



Land off Britannia Street

SuDS Assessment

Job Number: 1328

Date	Version	Notes/Amendments
March 2023	1	Issued for Information

Contents**Page**

Introduction	2
Site Description and Location	3
Development Proposal	4
Flood Risk	5
Surface Water Run-off Assessment	6
Existing Run-off	6
Proposed Run-off (Unmitigated without SuDS Measures)	6
SuDS Assessment	7
Living Roofs & Rainwater Re-use	9
Infiltration	9
Attenuation	10
SuDS Run-off Summary	12
Surface Water Maintenance Strategy	13
Permeable Paving	13
Cellular Storage Tank	13
Conclusions	14
Appendix A - SuDS Strategy	16
Appendix B - Hydraulic Calculations	17
Figure 1. Site Location	3
Figure 2. Proposed Building and associated External Works	4
Figure 3. Environment Agency Flood Risk from Rivers or Sea Map (gov.uk, 2022)	5
Figure 4. SuDS Site Suitability	8
Figure 5. BGS Geological Maps	9
Figure 6. Permeable Pavement used for the Hardstanding areas	11

Acronyms	
AOD	Above Ordnance Datum
CIRIA	Construction Industry Research and Information Association
EA	Environment Agency
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
NSTS	Non-Statutory Technical Standards

Introduction

Flume Consulting Engineers have been appointed to undertake a Sustainable Drainage Systems (SuDS) Assessment for the proposed development at the Land off Britannia Street, Heywood, OL10 1JG.

This report has been carried out in accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance 'Flood Risk and Coastal Change' (PPG). This report also incorporates advice and guidance from the Environment Agency (EA), the Strategic Flood Risk Assessment (SFRA) by Rochdale Borough Council, DEFRA's Non-statutory technical standards (NSTS) for sustainable drainage systems and CIRIA documents.

The local authority provided a response to the initial planning application, as follows:

By reason of the proposed impermeable hardstanding, in conjunction with the proposal to send all rainfall run off to public sewers without any attenuation, the proposed development would not include drainage which is appropriate for the site, and sustainable urban drainage solutions have not been included, in conflict with policy G8 of the adopted Rochdale Core Strategy and the National Planning Policy Framework.

Therefore, this SuDS Assessment has been carried out to assess the available options for SuDS use for the proposed development in accordance with the planning comments outlined above.

Site Description and Location

The existing site is accessible via Britannia Street and resides to the rear of No.100-106 Bridge Street. The site currently stands as an existing storage facility with the nearest residential properties to the south and commercial units to the east and south of the site close to a busy Bridge Street main road.

The site is entirely hard landscaped and has an existing building which is to be removed as part of the works.

The nearest watercourses, the River Roch (Spodden to Irwell), flows to the north of the development although this does not impact the fluvial flood risk to the development.

The site postcode is OL10 1JG and the OS grid reference is SD 84960 10841.



FIGURE 1. SITE LOCATION

Development Proposal

The planning application proposes the erection of 4 no. commercial units (Use Class B2) with office space at first floor level.

The property will be accessed via the existing entrance at Britannia Street.

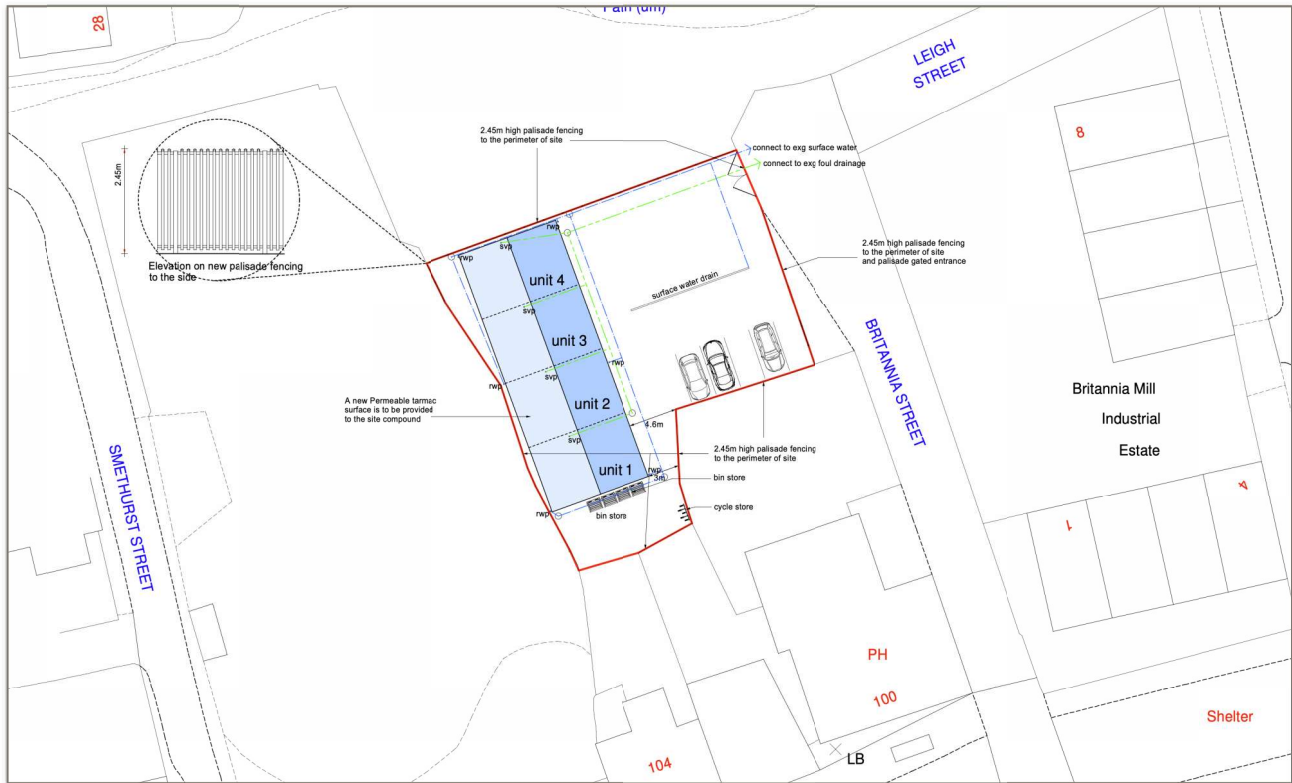


FIGURE 2. PROPOSED BUILDING AND ASSOCIATED EXTERNAL WORKS

Flood Risk

The EA's indicative floodplain map shows that the site is located in Flood Zone 1 and is not at risk of flooding (Figure 3). Developments in this flood zone do not have any restrictions, provided they do not increase the risk of flooding elsewhere.

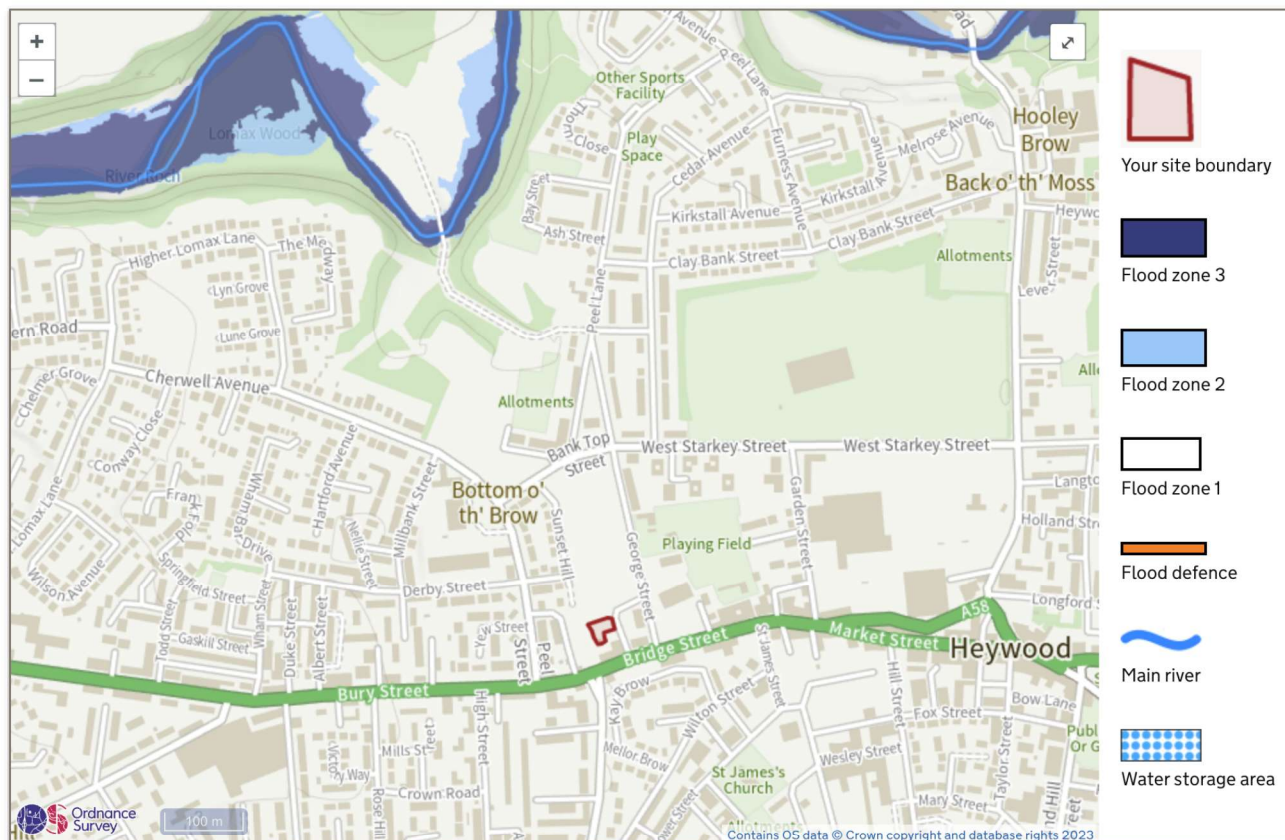


FIGURE 3. ENVIRONMENT AGENCY FLOOD RISK FROM RIVERS OR SEA MAP (GOV.UK, 2022)

Surface Water Run-off Assessment

Existing Run-off

The total site area which includes the existing building and associated external landscaping, is approximately 750m²/0.075ha, and all of which is impermeable hardstanding areas.

The existing peak run-off rate for the design storm event (1 in 1, 1 in 30 and 1 in 100 year) was calculated using the Modified Rational Method | Wallingford Procedure as shown below:

as shown below:

$$Q = 2.78 \times i \times A$$

Where 'A' is the catchment area in ha and 'i' is the rainfall intensity in mm/hr as estimated using the relevant maps presented in the Flood Studies Report.

$$Q_{1ex} = 2.78 \times 33 \times 0.075 = \underline{6.88 \text{ l/s}}$$

$$Q_{30ex} = 2.78 \times 83 \times 0.075 = \underline{17.31 \text{ l/s}}$$

$$Q_{100ex} = 2.78 \times 106 \times 0.075 = \underline{22.10 \text{ l/s}}$$

Proposed Run-off (Unmitigated without SuDS Measures)

According to Planning Practice Guidance (PPG), “generally the aim should be discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable: 1. Into the ground (infiltration) 2. To a surface water body; 3. To a surface water sewer, highway drain or another drainage system; 4. To a combined sewer”, whilst ensuring that surface water run-off is managed as close to its source as possible.

The proposed development does not introduce any additional hardstanding areas compared with the existing case, and will therefore not generate any additional surface water run-off. An allowance for a future increase in rainfall intensity is provided below:

$$Q_{100+40cc} = 2.78 \times 148 \times 0.075 = \underline{30.94 \text{ l/s}}$$

The following chapters aims to outline the possibility of incorporating SuDS features in the design. Figure 7 outlines the possibility of incorporating SuDS into the scheme to reduce the surface water run-off and volumes further.

SuDS Assessment

It is recommended that SuDS be introduced to mimic natural drainage pathways as close to source as possible, reducing the impact of urbanisation on watercourse flows, and ensures the protection and enhancement of water quality, while encouraging the recharge of groundwater.

In accordance with the EA's guidelines, DEFRA's Non-statutory technical standards for sustainable drainage systems (NSTS), Building Regulations and Water Authorities advice, surface water run-off should be managed as close to its source as possible. The proposed SuDS will aim to reduce surface water run-off to the required rates where possible and practical, in line with national and local policy.

The NSTS states surface water run-off rates from site should be restricted as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

CIRIA SuDS Manual (C753) states that a development should utilise SuDS unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

- I. Use infiltration techniques, such as porous surfaces in non-clay areas,
- II. attenuate rainwater in ponds or open water features for gradual release,
- III. attenuate rainwater by storing in tanks or sealed water features for gradual release,
- IV. discharge rainwater direct to a watercourse,
- V. discharge rainwater to a surface water sewer / drain,
- VI. discharge rainwater to the combined sewer.

The possibility of implementing SuDS at the site was assessed using a hierarchy of preferred surface water management methods, and in line with comments received from the LLFA. The following paragraphs discuss the various methods in order of that hierarchy and evaluate the site's suitability for each method.

Ground Investigation was not available at the time of writing this report, therefore, this assessment will be based on the geological maps. The SuDS site suitability table, in Figure 4, has been used to determine the suitability for each SuDS element for this development.

SuDS Component	Site Suitability	Comments
Green Roofs & Rainwater Reuse	X	No flat roofs were proposed on the scheme which might facilitate Green Roofs.
Soakaways	X	Not feasible in this instance due to the low expected infiltration rates to permit the use of 3D Soakaways. Furthermore, the requirement for a minimum 5m easement from adjacent structures and 2.5m easement from boundaries which restricts their use.
Filter Strips	X	Not feasible in this instance due to the low expected infiltration rates to permit the use of 3D Soakaways. Furthermore, the requirement for a minimum 5m easement from adjacent structures and 2.5m easement from boundaries which restricts their use.
Infiltration Trenches	X	Not feasible in this instance due to the low expected infiltration rates to permit the use of 3D Soakaways. Furthermore, the requirement for a minimum 5m easement from adjacent structures and 2.5m easement from boundaries which restricts their use.
Swales	X	Not suitable due to site layout and size of the development.
Bioretention	X	Not suitable due to site layout and size of the development.
Porous Pavements	✓	Permeable Paving (Type B Partial Infiltration) will be introduced to all hardstanding areas. Surface water will infiltrate into the ground below the permeable pavement. Although the geological maps confirms Till (Clay & Stones) with poor infiltration properties, Permeable Paving will remain unlined, permitting surface water to slowly infiltrate into the ground through pockets of more permeable strata. The Permeable Paving will also be used as part of the site-wide attenuation, with an overflow incorporated to consider the worst-case scenario; that no infiltration occurs.
Geocellular Systems	✓	An attenuation tank will be incorporated which will restrict the peak surface water flow rates from the development to 1.30 l/s. Surface water flow rates cannot be reduced further due to the risk of blockages associated with low flow control devices.
Infiltration basins	X	Not suitable due to site layout and size of the development.
Detention basins	X	Not suitable due to site layout and size of the development.
Ponds	X	Not suitable due to site layout and size of the development.
Stormwater wetlands	X	Not suitable due to site layout and size of the development.

FIGURE 4. SUDS SITE SUITABILITY

Living Roofs & Rainwater Re-use

Green Roofs have not been incorporated as part of the proposed scheme, as this would not be appropriate for the building or consistent with the surrounding buildings in the area. The SuDS Manual C753 states *“Green roofs can provide benefits in terms of reducing peak flow rates to the site drainage system – principally for small and medium-sized events.”*. However, the SuDS Manual also goes further to say that they behave like traditional roofs during storm events or return periods greater than this, limiting their effectiveness for these types of occurrences.

Infiltration

The preferred means of surface water drainage for any new development is into a suitable soakaway or infiltration system. However, according to the BGS maps, infiltration in this area is not likely due to the presence of Till (Figure 5). The requirement for a minimum 5m easement from adjacent structures and 2.5m from any adjacent boundary further restricts centralised “3D” Infiltration tanks/Soakaways.

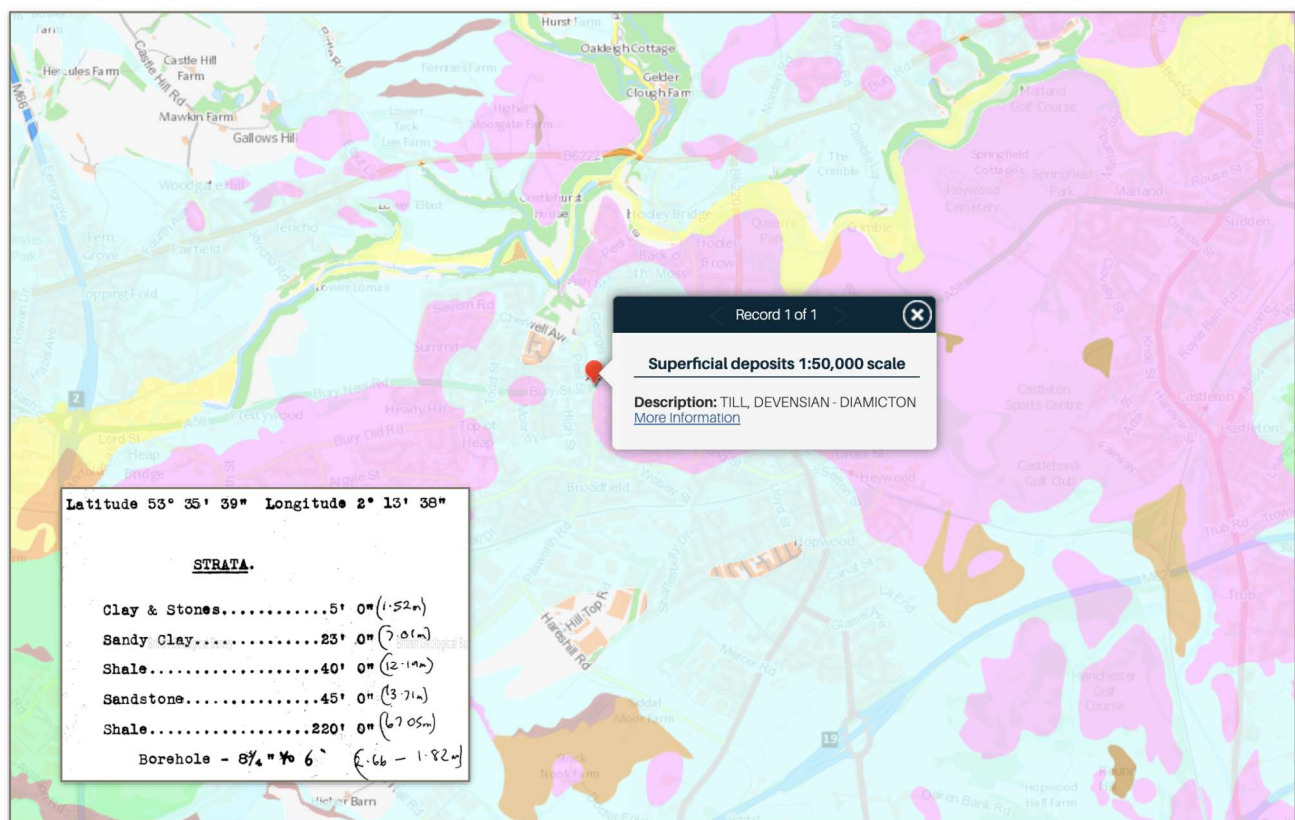


FIGURE 5. BGS GEOLOGICAL MAPS

Attenuation

Cellular Storage

Cellular storage tanks will be used to drain the surface water run-off from the roof and hardstanding areas and limit peak flow rates being discharged from the development into the public sewer.

This Attenuation tank has been designed to accommodate the 1 in 100 year return period plus a 40% allowance for climate change, restricting surface water in line with local and national policy recommendations. The hydraulic calculations are included in Appendix B.

DEFRA's Non-statutory technical standards for SuDS prioritise the reduction to greenfield run-off rates from new developments. The Greenfield run-off rate for the site was calculated based on the IH124 method outlined in the *uksuds* tool. The shows that the site generates greenfield run-off rates of 0.51 l/sec, 1.02 l/sec and 1.25 l/sec, for the annual, 1 in 30 year and 1 in 100-year storm events respectively.

The joint DEFRA/EA R&D rainfall runoff management for developments (Report-SC030219) states that “a practicable minimum limit on the discharge rate from a flow attenuation device is often a compromise between attenuating to a satisfactorily low flow rate while keeping the risk of blockage to an acceptable level. This limit is set at 5 litres per second, using an appropriate vortex or other flow control device”.

Building regulations require a minimum diameter outlet of 75mm for all below ground drainage elements. Restricting rates to such a low-flow rate would not comply with their requirements, and therefore not be approved. HR Wallingford's Run-off tool (and similarly EA/DEFRA's guidance) recommends that “where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible”. Furthermore, Building Regulations Part H states that a minimum diameter of 75mm must be provided for surface water drainage in order to avoid blockages.

A very small outlet is needed to restrict flow rates to Greenfield rates, which will increase blockage risk and the associated flood risk to the development, and national policies and industry standard practice¹ does not support reducing the flow control below 50mm. The SuDS Manual only suggests that smaller flow controls are possible if it can be guaranteed that debris cannot pass through the system e.g permeable pavements etc. When such small openings / flow controls are stipulated, this significantly increases the flood risk to the building and the end-user. The designer should make additional allowances for this in their design.

The Design and Construction Guidance (Sewerage Sector Guidance, Appendix C) states that the minimum flow control size for protected controls is 50mm. Calculations using the Hydro-International's flow control tool, states that a minimum achievable flow control from their devices for 50mm diameter is **1.30 l/s**.

Therefore, the surface water run-off rates from site will be restricted to 1.30 l/s with a suitable flow control device. A management and maintenance strategy has been included as part of this report to mitigate any

¹ Design and Construction Guidance (DCG Sewerage Sector Guidance, Appendix C), BS EN 752, Building Regulations Part H, EA SCO30219, SFA 7th Ed (withdrawn), HR Wallingford Greenfield Run-off Tool

opportunity for future blockage risk. Suitable protective measures will be implemented in order to permit the flow control to be reduced to 50mm (*Downpipe Filter Leaf Ejectors* installed on all accessible RWPs, silt traps incorporated on all upstream inspection chambers, and regular maintenance schedule enforced in the O&M Manual). Additionally, an Attenuation tank has been designed to accommodate the 1 in 100 year return period plus a 40% allowance for climate change, restricting surface water to 1.30 l/s.

Permeable Pavements

The site is not likely to permit concentrated volumes of surface water run-off from the hardstanding areas to ground in the form of a '3D Soakaway' or similar. However, unlined permeable pavements (Type B) can be utilised for partial infiltration and attenuation purposes. Therefore, an overflow from the permeable pavement will be connected to the surface water drainage as a fail-safe solution.

Capacity of the Permeable Pavement

The surface water run-off from the hardstanding areas will self-attenuate through the sub-base of the permeable pavement. As a conservative approach, the permeable pavement has not been included in the hydraulic calculations.

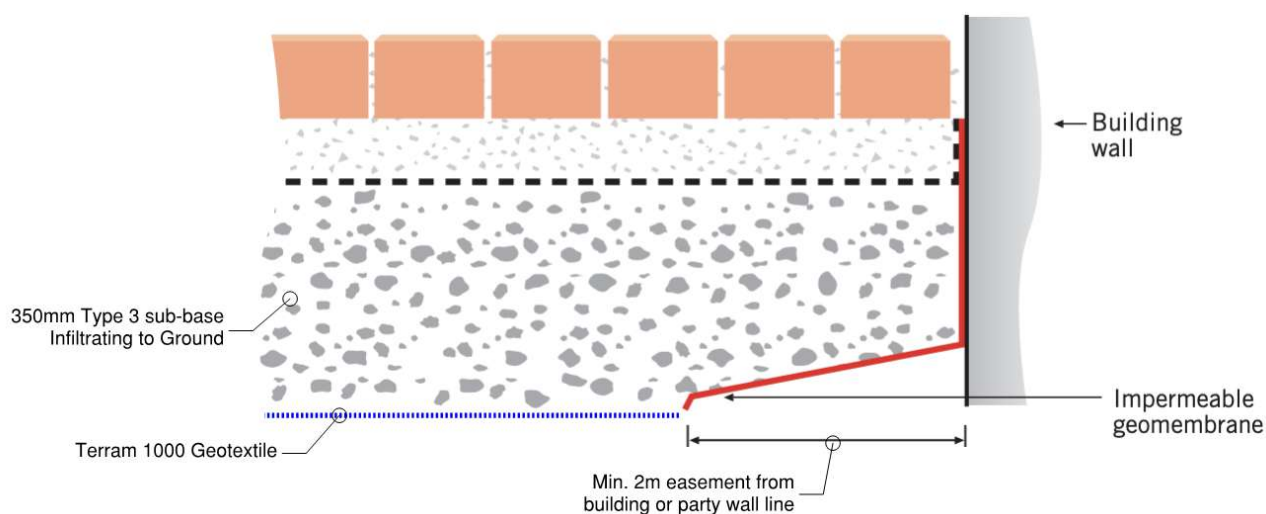


FIGURE 6. PERMEABLE PAVEMENT USED FOR THE HARDSTANDING AREAS

SuDS Run-off Summary

Return Period	Greenfield (l/s) Interpolated	Existing (l/s)	Proposed (l/s) (without SuDS Measures)	Proposed (l/s) (with SuDS Measures)
1 in 1 Year	0.51	6.88	6.88	1.30
1 in 30 Year	1.02	17.31	17.31	1.30
1 in 100 Year	1.25	22.10	22.10	1.30
1 in 100 Year + 40%cc	-	-	30.94	1.30

In conclusion, the expected infiltration rates for the site and the proximity of adjacent structures and the site boundaries, further limit the options for introducing infiltration based SuDS measures. It is not reasonably practicable to restrict the discharge rate to Greenfield rates / Q_{bar} (0.60l/s) without increasing the risk of blockage and the associated flood risk to the development. However, Type B Permeable Paving and an attenuation tank will be incorporated which will restrict the peak surface water flow rates from the development to 1.30 l/s. Surface water flow rates cannot be reduced further due to the risk of blockages associated with low flow control devices. These SuDS elements provide an overall reduction in surface water run-off rates for all storm events up to the 1 in 100 year plus climate change compared to the unmitigated scenario by up to 96%.

Surface Water Maintenance Strategy

The drainage design will be designed to be fully maintainable in accordance with building regulations and the recommendations of CIRIA C753 – SuDS Manual, outlined below.

Permeable Paving

Maintenance Schedule	Required Action	Typical Frequency
Monitoring/Inspections	Initial Inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required take remedial action.	Annually (and after severe storms)
Regular Maintenance	Rubbish and litter removal	As required
	Brushing and vacuuming - standard cosmetic sweep across surface	Once a year after Autumn leaf fall
Remedial Actions	Remedial work to any depressions or rutting considered detrimental to the structural performance.	As required
	Rehabilitation of surface with remedial sweeping	Every 10-15 years or as required.

Cellular Storage Tank

Maintenance Schedule	Required Action	Typical Frequency
Monitoring / Inspections	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are working as they should	Annually or after severe storms
Regular Maintenance	Inspect and identify any elements that are not operating correctly.	Monthly for three months, then Half yearly or as required.
	Remove sediments / debris from catch pits / gullies and control structures	Annually, after severe storms or as required
Remedial Actions	Repair inlets, outlets, vents, overflows and control structures.	As required

The CDM Regulations place specific Health and Safety duties on those commissioning, planning and undertaking construction works. If you are uncertain what this means you should seek the advice of your architect, builder or other competent professional. Flume does not provide health and safety advisory services, but we are required to advise you of your general responsibilities under CDM. Please remember that detailed design should be undertaken by a competent professional who might be your engineer, architect, builder or another competent party.

Conclusions

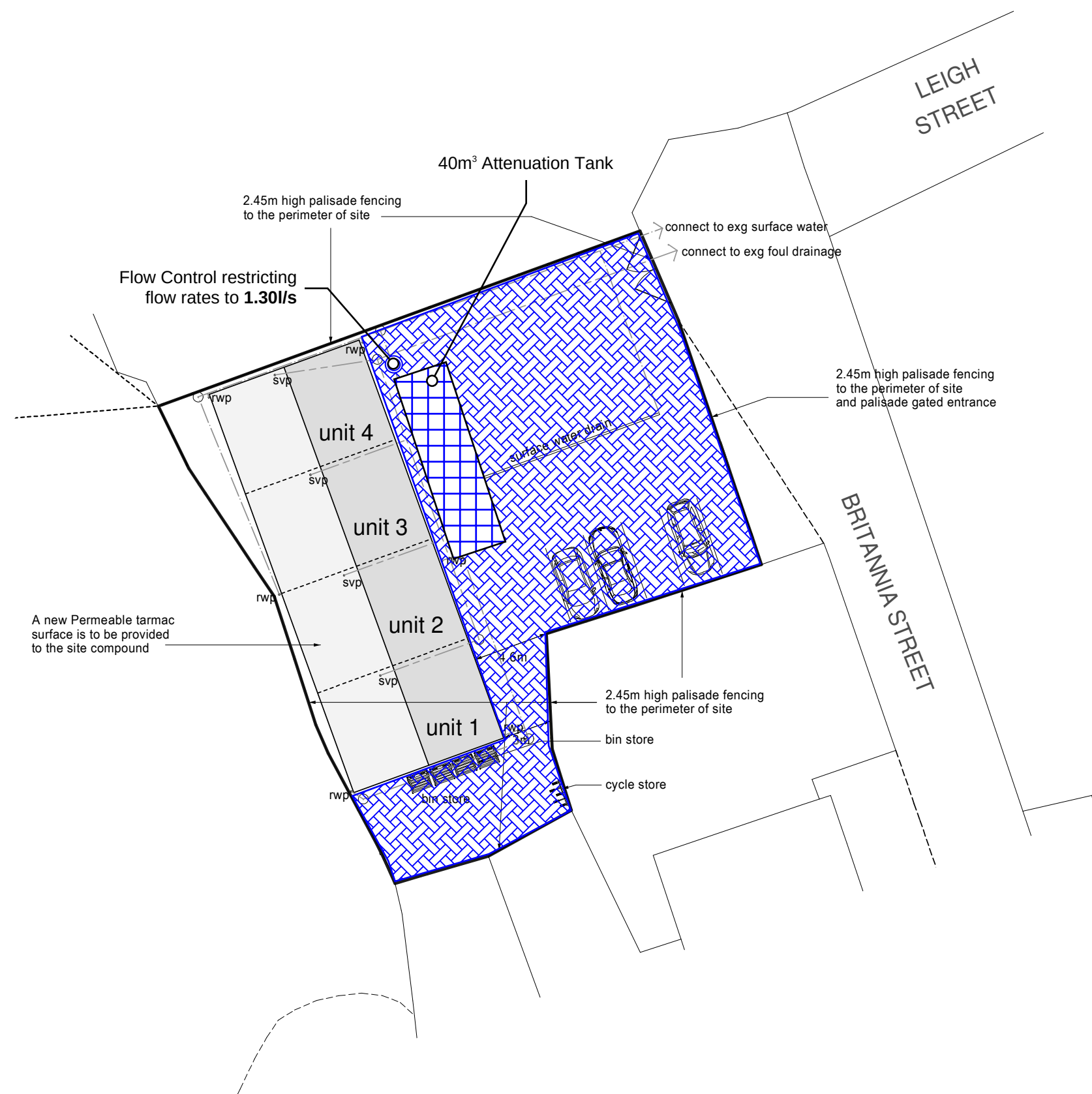
- The site resides in Flood Zone 1 where there is less than 1 in 1000 annual probability of river or sea flooding (<0.1%). Developments in this flood zone have no restrictions other than ensuring surface water drainage proposals do not increase the flood risk on site and the surrounding areas.
- The existing development discharges surface water at unrestricted rates to the public sewer. The proposals will therefore not increase the flood risk from surface water, as there will be no increase in the surface water run-off rate or volumes.
- Permeable Paving ('2d' Infiltration) and an Attenuation tank will restrict the development's surface water run-off rates to 1.30 l/s. These SuDS elements provide an overall reduction in surface water run-off rates for all storm events up to the 1 in 100 year plus 40% allowance for climate change compared to the unmitigated scenario by 96%. It is also expected that a small amount of surface water run-off will discharge slowly into the ground from the base of the permeable paving; this was not considered as part of the calculations, assuming no infiltration occurs.
- Permeable Pavements are also placed highly in the SuDS Hierarchy, and will ensure that water quality, water quantity, amenity and biodiversity are all promoted in the SuDS design.
- A SuDS Maintenance Plan will also be in place to ensure efficient operation and prevent failure of the system.
- A completed Section 106 of the Water Industry Act 1991 application (providing details on proposed flows), requesting consent for discharging foul and surface from the proposed development to the public sewers should be submitted to the local water authority for approval.

Note:

This report has been prepared for the purposes of submitting for planning to the local planning authority for review in relation to the associated SuDS for the proposed development, and uses the most up-to-date information available to us at the time. It should not be relied upon by anyone else or used for any other purpose. This report is confidential to our Client; it should only be shown to others with their permission. We retain copyright of this report which should only be reproduced with our permission.

	Prepared By	Checked By	Approved for issue
Name	Tom Quigg BSc MSc CEng MICE	Magaly Sedeño BA	Tom Quigg BSc MSc CEng MICE
Signature	TQ	MS	TQ
Date	27 March 2023	27 March 2023	27 March 2023

Appendix A - SuDS Strategy



Appendix B - Hydraulic Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	150.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.300	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Attenuation	0.075	5.00	2.000	1200	2.000
Outfall	0.000		2.000	1200	2.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Attenuation	Outfall	3.000	0.600	0.000	0.000	0.000	0.0	100	5.05	52.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.000	7.9	10.7	1.900	1.900	0.075	0.0	0	∞

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	3.000	0.0	100	Circular	2.000	0.000	1.900	2.000	0.000	1.900

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Attenuation	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Attenuation	2.000	2.000	1200				
				0	1.000	0.000	100
Outfall	2.000	2.000	1200		1	1.000	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.400	Additional Storage (m ³ /ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node Attenuation Online Hydro-Brake® Control

Flap Valve	x	Objective	(CL) Minimise blockage risk
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	0.000	Product Number	CTL-SCL-0051-1300-1000-1300
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.3	Min Node Diameter (mm)	1200

Node Attenuation Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	264

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	40.0	40.0	1.000	40.0	40.0	1.001	0.0	40.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Attenuation	90	0.148	0.148	3.5	5.8065	0.0000	SURCHARGED
15 minute summer	Outfall	1	0.000	0.000	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Attenuation	Hydro-Brake®	Outfall	1.1	10.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Attenuation	118	0.449	0.449	8.1	17.5867	0.0000	SURCHARGED
15 minute summer	Outfall	1	0.000	0.000	1.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Attenuation	Hydro-Brake®	Outfall	1.2	23.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Attenuation	118	0.630	0.630	10.7	24.6584	0.0000	SURCHARGED
15 minute summer	Outfall	1	0.000	0.000	1.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Attenuation	Hydro-Brake®	Outfall	1.2	30.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Attenuation	176	0.941	0.941	11.0	36.8416	0.0000	SURCHARGED
15 minute summer	Outfall	1	0.000	0.000	1.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Attenuation	Hydro-Brake®	Outfall	1.3	47.4

Calculated by: Tom Quigg

Site name: Land off Britannia Street

Site location: Heywood

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 53.59390° N

Longitude: 2.22864° W

Reference: 2220787395

Date:

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.10

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics Default Edited

SOIL type: 4 4

HOST class: N/A N/A

SPR/SPRHOST: 0.47 0.47

Hydrological characteristics Default Edited

SAAR (mm): 1075 1075

Hydrological region: 10 10

Growth curve factor 1 year: 0.87 0.87

Growth curve factor 30 years: 1.7 1.7

Growth curve factor 100 years: 2.08 2.08

Growth curve factor 200 years: 2.37 2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

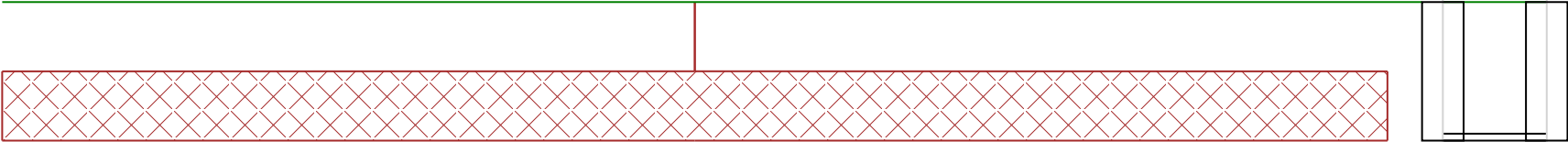
(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates Default Edited

Q_{BAR} (l/s):	0.8	0.8
1 in 1 year (l/s):	0.69	0.69
1 in 30 years (l/s):	1.36	1.36
1 in 100 year (l/s):	1.66	1.66
1 in 200 years (l/s):	1.89	1.89

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Node Name	Attenuation@outfall		
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) -5.000			
	Link Name	1.000	
	Section Type	100mm	
	Slope (1:X)	0.0	
	Cover Level (m)	2.000	2.000
	Invert Level (m)	0.000	0.000
	Length (m)	3.000	