



The Squirrels Bar Reprovision

Drainage Strategy

For University of Manchester

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Executive Summary

The Proposed Development consists of the relocation of the existing Squirrels Bar in the University of Manchester's Fallowfield Campus. The development will utilise repurposed shipping containers, providing a 1 storey drinks venue hosting events for students such as comedy nights, society socials, live band performances etc.

The surface water drainage hierarchy has been considered and the preferred drainage solution for disposal of surface water is to discharge to the existing private sewer via a below ground gravity network at a restricted rate of 7.5l/s. The total site area is approximately 0.124 hectares.

The use of Sustainable Drainage Systems (SuDS) has been considered. Pollution prevention and site control methods will be utilised prior to outfall.

Pollution treatment measures will be provided in the form of SuDS Planters and silt traps on drainage elements which will filter and trap silts and debris and mitigate against the risk of pollution entering the sewer network.

The SuDS and other drainage elements will be regularly maintained by a nominated management company on behalf of the client/occupier.

Foul flows will be discharged to the existing private combined sewer network at an unrestricted rate before connecting into the public United Utilities combined sewer south of the site. (See Appendix C and E)

1. Introduction

1.1 Development Context

- 1.1.1 This report has been prepared by Hydrock Consultants Limited (Hydrock now Stantec) on behalf of The University of Manchester to support the planning application. The Proposed Development consists of the relocation of the existing Squirrels Bar in the University of Manchester's Fallowfield Campus.
- 1.1.2 The development will utilise repurposed shipping containers, providing a 1 storey drinks venue hosting events for students such as comedy nights, society socials, live band performances etc.
- 1.1.3 The proposed site building is located just East of the Armitage Sports Centre (M14 6HE) in the Fallowfield Campus of the University of Manchester (see Appendix A).
- 1.1.4 The site is currently used for coach parking serving the existing Armitage Sports Centre and is therefore considered to be 'brownfield'.

1.2 Flood Risk

- 1.2.1 Previously BDP prepared a Flood Risk Assessment and Drainage Strategy (110184-EFR-0001, October 2015, which was submitted under planning application 110184/FO/2015/S1) and considers the flood risk posed to the site from all sources, in accordance with the NPPF and the local Strategic Flood Risk Assessment (SFRA). The report indicates that the site is located in Flood Zone 1.
- 1.2.2 Figure 1 below shows the risk of flooding from rivers and the sea, taken from the governments Flood Map for Planning Service. The proposed development is located within Flood Zone 1.

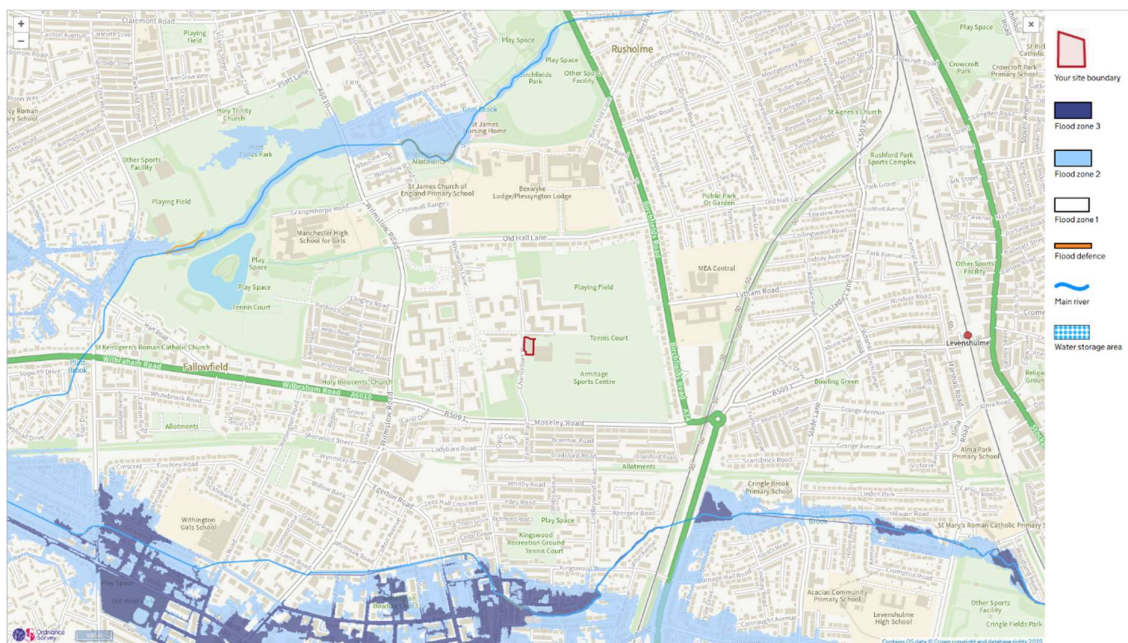


Figure 1: Rivers and the Sea Flood risk map

1.2.3 Figure 2 below shows the Surface water flood risk map. As can be seen, the proposed development has a 'Low Chance' of surface water flooding.

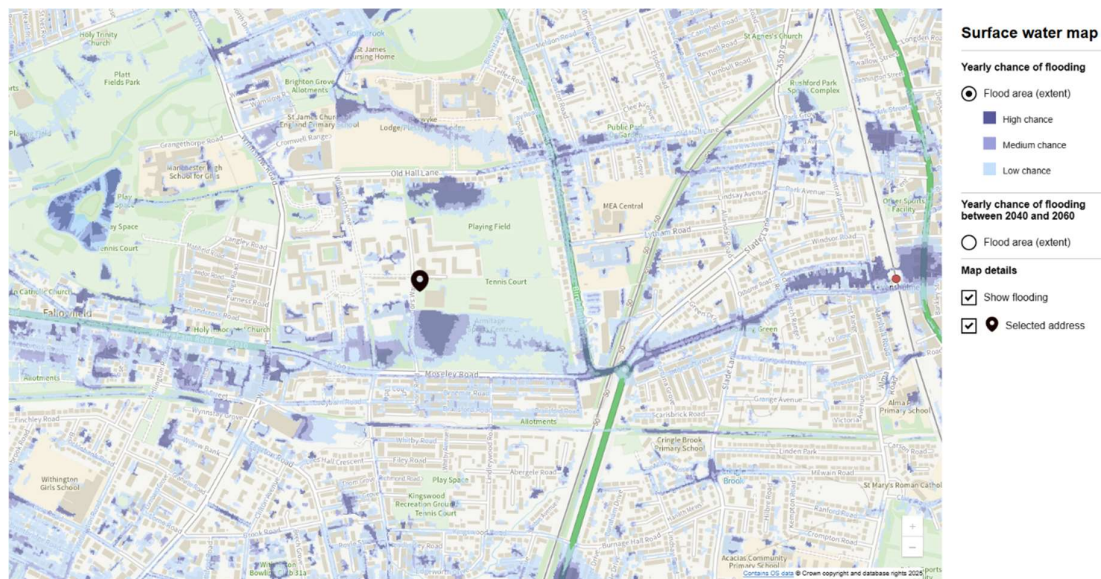


Figure 2: Surface Water Flood risk map

2. Development Description and Location

2.1 Site Location

2.1.1 This site is referenced in Table 1, and a location plan is provided in Figure 3.

Site Referencing Information	
Site Name	The Squirrels Bar Relocation
Site Address & Location	Fallowfield, Manchester, M14 6HE
Council Area	Manchester City Council
Approximate Grid Reference	385998E, 394161N
Site Area	The total site area is 0.124ha.
Boundaries & Surrounding Land	The site is bound by Chancellors Way to the west, Gunnery Lane to the North, The Armitage Sports Centre to the east and a lawn to the south.
Existing Land Use and Access	The site is currently an existing parking space for coaches, serving the existing Armitage Sports Centre. Access can be made via Chancellors Way (south east of the site) or Fatty Avenue (North east of the site, just off Gunnery Lane).
Elevation and Topography	A topographical survey has been undertaken and indicates that the site falls from North East to South West, from a level of ~44.9m AOD to ~43.49m AOD. See Appendix B for the full topographical survey.
Development Proposals	The proposed development is for the construction of a new events bar for students.
Vehicular access	The main vehicular access to the site will be made via Chancellors Way (south east of the site) or Fatty Avenue (North east of the site, just off Gunnery Lane).

Table 1: Site referencing information

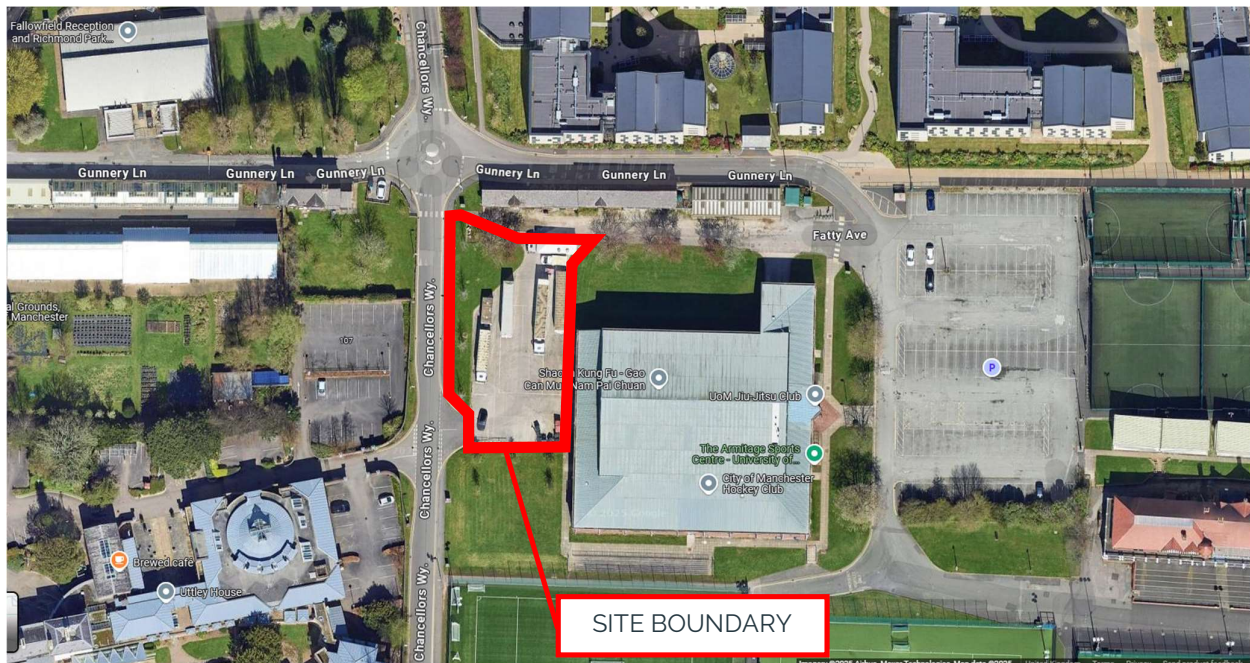


Figure 3: Site location

3. Drainage Strategy

3.1 Existing surface water runoff

- 1.1.1 The existing site is considered to be 'brownfield.'
- 1.1.2 The existing site drains via gullies, which is thought to connect into the private combined system.
- 1.1.3 The total site area is approximately 0.124 hectares.
- 1.1.4 The proposed site is to discharge into the private surface water system running along the western boundary of the site.
- 1.1.5 As the existing site is considered to be brownfield, a peak discharge rate of 7.5L/s has been calculated via the modified rational method. Therefore, the proposed site is to discharge into the private surface water network at a restricted rate of 7.5L/s.

3.2 Infiltration

- 3.2.1 A Phase 1 Ground Conditions Desk Study Report produced by Hydrock (37821-HYD-XX-XX-RP-GE-0001) suggests that infiltration for this development is not feasible due to ground conditions.

3.3 Sustainable Drainage Systems (SuDS)

- 3.3.1 Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed to manage both the environmental risks resulting from the urban runoff and to contribute, wherever possible, to environmental enhancement. Therefore, SuDS objectives are to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).
- 3.3.2 SuDS help to mimic the natural flow of water ensuring that both the quantity and quality of the surface water is dealt with before feeding it into the drainage network. SuDS features usually come with added maintenance; however, the benefits they reap are considered to outweigh this. The selection of the most appropriate SuDS features should consider constraints, requirements and maintenance of the site. It should be remembered that Local Planning Authorities expect SuDS to be investigated on construction projects. The implementation of SuDS features can assist in achieving the drainage requirements set out in the National Planning Policy Framework.
- 3.3.3 A strong design theme is essential if maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale SuDS should link with the individual plot structure, planting and amenity areas, gaining multiple benefits from a limited area of land.
- 3.3.4 The 'Management Train Approach' should be central to the surface water drainage strategy of a proposed site. The main objective is the treatment and control of runoff as near to source as possible, thus protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- » Prevention - The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater re-use).
- » Source Control - Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- » Site Control - Management of water in a local area (e.g. ground storage/attenuation, detention ponds/basins).
- » Regional Control - Management of water from a site or various sites (e.g. wetlands, balancing ponds).

3.3.5 The SuDS philosophy for a development site is the promotion of Pollution Prevention and Site Control Techniques. The following design philosophy is proposed:

- » Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance.
- » Surface water discharge into the existing private drainage network.
- » Site Control features (attenuation) to accommodate the additional surface water runoff generated by the development site before discharging into the private drainage network.
- » Aim to limit, where possible, the impermeable fraction of development.

3.3.6 It is proposed that the development site has two levels of treatment. Source control via the use of SuDS features is considered as the first level of treatment and the provision of trapped gullies and silt traps on chambers as the second.

3.3.7 A review of the possible SuDS solutions that are feasible include:

- » SuDS Planters (subject to suitable RWP locations)

3.4 Prevention and Source Control - Principles and Objectives

3.4.1 The main objective of prevention and source control is the treatment and control of runoff as near to source as possible. Application of these techniques will require reduction of impermeable areas and techniques to restrict the runoff rates.

3.4.2 Prevention measures to be considered, where possible, as part of the overall approach to the management train at this site include rainwater harvesting. Typical examples are given in the SuDS Manual (Ciria C697) and are briefly described in Table 2 below. It must be noted that the effectiveness of each system is dependent on the final design as well as the actual site conditions.

SuDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for use on site?
Retention	Balancing Pond/Swale		Provides both storm water attenuation and treatment. Run-off from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation.	Good removal of pollutants, can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits.	No reduction in run-off volume, land take may limit use in high density sites.	Unsuitable due to lack of available land.
	Sub-Surface Attenuation		Oversized pipes, tank systems and modular geo-cellular systems that can be used to create a below ground storage structure.	Modular and flexible, dual usage (infiltration/storage, high void ratios), can be installed beneath trafficked and soft landscaped areas.	No water quality treatment.	Sub-surface storage can be used.
Infiltration	Infiltration Trench		Surface water run-off can be discharged directly to ground for infiltration by soakaways, basins, or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to receive the quality and quantity of water generated.	Reduces the volume of run-off, effective at pollutant removal, contributes to groundwater recharge, simple and cost effective, easy performance observation.	Requires appropriate pre-treatment, basins require a large flat area, offset from foundations.	Infiltration is not considered to be feasible.
	Infiltration Basin					
	Soakaway					

	Porous Paving		Block or porous paving allows run-off to infiltrate through to sub base layer. Water can then be infiltrated into ground or conveyed into storage or drainage systems.	Reduces the volume of run-off and if designed for infiltration contributes towards groundwater recharge. Easy to install and retrofit. Simple to manage. If lined can be used where groundwater is sensitive.	Not suitable for heavily trafficked areas or adoptable roads. Requires regular sweeping to prevent clogging with dirt.	Permeable paving not considered feasible.
	Permeable Paving					
Detention	Detention Basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility.	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain.	Land take, little reduction in run-off volume, detention depths constrained by levels.	Unsuitable due to lack of available land.
	Enhanced Dry Swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces run-off rates and volumes, low cost.	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking.	Unsuitable due to lack of available land.
	Enhanced Wet Swale					

Source Control	SuDS Planters		Specialised containers made from recycled materials that are designed to grow plants sustainably. They provide source control by preventing water runoff, reducing soil erosion, and filtering pollutants before they can enter stormwater systems.	Space-efficient, soil provides water quality treatment to roof run off, easy to install, promotes sustainability and enhances biodiversity.	Regular maintenance required, may not match certain aesthetic preferences, more expensive than traditional planters	Can be used
	Rainwater Harvesting		Similar to the use of water butts this prevention method stores rainwater runoff from roofs and external areas in below ground tanks. The water can then be used for irrigation purposes to the soft landscaping areas or alternatively pumped to an internal storage tank where the 'Grey' water can be used for WC's and washing machines.	Harvested grey water will collect and automatically be used for various systems, such as toilet flushing, outside taps etc. The result will be less water usage and cheaper bills and a greener building or commercial premises.	Rainfall is hard to predict and sometimes little or no rainfall can limit the supply of rainwater. It also should have a "mains water" top up to ensure that you don't run out of water.	Rainwater Harvesting can be used. If appropriate.
Filtration	Surface Sand Filter		Structures designed to treat surface water run-off through filtration using a sand bed filter medium. The filters can be designed with or without infiltration.	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in	Not for high sediment content, detention times can support algae growth, minimum hydraulic head of	There is no requirement for high pollution reduction at this site.
	Sub-surface Sand Filter					

Perimeter Sand Filter		Temporary storage of run-off is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required.	tightly constrained urban locations.	1.2m required, possible odour problems, high capital and maintenance cost.	
Bioretention/ filter swale		Vegetated strips of land designed to accept run-off as overland sheet flow between a hard-surfaced area and a receiving system.	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit, capability, effective pre-treatment option.	Requires landscaping and management, large land required, not suitable for steep sites; no significant attenuation or reduction of flows.	No requirement for high pollution reduction; large land areas not available.
Filter trench/drain		Shallow excavations filled with rubble or stone that create temporary subsurface storage for filtration of storm water run-off. Receive lateral inflow from an adjacent impermeable surface.	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site landscaping and fit well beside roads and car parks.	High clogging potential without effective pre-treatment, limited to small catchments, high cost of replacing filter material.	Filter drains can be used.

Conveyance	Conveyance Swales		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation. Possible reduction in run-off volume via plant uptake and infiltration.	Potential trip/wheel hazard, disabled access issues.	Unsuitable due to lack of available land.
	Rills					
Wetland	Shallow Wetland		Wetlands provide storm water attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle and to remove contaminants. They can provide significant ecological benefits.	Good pollutant removal and if lined can be used where groundwater is vulnerable. Good community acceptability, ecological and amenity benefits.	Land take is high, requires base flow, little reduction in run-off volume, not suitable for steep sites.	Unsuitable due to lack of available land.
	Extended Detention Wetland					
	Pond Wetland					
	Pocket Wetland					
	Submerged Gravel Wetland					
	Wetland Channel					

Table 2: SuDS considerations

3.5 Surface Water Drainage Strategy

- 3.5.1 Surface Water Drainage Strategies must follow the hierarchy of surface water disposal as set out in Building Regulations - Approved Document H, as listed below;
- » **Option 1** - Into the ground (infiltration)
 - » **Option 2** - To a watercourse
 - » **Option 3** - To a public/private sewer
- 3.5.2 A Phase 1 Ground Conditions Desk Study Report produced by Hydrock (37821-HYD-XX-XX-RP-GE-0001) suggests that infiltration for this development is not feasible due to ground conditions.
- 3.5.3 Option 2, to a watercourse, is not considered feasible due to there being no available watercourses within the vicinity of the site.
- 3.5.4 Therefore, Option 3 is the preferred method, whereby surface water will discharge into the nearest private surface water within Chancellors Way.
- 3.5.5 Surface water runoff from roofs will be directed to rainwater pipes before passing through SuDS planters. Run off from the roofs and external areas will then be directed to the below ground gravity network (see Appendix C Hydrock proposed surface water drainage layout).
- 3.5.6 A quick storage estimate has been conducted using drainage software as part of the preliminary drainage design, which defines the required attenuation volumes. Quick storage parameters and results have been provided in Appendix D. It is noted that this storage volume is preliminary and may change at detailed design stage when more specific information is available.
- 3.5.7 A climate change allowance of 40% has been applied.
- 3.5.8 The proposed drainage layout is designed in accordance with Design and Construction Guidance. No above ground flooding for the 1 in 30-year storm event should occur. An assessment of extreme storm event, the 100-year event plus 40% climate change has been carried out. The storm-water volumes generated by this event are classed as exceedance flooding and will be safely contained on site and directed away from the buildings, where they will sit in the low points of the site and drain into the surface water infrastructure as water levels recede.
- 3.5.9 As part of the drainage strategy, we are proposing the following:
- » The proposed drainage system will be a managed gravity system discharging into the existing private surface water sewer.
 - » The external catchment areas will be drained via drainage channels and then discharge into the new private surface water network. Surface runoff from the roof will also discharge to the new private surface water network.
 - » Pollution treatment measures will be provided in the form of SuDS planters and silt traps on drainage elements which will filter and trap silts and debris and mitigate against the risk of pollution entering the sewer network.

3.6 Water Quality

- 3.6.1 The primary pollution control measure for the infrastructure elements will be in the form of SuDS planters. Further pollution control will be provided in the form of silt traps on chambers and trapped gullies.

3.7 Foul Drainage Strategy

- 3.7.1 Foul flows will outfall at an unrestricted rate to the existing private combined sewer network, east of the site before discharging into the public united utilities sewer located in Moseley Road, south of the site.
- 3.7.2 A map showing the location of the existing United Utilities public sewer is included in Appendix E.

3.8 Management, Maintenance and Residual Risk

- 3.8.1 The proposed drainage layout will be designed in accordance with building regulations. SuDS guidance will be taken from Ciria C753.
- 3.8.2 Run-off from roofs is considered to be generally clean with limited contamination, and will be discharged directly to SuDS planters before entering the proposed drainage infrastructure. Silt is to be prevented from entering the drainage system by the use of trapped gullies or by the use of sustainable drainage techniques.
- 3.8.3 A private management company will maintain the drainage infrastructure as part of a site-wide management and maintenance schedule as shown in Table 3.
- 3.8.4 Access and egress arrangements to and from the new development, should exceedance flooding occur, will be via the access road in Chancellors way, south east of the site.
- 3.8.5 Flood risk to people and property can be managed but it can never be completely removed. Residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified.

Item	Maintenance	Frequency per year
Gullies	Removal of silt accumulation from mud bucket. Gratings checked for operation/damage – replaced if required.	2
Foul Water Manholes	Manholes covers checked for operation/damage – seating's re-greased or replaced as required. Check for blockages and or damage to invert channel/inlets – jetting pipe runs if blocked, any damage to be repaired. All access ladders & other associated ironworks to be checked for corrosion & fixings to be checked for deterioration. To be repaired or replaced dependant of extent of damage.	1
Surface Water Manholes, Flow Controls	As Above All catch pits/Vortex Separators to have silt/solid accumulation removed & base jetted clean.	1
Drainage Channels	All catch/access pits to have silt/solid accumulation removed. Channel run to be jetted through between access points. Any channel grates to be inspected for damage & replaced as necessary.	2
Attenuation Tank	Inspection - Check for blockages, structural damage, signs of wear. Inspect inlets and outlets to ensure they are clear and functioning properly. Remove and accumulated silt, leaves or other debris Remove any overgrown vegetation around the tank. Check for corrosion or deterioration in tank walls and lining	2
SuDS Planters	Check for clogging or debris. Inspect plant health. Ensure filtration media is functioning properly. Inspect structure for cracks/damage and erosion	2

Table 3: Drainage maintenance

APPENDIX A



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APPENDIX B

APPENDIX C

APPENDIX D

Variables

Results

Design

Overview 2D

Overview 3D

Vt

Variables

FSR Rainfall

Return Period (years)

Region

Map

M5-60 (mm)

Ratio R

Cv (Summer)

Cv (Winter)

Impemeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

100

England and Wales

18.000

0.364

0.750

0.840

0.063

7.5

0.00000

1.0

40

Analyse

OK

Cancel

Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Variables

Results

Design

Overview 2D

Overview 3D

Vt

Results

Global Variables require approximate storage of between 9.1 m³ and 19 m³.

These values are estimates only and should not be used for design purposes.

Analyse

OK

Cancel

Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

APPENDIX E

