage type detailing:

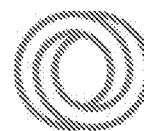
- ¿ Description of feature
- ¿ Maintenance activities and frequency
- ¿ Inspection and frequency



1.1.6 The implementation plan for the sites proposed drainage features has been set out in the table below. Catchments associated with these features are also shown on Odyssey drawing 18-344/108 in Appendix A.

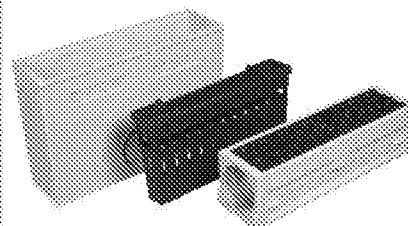
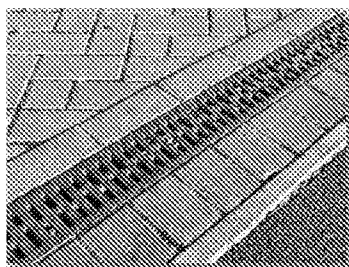
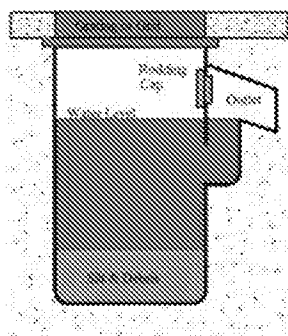
Table 1.1: Drainage Feature Implementation Schedule

Drainage Feature	Area/Plots
Tank 1, Tank 2, Tank 6, Basin	19 - 24, 37 - 50, turning head facility opposite plots 34 - 36
Tank 3	1 - 9, 94 - 100
Tank 4	7, 10 - 14
Tank 5	Site Access
Private Soakaway	25 - 36, 79 - 82
Permeable Paving	15 - 18, 50 - 93
Swale	Lay-bys on main access road



2.0 MAINTENANCE OF GULLIES, LINEAR / KERB DRAINS, PIPE SYSTEMS & MANHOLES / INSPECTION CHAMBERS

2.1 *Description*



2.1.1 Drainage systems comprising of pipe runs, manholes and gullies are a more conventional method of draining surface water run-off from roof and highway areas. Linear/kerb drains catch surface water runoff similar to gullies and discharge to the surface water network.

2.1.2 Surface water falling on impermeable surfaces, such as roof and footways areas, drain at surface level and convey the water below ground to the drainage network. Manholes or inspection chambers are also provided on the drainage system at regular intervals, changes in sewer direction, gradient or pipe diameter. This type of drainage system can be accessed from the gullies or manholes/inspection chambers for routine inspection and maintenance.

2.1.3 Gullies are trapped where possible such that on collecting and conveying surface water they trap sediment and prevent any unpleasant odours returning from the sewers.

2.1.4 Linear drainage channels can have covers removed for routine inspection and maintenance and to remove leaves or debris. Kerb drains can be jetted through and sump/outlet covers removed/inspected.

2.1.5 Sumps or silt traps are also provided upstream of the infiltration soakaways in order to trap silt/sediment before the surface water discharges into soakaways, thus prolonging the life of the soakaway. These can be accessed and maintained in a similar way to inspection chambers.

2.1.6 Pipe runs, manholes, inspection chambers, sumps/silt traps and linear drains are to be maintained by a private management company in accordance with the following recommendations.

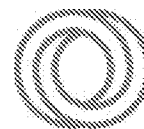


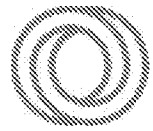
Table 2.1: Gullies, Linear Drains, Pipe Systems and Manholes / Inspection Chambers Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Inspect and identify any areas that are not operating correctly.	Gullies, manholes and inspection chambers.	Monthly (for the first three months) then annually.
	Remove debris from gratings, sumps / silt traps.		Annually.
Infrequent Maintenance	Clear blockages.	Piped system.	As required.

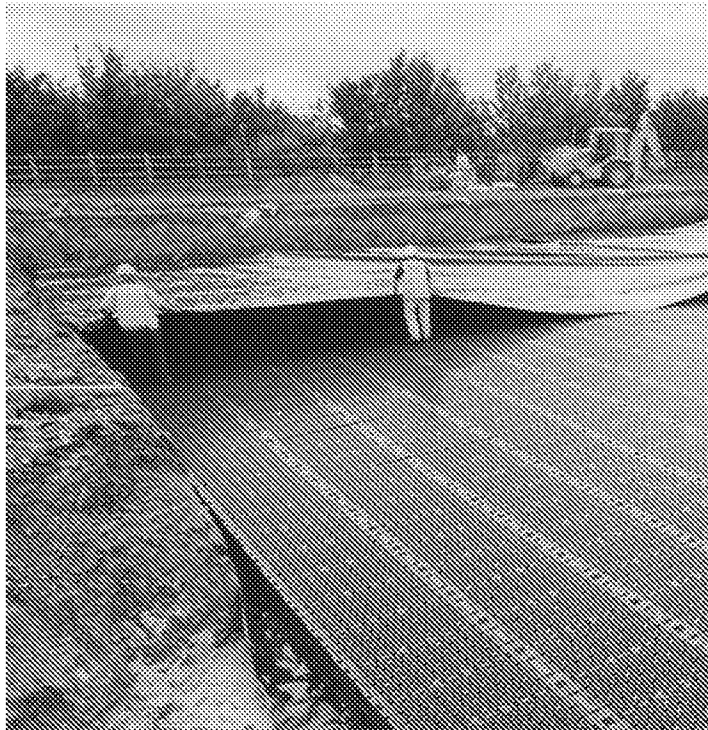
Table 2.2: Pipe Systems, Gullies and Manholes Inspection & Frequency

Inspection Activity	Comments	Frequency
Clearing of gullies / sumps and silt traps	Gullies, sumps and silt traps found to be non-functioning/blocked on annual inspection will be noted and cleared at six monthly intervals. Recurring blockages should be investigated.	Annually (or six monthly if blocked annually).
Cleaning / jetting	Pipes, manholes and inspection chambers.	When required.

2.1.7 The above maintenance and inspection regime is recommended; however, reference should be made to the appropriate manufacturers guidance and recommendations and the more frequent maintenance and inspection regime implemented.



3.0 MAINTENANCE OF CELLULAR SYSTEMS



3.1 *Description*

3.1.1 Cellular (or Modular) systems provide storage within a void space. They are usually built out of plastic, or other man-made materials, and can store and infiltrate (where conditions permit) run-off. Cellular systems are sub-surface components that can cater for vehicle loading, given appropriate specification and installation depth.

3.1.2 As cellular systems only offer a limited improvement in water quality, it is preferable that they form one part of a treatment train. It is important to pre-treat upstream as this will curtail sediment influx and increase the system's longevity.

3.1.3 Surface water flow to the cellular system will be via trapped gullies prior to connecting to the piped network. All manholes immediately upstream of the cellular storage structure will incorporate a silt trap / sump. The above system will offer treatment of surface water prior to entering the cellular system.

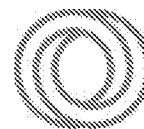


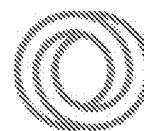
Table 3.1: Cellular System Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Inspect and identify any areas that are not operating correctly.		Monthly (for the first three months) then six monthly.
	Remove sediment from upstream silt trap (sump).	Remove sediment from sump when 50% volume lost. N.B. Sumps must be maintained to limit sediment entry into the underground cells.	Six monthly, or as required.
Infrequent Maintenance	Clear blockage of half perforated underflow pipes (Stormcell only) by rodding / jetting.	Stormcell system (if used) should be designed with underflow pipes laid at self-cleansing velocity; reducing likelihood of blockage.	As required.
Corrective Maintenance	Excavate, uncover & jet cells to remove sediment (Wavin Aquacell or similar).		As required.

Table 3.2: Cellular System Inspection & Frequency

Inspection Activity	Comments	Frequency
Inspect all inlets / outlets, vents and overflows to check they are in good condition and operating as designed.		Annually.
Check mechanical devices within associated chambers.		Half yearly.

3.1.4 The above maintenance and inspection regime is recommended however reference should also be made to the appropriate manufacturers guidance and recommendations and the more frequent maintenance and inspection regime implemented.



4.0 MAINTENANCE OF PERMEABLE PAVING



4.1 Description

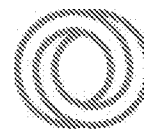
4.1.1 Permeable Block Paving allows water to pass through the gaps between the blocks into underlying sand and gravel layers allowing for the attenuation, conveyance and where possible infiltration, of surface water runoff.

4.1.2 Permeable paving will cleanse surface water run-off. The initial cleansing occurs within the sand bedding layer where hydrocarbons are collected. The layer of geotextile below the sand acts as a secondary filter before infiltration through to the sub-base further filters the discharge before infiltrating into the soil strata below.

4.1.3 Cellular diffuser units are used within areas of permeable paving to filter and disperse flows or to mitigate any 'wash-out' of the granular material for outflows.

Table 4.1: Permeable Paving Maintenance Activities & Frequency (continued overleaf)

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Visual inspection of paving.	Ensure joints are kept fully filled.	Monthly (depending on local environment).
	Paving should be agitated (e.g. brushed, vacuumed, etc.).	To ensure no vegetation of any sort is allowed to grow and develop in the joints.	Six monthly or as required (Spring and Autumn seasons).



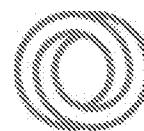
Maintenance Category	Maintenance Activity	Comments	Frequency
Corrective Maintenance	Paving should be inspected after any heavy precipitations.	Ensure no displacement of any organic matter into the surface of the pavement.	As required.
	Inspection of outfall should be undertaken.	Non-infiltration systems to have outfall checked for debris and blockages.	Six monthly or as required.
	Removal of weeds.	To ensure weeds are killed effectively they should be actively growing so that the glyphosate will go down to the roots. Glyphosate based weed killers include Roundup and Tumbleweed.	As required.
	Laying material may require cleaning and /or replacing.	Depending on the environment the permeable pavement has received and been exposed to.	25 to 30-year period.

Table 4.2: Permeable Paving Inspection & Frequency

Inspection Activity	Comments	Frequency
Visual inspection of permeable surface for poor operation.	Includes visual inspection of blocks, water ponding, weeds and to make sure joints are kept full.	Monthly.
Visual inspection of outfall.	Includes visual inspection of control structures and outfall to check for damage and blockages.	Monthly.

4.1.4 It is recommended that the surfaces should be regularly inspected and cleaned accordingly. Based on the results of full-scale trials carried out by Aggregate Industries, the most effective method is to use a cleaner with suction only. Even if the surface has become completely clogged, trials have shown that this method of cleaning can rehabilitate the surface to an acceptable level.

4.1.5 The maintenance and inspection regime is recommended however reference should also be made to the appropriate manufacturers guidance and recommendations and the more frequent maintenance and inspection regime implemented.



5.0 MAINTENANCE OF INFILTRATION BASINS



5.1 Description

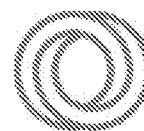
5.1.1 Basins are generally dry, intermittently wet, SuDS that are used in the later stages of the treatment train, and they are seen as site or regional controls. Basins attenuate and treat the runoff through sedimentation and biological degradation.

5.1.2 Basins are visually pleasing and offer various types of planting and vegetation in and around the basin.

5.1.3 Hard engineered headwalls are used for inlet pipes.

Table 5.1: Basin Maintenance Activities & Frequency (continued overleaf)

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Litter and debris removal.	Litter & debris to be removed prior to any grass cutting activity (of perimeter areas) to minimise risk of shredding litter. Particular attention should be paid to inlet pipes and grilles (if in place).	Monthly.
	Grass cutting: landscaped areas, spillways and access routes.	All cuttings to be removed from SUDS component.	Monthly (during growing season) or as required.
	Grass cutting: meadow grass.	All cuttings to be removed from SUDS component.	Half yearly (Spring before



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Maintenance Category	Maintenance Activity	Comments	Frequency
			nesting season, and Autumn).
	Remove dead vegetation from pond edge.		1-3 years, or as required.
	Hand cut submerged and emergent aquatic plants (at a minimum of 0.1m above pond base; max 1/3 of pond surface).	Thinning of emergent barrier vegetation. Areas of tall emergent plants obscuring visual inspection (for safety) of the open water should be regularly trimmed.	As required.
	Cut and remove bank vegetation from waters edge to a minimum of 1m above water level.	To provide access to pond edge / emergent vegetation for maintenance and inspection.	Monthly (for first 3 years) then as required.
	Manage other vegetation and remove nuisance plants.	Weeding should be conducted by hand or use non-toxic and biodegradable weed killer. Invasive species should be removed in accordance with best practice.	Monthly (at implementation) then as required.
	Tidy all dead growth before start of growing season.		Annually.
	Re-seed or replant areas of poor vegetation growth.		As required.
Infrequent Maintenance	Prune and trim trees and remove cuttings.	Where vegetation is planted as a barrier management of upward growth to encourage outward growth is necessary (after shrub seedlings are established).	As required.
	Remove sediment from forestry and main body of large ponds when pool volume is reduced by 20%.	Sediment level will be dependent upon presence and type of upstream SUDS, size and land use of catchment as well as local soil conditions. Refer to above point for pond liner.	>25 years usually, or as required.
Corrective Maintenance	Repair erosion or other damage.		As required.
	Repair / rehabilitation of inlets.		As required.

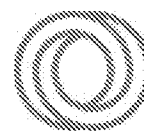
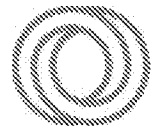


Table 5.2: Basin Inspection & Frequency

Inspection Activity	Comments	Frequency
Inspect structures for evidence of poor operation		Monthly.
Inspect banksides, structures, pipework etc. for evidence of physical damage.		Monthly.
Inspect water body for signs of eutrophication.		Monthly (May - October).
Inspect inlets and pre-treatment components for silt accumulation.	Includes visual inspection of chamber (where present)	Half yearly.



6.0 MAINTENANCE OF INFILTRATION SWALES

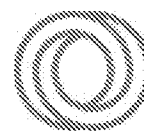


6.1 Description

6.1.1 Infiltration swales are linear, flat bottomed grassed or vegetated channels that store and infiltrate conveyed surface water runoff into the ground.

Table 6.1: Swale Maintenance Activities & Frequency (continued overleaf)

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine maintenance	Debris and litter removal.		Monthly, or as required.
	Grass cutting and vegetation management.	Retain grass height to an ideal height of 100mm and remove nuisance plants.	Monthly during growing season, or as required.
	Manage other vegetation & remove nuisance plants.		Monthly for first three months, then as required.
	Inspection for blockages.	Inspect inlets for blockages, and clear if required.	Monthly.
	Inspection for infiltration.	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where extended ponding occurs.	Monthly or when issues arise.

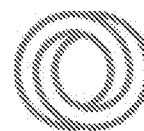


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Maintenance Category	Maintenance Activity	Comments	Frequency
Infrequent maintenance	Inspection for silt build up.	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.	Half yearly.
	Check for poor vegetation growth.	Cut back adjacent vegetation where possible.	Annually.
	Reseed.	Reseed areas of poor vegetation growth.	As required, or when bare soil is exposed over 10% or more of the treatment area.
	Scarify	Scarify top layer to improve infiltration performance	As required.
	Sediment removal	Remove build-up of sediment on upstream gravel trench or at top of filter strip.	As required.
	Oil removal	Remove oils or petrol residues using safe work practices.	As required.

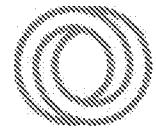
Table 6.2: Swale Inspection & Frequency (continued overleaf)

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris.	Monthly, or as required.
	Cut the grass to retain grass height within specified design range.	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly at start, then as required.
	Inspect inlets for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where extended ponding occurs.	Monthly, or when required.
	Inspect vegetation coverage.	Monthly for six months, quarterly for two years, then half yearly.
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.	Half yearly.
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area.
	Repair erosion or other damage by re turfing or reseed.	As required.
	Relevel uneven surfaces and reinstate design levels.	As required.



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Maintenance Schedule	Required Action	Typical Frequency
Remedial actions	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.



7.0 MAINTENANCE OF FLOW CONTROL DEVICES (VORTEX AND ORFICIE CONTROLS)



7.1 *Description*

7.1.1 A flow control device usually comprises of a fixed orifice or an alternative form of throttle such as a vortex flow control unit. Its principle function is to throttle the discharge passed down stream and thereby retain water upstream within associated storage facilities.

7.1.2 The vortex flow controls provide a non-linear flow curve and as such, can respond to both high and low intensity rainfall events.

7.1.3 This site utilises a vortex flow control device (Hydrobrake or similar) and will usually contain a sump within the flow control chamber and associated parts for access and maintenance.

7.1.4 Normally, little maintenance is required as there are no moving parts within the flow control device and generally if blockages occur, they do so at the intake and can be due to poor installation or upstream treatment of water entering the system.

7.1.5 The vortex flow control is to be fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

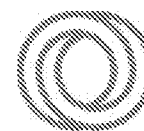


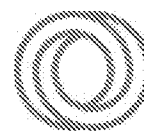
Table 7.1: Flow Control Devices Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine maintenance	Debris and litter removal.		Monthly, or as required.
	Grass cutting and vegetation management.	Retain grass height to an ideal height of 100mm and remove nuisance plants.	Monthly during growing season, or as required.
	Manage other vegetation & remove nuisance plants.		Monthly for first three months, then as required.
	Inspection for blockages.	Inspect inlets for blockages, and clear if required.	Monthly.
	Inspection for infiltration.	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where extended ponding occurs.	Monthly or when issues arise.
	Inspection for silt build up.	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.	Half yearly.
Infrequent maintenance	Check for poor vegetation growth.	Cut back adjacent vegetation where possible.	Annually.
	Reseed.	Reseed areas of poor vegetation growth.	As required, or when bare soil is exposed over 10% or more of the treatment area.

Table 7.2: Flow Control Inspection & Frequency

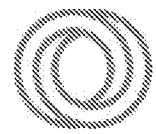
Inspection Activity	Comments	Frequency
Inspect all inlets /. Outlets, to check they are in good condition and operating as designed.		Annually.
Check mechanical devices within associated chambers.		Half yearly.

7.1.6 The above maintenance and inspection regime is recommended; however reference should also be made to the appropriate manufacturers guidance and recommendations and the more frequent maintenance and inspection regime implemented.

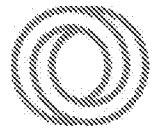


8.0 GLOSSARY

Amenity grass	Close mown grass, cut 16 times per annum to a length of 50-65mm.
Attenuation	Storage of runoff; used with a flow control to control discharge.
Baseflow	Sustained (or constant) flow required for wetlands.
Barrier vegetation	Vegetation to deter access.
Berm	A mound of earth used to control flow (similar to a submerged dam or weir).
Check dam	Small dam used to control flow, common (for swales) where site slope exceeds 4%.
Conveyance	Movement of runoff from one point to another.
Diaphragm trench	Small trench (normally containing pea gravel) acting as a silt trap prior to sheet flow onto a filter strip.
Design level (or flood level)	Level of water storage within SUDS.
Emergent vegetation	Vegetation which grows in water but which pierces the surface, e.g. Phragmites.
Energy dissipation technique	A method to reduce energy of water flow to prevent damage / erosion to the structure.
Filter bed	A gravel filled base designed to ensure the base of a structure remains dry during small storm events. Similar in nature and construction to a filter trench.
Flow control	A device used to control the discharge from a structure, e.g. weir, orifice.
Flow spreading technique	A method to reduce intensity of flow, scattering across a wider area, reducing erosion and scour.
Forebay	Small basin designed to capture and retain sediment.
Gabion	Wire baskets filled with large boulders, offering reinforcement whilst allowing water to drain through.
Geocellular system	Plastic storage system used to attenuate runoff.
Geotextile	Synthetic permeable fabric commonly used in SUDS construction, e.g. filter trenches, helping to retain sediment.
Groundwater recharge	Where surface water moves downward to groundwater.



Half drain down	Time taken for the attenuated volume (in SUDS) to reduce to half of the storage volume by infiltration or use of flow control.
Hydro-Brake	Control device to regulate flow. Uses a vortex system to achieve design flow.
Infiltration	Process by which water on the ground surface enters the soil.
Inspection chamber	Open chamber used to assess level of sediment in the structure and assess half drain down time.
Long grass	Similar to meadow grass but without wildflower mix.
Meadow (or long) grass	Long grass with wildflower mix (sown or natural) cut 1-2 times per annum.
Modular system	See geocellular system.
Overflow weir	Type of weir (hard or soft engineered) to control flow when design level is exceeded.
Penstock	An adjustable vertical sliding plate to control flow.
Permeable paving	Paving designed to allow infiltration of runoff between blocks; can be designed to attenuate or allow infiltration into the ground.
Permanent water level	Static level of water within a pond. Storage capacity is the volume above this.
Point flow	Inflow from a specific source, i.e. a pipe.
Regional control	Management of runoff from a site or several sites, typically a pond or wetland.
Reno mattress	Type of gabion, typically wider and shallower (in depth) than normal gabions.
Rip-rap	Rock or other material used to prevent erosion, reduce velocity and dissipate flow.
Runoff	Surface runoff is water from rain, snow melt or other sources that flows over the land surface.
Safety bench	Shallow sloped margin areas normally used around pond edges to reduce risk of falling in and allows ease of exit from the water following an emergency.
Scarify	Method to break up silt deposits, remove dead grass and other organic deposits and relieves compaction of the soil surface.
Scour	Localised erosion usually as a result of high flows (or velocities of flow).
Sediment forebay	See forebay.



Sheet flow	Runoff that moves as overland flow in very shallow depths.
Site control	Management of runoff from a local area or site, typically detention basins or infiltration basins.
Slotted (or perforated) pipe	Pipe usually (UPVC) with holes or slots at regular intervals allowing water to drain out or in as required.
Source control	Control of runoff at or near its source, e.g. soakaway.
Spike	Method (usually mechanical) to open up soil, improving infiltration.
Spillway	Structure allowing the controlled release of water when design levels are exceeded. Can be soft or hard engineered.
Storage	See attenuation.
Stormwater	An interchangeable term for surface water runoff. See runoff.
Surface blinding	Blockage of the soil (normally by sediment) preventing infiltration.
Treatment	Improving water quality by physical, chemical and/or biological means.
Treatment train	Series of SUDS component used to provide incremental water quality improvement and storage.
Void space	The storage volume between gravel particles (usually for filter/infiltration trenches).
Weir	Horizontal structure designed to control flow.

Abbreviations

Ha	Hectare (1ha = 10,000 square metres)
SUDS	Sustainable Urban Drainage Systems

APPENDIX A

Odyssey Drawing 18-344/108

Surface Water Catchment and Implementation Plan

