



Mann Williams
Consulting Civil and
Structural Engineers

SuDS Operation & Maintenance Manual

Mount Pleasant Farm

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1.0 Introduction

- 1.1.1 This manual has been produced to provide guidance for the property owner and end user in the ongoing monitoring and maintenance of the storm water control features included in the Mount Pleasant Farm development.
- 1.1.2 This report aims to provide supporting information for the sign off of any SuDS maintenance related conditions included in the general conditions for the Mount Pleasant Farm development.

1.2 Scope of the O&M Manual

- 1.2.1 This manual is intended to give an overview of the operation and maintenance for the range of SuDS features that can make up a SuDS based storm water drainage strategy for any specific site. The features included in the storm water drainage strategy have been *highlighted* in the general list of SuDS features given in section 2.1.2 below.
- 1.2.2 Where proprietary products are specified the manufacturer's instructions and recommendations should be followed in priority to this document, unless specifically noted otherwise due to project constraints.

1.3 General

- 1.3.1 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the suggested operation and then adjusted to suit the site requirements.
- 1.3.2 Regular inspection and maintenance is important for the effective operation of SuDS features. Maintenance responsibility for SuDS features and surrounding areas should be placed with an appropriate responsible person/organisation.
- 1.3.3 Adequate access should be provided to the SuDS features for inspection and maintenance, including for appropriate equipment and vehicles. Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task.
- 1.3.4 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols as some run-off is taken from potentially contaminated areas such as car parks/service yards.

2.0 SuDS Layout & Design.

- 2.1.1 The storm water drainage strategy for the proposed development utilises SuDS features to intercept and convey all pluvial surface water runoff. The design of the system aims to attenuate runoff and encourage infiltration.
- 2.1.2 The proposed storm water system at the development consists of the following SuDS components (**NOTE: components not used in this scheme are greyed out**):
 - Green Roofs
 - Rain Gardens
 - Soakaways
 - Rainwater Harvesting Systems
 - Geocellular/Modular Systems/Soakaways
 - Permeable Paving / Void Formers

- Pipework & Manholes
- Filtering Gullies
- Diffusers
- Flow Control Chambers (with Filtration)
- Hydrocarbon Filter Membranes
- Attenuation Basins
- Swales
- Filter Strips

2.1.3 There are three categories of maintenance activities referred to in this report:

- **Regular maintenance** (including inspections and monitoring).
Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.
- **Occasional maintenance**
Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).
- **Remedial maintenance**
Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site specific characteristics or unforeseen events, and as such timings are difficult to predict.

3.0 SuDS Components Maintenance & Management

3.1 Green Roofs

- 3.1.1 There are two main types of green roofs: extensive and intensive. For extensive green roofs, minimal maintenance is required as they are designed for plants such as mosses, succulents, herbs and grasses. Intensive green roofs are designed to sustain more complex landscaped environments with high biodiversity and amenity benefits. Therefore, they will require a higher level of maintenance especially during the first 12 – 15 months of the establishment stage.
- 3.1.2 All maintenance actions carried out at roof level must be in full compliance with appropriate health & safety regulations.
- 3.1.3 Specific maintenance needs of the green roof should be monitored and maintenance schedules adjusted to suit requirements

3.2 Rainwater Harvesting Systems

- 3.2.1 RWH systems should be designed so that when there is an absence of rain, or a need to disconnect the system for maintenance or repair, that potable water is safely available for all appliances to avoid inconvenience.
- 3.2.2 Tanks should be accessible for internal inspection, and the cover should preferably be lockable.

3.3 Geocellular/Modular Systems

- 3.3.1 This refers to modular plastic geocellular systems which usually have a high void/volume ratio, and that can be used to create a below ground storage structure.

- 3.3.2 The below ground crates are intended to be a surface water storage feature to attenuate the discharge from the site up to and including the 1 in 100 year plus climate change event. The system may be designed to be surcharged in any storm event that exceeds this design level.
- 3.3.3 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, especially where run-off is taken from potentially contaminated areas such as car parks/service yards.

3.4 Permeable Paving

- 3.4.1 The permeable pavements are intended to be water quality and attenuation storage features. These features are intended to be dry except during rainfall events. The permeable pavements may also be utilised as an infiltration area or soakaway for other areas of the development (where permissible).
- 3.4.2 The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers into the voided stone / specialist void former which makes up the subbase. Where these features are intended to be used as infiltration devices or soakaways any capping also needs to be permeable to permit the flows to the formation.

3.5 Pipework & Manholes

- 3.5.1 Pipes are proprietary products, and the materials can vary across the site and as such the manufacture's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with the drainage specification.
- 3.5.2 Pipes are intended to be the main conveyance across the development and where oversized they provide part, or all of the attenuation volume required where a limited discharge rate is used. They are intended to be dry except during rainfall events. The pipes have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk of blockages occurring is reduced due to the overall pipe size.
- 3.5.3 Access for maintenance is provided through access chambers, manholes, rodding plates and rodding eyes.
- 3.5.4 Maintenance responsibility for collector sewers should be placed with the statutory water authority for public sewers, and the individual resident ('riparian owner') for private drains, unless adopted as lateral drainage.

3.6 Flow Control Chamber

- 3.6.1 Flow control chambers are proprietary products and as such, where used, the manufacturer's recommendations should be followed. Regardless of the flow control used it will be fully compliant with the drainage specification.
- 3.6.2 Flow control chambers are intended to restrict the surface water runoff discharge rate from the site to a designed rate utilising techniques such as an orifice plate, vortex separator or mechanical float control.
- 3.6.3 Maintenance responsibility for the flow control chamber should be placed with the relevant adopting authority, or if left private, then the management company should seek to consult with the manufacturer and appoint a contractor approved by the local authority.
- 3.6.4 Should sediment/material result in a blockage within the outfall of the flow control chamber, a high-level overflow outfall will prevent flooding occurring on site as a result of the blockage.
- 3.6.5 Once the storm event has passed it will be necessary to remove the sediment/material to allow the flow control to operate correctly. Where fitted, the bypass penstock valve will allow discharge

of any blocked water within the chamber to allow for safe entry and maintenance of the flow control chamber.

3.7 Attenuation Basin

- 3.7.1 Adequate access should be provided to the basin areas for inspection and maintenance, including for appropriate equipment and vehicles.
- 3.7.2 The major maintenance requirement for a basin is vegetation control. If finished with grass, mowing cut levels should ideally retain grass lengths of 75-100mm across the main treatment surface, to assist in filtering pollutants and retaining sediments, and to reduce the risk of flattening during runoff events. However, longer vegetation lengths, where appropriate, are not considered to pose a significant risk to functionality.
- 3.7.3 Occasionally sediment will need to be removed (once exceeding 25mm in depth) although this can be minimised by ensuring that upstream areas are stabilised and by incorporating effective pre-treatment devices.

3.8 Swale

The major maintenance requirement for a swale is mowing / vegetation control. Mowing cut levels should ideally retain grass lengths of 75-100mm across the main treatment surface, to assist in filtering pollutants and retaining sediments and to reduce the risk of flattening during runoff events. However, longer vegetation lengths, where appropriate, are not considered to pose a significant risk to functionality.

- 3.8.1 Occasionally sediment will need to be removed (once exceeding 25mm in depth) although this can be minimised by ensuring that upstream areas are stabilised and by incorporating effective pre-treatment devices.

3.9 Filter Strips

- 3.9.1 The major maintenance requirement for filter strips is mowing / vegetation control. Mowing cut levels should ideally retain grass lengths of 75-100mm across the main 'treatment' surface to assist filtering pollutants and retaining sediments and to reduce the risk of flattening during runoff events.
- 3.9.2 Grass clippings to be disposed of either offsite or outside the area of the filter strip to remove nutrients and pollutants.

3.10 Ownership & Maintenance

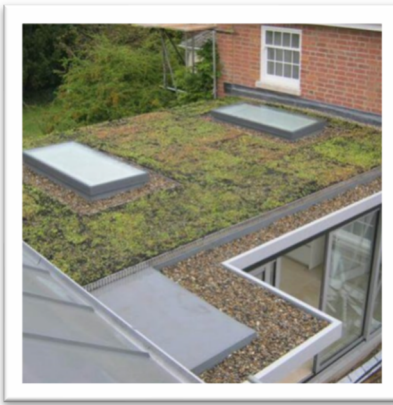
- 3.10.1 The private foul & surface water drainage systems will remain in the ownership of, and be maintained by:

The owners of Mount Pleasant Farm, Faulkland, BA3 5XH

1.0 Maintenance Schedule


1.1 Green roofs / Rain Gardens

Table 1 Green Roof / Rain Garden Maintenance Requirements

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
 <p>(Imagery ikopolymeric.com)</p>	Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability.	Annually and after severe storms				
		Inspect soil substrate for evidence of erosion channels and identify any sediment sources.	Annually and after severe storms				
		Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system.	Annually and after severe storms				
		Inspect underside of roof for evidence of leakage.	Annually and after severe storms				
	Regular maintenance	During establishment phase (12-15 months), replace dead plants as required.	Monthly, in accordance with manufacturers specifications				
		Remove nuisance and invasive vegetation, including weeds.	As required				
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required.	As required				
	Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required				
		Relevel uneven surfaces and reinstate design levels	As required				
		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				


1.2 Rainwater Harvesting Systems

Table 2 Operation and Maintenance Requirements for RWH Systems

SuDS Feature	Maintenance Type	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
Rainwater Harvesting Systems  (Imagery Stormsaver)	Regular Maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)				
		Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)				
	Occasional Maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)				
	Remedial Actions	Repair of overflow erosion damage or damage to tank	As required				
Pump repairs		As required					


1.3 Geocellular/Modular Systems

Table 3 Geocellular/Modular Storage & Infiltration Systems Maintenance Requirements

SuDS Feature	Maintenance Type	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
Geocellular/Modular Systems  (Imagery Greg Harding Photography)	Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly				
		Debris removal from catchment surface (where may cause risks to performance)	As required				
		For systems where rainfall infiltrates into the tanks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary. Are we talking about a filter on the inlet system? Maybe make this clearer.	Monthly (and after large storms)				
	Remedial Actions	Remove sediment from pre-treatment structures / chambers	Half yearly , or as required				
		Repair/rehabilitation of inlets, outlet, overflows and vents	As required				
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms					


1.4 Permeable Paving

Table 4 Permeable Paving Maintenance Requirements

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
Permeable Paving  (Imagery Kent County Council)	Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Annually, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations.				
	Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required				
		Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – annually on less frequently used pavements				
	Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of paving	As required				
		Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required				
		Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)				
	Monitoring	Initial inspection	Monthly for three months after installation				
		Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three monthly, 48 hours after large storms in first six months				
		Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually				
		Monitor inspection chambers	Annually				


1.5 Pipework & Manholes

Table 5 Pipework & Manholes Maintenance Schedule

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
 <p>(Imagery pavingexpert.com)</p>	Occasional Maintenance	Lift manholes to check performance of system	Biannually				
		Clear gullies and other water traps of accumulated debris	Annually				
	Remedial Actions	Rod through poorly performing runs as initial remediation.	As required				
		If continued poor performance jet and CCTV survey poorly performing runs.	As required				
		Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required if above does not improve performance				
	Monitoring	Initial inspection should be provided as post construction CCTV survey.	Monthly for three months after installation				
		Inspect for evidence of poor operation via water level in chambers and if required, take remedial action	Half yearly, 48 hours after large storms in first six months				
		Inspect silt accumulation rates and establish appropriate timescales for regular clearance	Annually				
		Monitor inspection chambers	Annually				

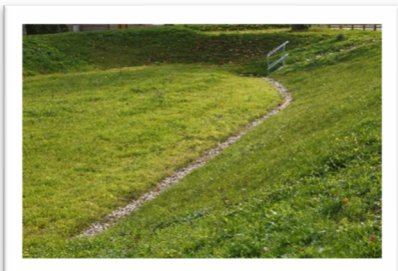
1.6 Flow Control Chamber

Table 6 Flow Control Chamber Maintenance Requirements

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
Flow Control Chamber  (Imagery jdpipes.co.uk)	Occasional Maintenance	Check operation of flow control device	Half yearly, 48 hours after large storm event				
		Check performance and clean any filtration unit / device	Half yearly				
	Remedial Actions	Clear debris / rod through poorly performing units as initial remediation.	As required				
		If continued poor performance replace parts as required	As required				
		Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required if above does not improve performance				
	Monitoring	Initial inspection should be provided as post construction CCTV survey.	N/A				
		Inspect for evidence of poor operation via water level in chambers and if required, take remedial action	Three monthly, 48 hours after large storms in first six months				
		Inspect silt accumulation rates and establish appropriate clearance frequencies	Annually				
		Monitor inspection chambers	Annually				


1.7 Attenuation Basin

Table 7 Attenuation Basin Maintenance Requirements

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
Attenuation Basin	Regular Maintenance	Remove litter and debris	Monthly, or as required				
		Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required				
		Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly				
		Inspect infiltration surface for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly, or when required				
		Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly				
		Inspect inlets and facility surface for silt accumulation, establish silt removal frequencies	Half yearly				
 (Imagery essexdesignguide.co.uk)	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 basin treatment area				
	Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required				
		Re-level uneven surfaces and reinstate design levels	As required				
		Scarify and spike topsoil layer to improve infiltration performance, break up soil 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				


1.8 Swale

Table 8 Swale Maintenance Requirements

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
Swale	Regular Maintenance	Remove litter and debris	Monthly, or as required				
		Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required				
		Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly				
		Inspect infiltration surface for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly, or when required				
		Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly				
		Inspect inlets and facility surface for silt accumulation, establish silt removal frequencies	Half yearly				
 (Imagery abertay.ac.uk)	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				
	Remedial actions	Repair erosion or other damage by re-turfing or reseed	As required				
		Relevel uneven surfaces and reinstate design levels	As required				
		Scarify and spike topsoil layer to improve infiltration performance, break up soil 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				

1.9 Filter Strips

Table 9 Filter Strips Maintenance Requirements

SuDS Feature	Maintenance Schedule	Required Action	Typical Frequency	Maintenance Record			
				Signed & Dated	Signed & Dated	Signed & Dated	Signed & Dated
 <p>(Imagery susdrain.co.uk)</p>	Regular Maintenance	Remove litter and debris	As required				
		Cut grass – to retain grass height within specified design range	As required				
		Manage other vegetation and remove nuisance plants.	As required				
		Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination.	Half yearly				
		Check flow spreader and filter strip surface for even gradients	Half yearly				
		Inspect gravel flow spreader upstream of filter strip for clogging	Half yearly				
		Inspect silt accumulation rates and establish appropriate removal frequencies					
	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 filter strip area				
	Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required				
		Relevel uneven surfaces and reinstate design levels	As required				
		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				

2.0 Supporting Guidance

Figure 1 Typical SuDS components operation and maintenance activities (The SuDS Manual)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/ trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management ¹	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

- will be required
- may be required

Notes

1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.