Surface Water Drainage Statement

Address:

8 Downview Road,

Barnham,

PO22 0EE

Executive Summary

This Surface Water Drainage Statement outlines the proposed surface water management strategy for the development at 8 Downview Road, Barnham, PO22 0EE. The project involves the demolition of existing structures, the construction of single and two-storey side and rear extensions, and the addition of a first floor.

The site's geology, consisting of predominantly sandy and silty River Terrace Deposits, offers naturally favourable drainage conditions. Sustainable Drainage Systems (SuDS) will be employed to ensure effective surface water management and compliance with local policies, mitigating potential flood risks. The development will incorporate a combination of rainwater harvesting, permeable surfaces, and bioretention systems, with all drainage solutions aligned with Approved Document H and the CIRIA SuDS Manual (C753).

Key findings include:

- The site has low flood risk (Flood Zone 1) with no history of flooding.
- Surface water drainage options prioritize infiltration, rainwater harvesting, and bioretention.
- Modern solutions will enhance water quality, biodiversity, and sustainability.

This comprehensive strategy ensures the proposed development will manage surface water effectively, minimizing environmental impact while adhering to planning requirements.

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1. Proposed Works

The proposed works include the demolition of the existing kitchen and bay windows, and the construction of single and two-storey side and rear extensions. Additionally, a first floor will be added to the existing footprint.

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2. Site Geology

The site geology consists of:

- **London Clay Formation**: Clay, silt, and sand (sedimentary bedrock).
- **River Terrace Deposits**: Sand, silt, and clay (sedimentary superficial deposit).

The site elevation is between **12-13m**, compared to surrounding land at **9-10m**.

The predominantly sandy and silty **River Terrace Deposits** provide a naturally favourable drainage profile. These layers improve drainage efficiency. With the implementation of modern drainage solutions, such as soakaways and permeable surfaces, the development will align with local drainage policies to ensure effective surface water management, thereby mitigating potential flood risks.

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3. Surface Water Drainage Considerations

All Sustainable Drainage Systems (SuDS) and source control solutions will follow the hierarchy outlined in:

- **Approved Document H** of the Building Regulations.
- **The SuDS Manual (CIRIA C753)**.

The drainage hierarchy prioritizes the following:

1. **Infiltration**: Discharging water to the ground via soakaways or infiltration trenches.
2. **Attenuation and Controlled Discharge**: Using rainwater harvesting tanks, infiltration crates, or rain gardens to manage runoff.
3. **Discharge to Surface Water Sewer**: If infiltration is not feasible, discharge to surface water sewers may be considered, subject to approval. Not possible here.
4. **Discharge to Combined Sewer**: As a last resort, discharge to a combined sewer is only permitted if other options are unviable. Not possible here.

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4. Existing Drainage Disposal

The existing property was constructed in the 1930s and currently disposes of surface water into a combined sewer (and potentially a existing soakaway).

- There is no evidence of any other drainage features on-site.
- The potential existence of a soakaway will be investigated and reported on during the development process.
- The nearest main river is over 300m to the north-east, as shown in the Flood Map for Planning (Appendix).

The existing flood risk for the site is less than 0.1% (low risk), and the property has never been flooded. According to flood risk projections, the property will remain above the 25-year flood level by 2040.

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5. Proposed Drainage Disposal

Two options are proposed for surface water drainage disposal:

Option 1: Rainwater Harvesting System

A rainwater harvesting tank with a capacity of 5-8m^3 will be installed to manage surface water runoff. Based on calculations from the HR Wallingford Tool, this system will provide sufficient capacity for a 1 in 100-year storm event.

- The harvested rainwater will be reused for non-potable purposes, such as garden irrigation and toilet flushing.
- Overflow water will be managed via a rain garden or additional storage tanks to prevent overloading the system.
- The rain garden could be a proposed; HydroPlanter system by GreenBlue Urban who are specialists in Stormwater management. Refer to below.

Option 2: HydroPlanter 'Plug and Play' Raingarden

The HydroPlanter™ by GreenBlue Urban is a modular bioretention raingarden system designed to manage surface runoff effectively.

This system aligns with the four pillars of Sustainable Urban Drainage Systems (SuDS) as outlined in the CIRIA SuDS Manual, addressing water quality, water quantity, amenity, and biodiversity.

The HydroPlanter™ can function as an overflow for rainwater harvesting tanks or integrate with infiltration structures, providing flexibility in stormwater management strategies.

Manufactured from 100% recycled materials, the system is both environmentally friendly and efficient in attenuating and cleansing stormwater, contributing to sustainable infrastructure.

For a setup comprising 1 starter module, 6 continuation modules, and 1 end module, the total potential surface water storage capacity is approximately 7.92 cubic meters.

The HydroPlanter™ will be planted with a carefully selected palette of drought-tolerant plants to ensure resilience in the typically dry conditions of UK raingardens. Suggested plant species include Carex testacea, Rudbeckia fulgida, Verbena bonariensis, and Sedum spectabile, which are suited to variable conditions and contribute to biodiversity and visual appeal.

Option 3: Infiltration Crate System (Subject to groundwater testing & infiltration testing)

An infiltration crate system will be installed, subject to the results of infiltration testing. This system will allow surface water to percolate into the ground, reducing runoff and mimicking natural drainage processes. This will be installed maximum 1 crate (0.5m) deep therefore giving water stored a greater surface area to infiltrate into the ground. This will also make sure there is the clear 1m freeboard between the based of the infiltration structure and the highest recorded groundwater level identified in the area.

Option 4: Proposed Green Roof Area.

The property has currently 107m2 of existing roof area.

The proposed extension will add 41m2 of new double storey roof space and 47m2 of single storey roof area.

The proposed green roof will enhance sustainable drainage by improving water infiltration and reducing surface water runoff by approximately 50–80%, depending on rainfall intensity. It is designed to retain up to 50 liters of rainwater per square meter within its substrate and drainage layers, releasing it gradually over time. This approach helps mitigate the risk of localized flooding and reduces the load on conventional drainage systems.

The green roof build-up will include:

- A root-resistant waterproof membrane,
- A drainage layer capable of storing approximately 20 liters of water per square meter
- A lightweight substrate layer (60–100mm deep) holding up to 30 liters of water per square meter
- Sedum vegetation providing evapotranspiration and further water retention benefits.

This system will improve infiltration, slow runoff rates, and contribute to meeting sustainable drainage requirements while supporting biodiversity and reducing urban heat effects.

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6. Flood Risk Summary

The site is located in an area with a **flood risk of less than 0.1%** (Flood Zone 1).

- There is no history of flooding on the property.
- The property is projected to remain above the 25-year flood level in 2040, indicating low future flood risk.

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7. Methodology for Groundwater Testing (2 Boreholes)

Excavate two boreholes by hand auger, window sampling, or mechanical methods to a depth of at least 3m below the proposed infiltration level or until the groundwater table is reached. Install perforated standpipes in both boreholes to allow accurate groundwater monitoring. Backfill pit with gravel, bentonite clay and concrete capping to prevent surface water contamination. Conduct weekly water level readings from November 24 to February 25 to capture seasonal fluctuations and peak groundwater levels during wet months.

Purpose: This extended monitoring period ensures that potential peak water table levels are recorded. The results will determine if infiltration systems are feasible or if high groundwater levels could impact the effectiveness of soakaway crates.

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8. Methodology for Infiltration Testing (BRE365 – 1 Test Pit)

Excavate one test pit at the proposed infiltration system location to the base depth of the planned soakaway. The pit should be rectangular, typically 1m x 1m x depth to the base of the soakaway. Saturate the pit for 24 hours to replicate field conditions. Conduct three infiltration tests by filling the pit with water to a specific depth and measuring the time it takes for the water to fall by 75%. Ensure measurements follow BRE365 guidelines for accuracy.

Purpose: The infiltration rate will guide the soakaway design. If infiltration is too slow or groundwater is high, alternative drainage methods may be necessary, as infiltration crates may not function effectively during peak water table months.

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9. Appendices

1. **Flood Map for Planning (Environment Agency)**
2. **Survey Snippet of Flood Risk Data**
3. **Drainage Calculation from HR Wallingford Tool**
4. **Specification for HydroPlanter**
5. **Standard Details & Dimensions GRAF Rainwater Harvesting Tank**

Conclusion & Recommendations

Conclusion

The proposed development at 8 Downview Road, Barnham demonstrates a robust surface water management strategy incorporating modern SuDS principles. The site geology and low flood risk provide a favorable foundation for implementing sustainable drainage solutions.

Three primary surface water disposal options are proposed, each designed to align with local planning and environmental regulations:

- Rainwater Harvesting System for reuse and attenuation.
- HydroPlanter Raingarden for controlled discharge and enhanced biodiversity.
- Infiltration Crates subject to ground and infiltration testing results. **If infiltration is possible we will only install one of either the infiltration crates or the HydroPlanter system.**

A **green roof** is also proposed, offering significant water retention benefits and supporting sustainability goals. This multi-pronged approach ensures effective stormwater management, reducing flood risks and meeting the planning requirements.

Recommendations

1. **Groundwater and Infiltration Testing:**
    - Conduct groundwater monitoring using two boreholes from November to February to determine seasonal groundwater fluctuations.
    - Boreholes are already installed. Waiting on further results before publishing and providing to planning team.
    - Perform infiltration testing (BRE365) to confirm the suitability of infiltration systems. To be carried out late Jan early Feb.
2. **Adopt Rainwater Harvesting System:**

- Install a rainwater harvesting tank (5–8m^3 capacity) to manage runoff and supply water for non-potable use. Use a rain garden or HydroPlanter for overflow management.

3. **Implement HydroPlanter Raingarden:**
    - Use HydroPlanter modules to support stormwater attenuation, water quality improvement, and biodiversity enhancement.
4. **Install Green Roof:**
    - Utilize a green roof over the new extensions to further reduce surface water runoff, support biodiversity, and improve water infiltration.
5. **Coordinate with Planning Authorities:**
    - Share results from groundwater and infiltration testing with the planning team to confirm the suitability of proposed drainage solutions and finalize designs.

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**495336/105232**	**13 Jan 2025 8:58**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms

Appendix 1; Flood Map For Planning

Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
495336/105232

Scale
1:2500

Created
13 Jan 2025 8:58

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix 1; Flood Map For Planning

< Back to select an address

8, DOWNVIEW ROAD, BARNHAM, BOGNOR REGIS, PO22 0EE

Rivers and sea risk	**Very low risk** Very low risk means that this area has a chance of flooding of less than 0.1% each year.
Surface water risk	**Very low risk** Very low risk means that this area has a chance of flooding of less than 0.1% each year. Lead local flood authorities (LLFA) manage the risk from surface water flooding and may hold more detailed information. Your LLFA is **West Sussex**.
Reservoir risk	Flooding from reservoirs is unlikely in this area
Groundwater risk	Flooding from groundwater is unlikely in this area

Appendix 2: Survey Snippet Historical Flood Risk

2.06 Historic Flooding

NOT IDENTIFIED

Data provided by the Environment Agency indicates that the property is not in or within 250 metres of an area that has flooded in the past. This includes all types of flooding, including Groundwater. However, we would always recommend asking the vendor to confirm whether or not they are aware of any previous flooding at the property.

Please see the previous sections for the Flood Risk as of the date of this report.

hrwallingford

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	York Devenish
Site name:	8 Downview Road - Surface Water
Site location:	PO22 0EE

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	50.83878° N
Longitude:	0.647° W
Reference:	2776609340
Date:	Jan 15 2025 07:45

Site characteristics

Total site area (ha):	0.194
Significant public open space (ha):	0.156
Area positively drained (ha):	0.038000000000000006
Impermeable area (ha):	0.0368
Percentage of drained area that is impermeable (%):	97
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0.0368
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.04
Net impermable area for storage volume design (ha):	0.02
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI and SPR manually

Soil characteristics

	Default	Edited
BFI HOST:	--	0.608
SPR HOST:	--	0.4

Hydrological characteristics

	Default	Edited
Q_{MED}:	--	0.1
Q_{BAR} / Q_{MED} conversion factor:	--	1.136
Rainfall 100 yrs 6 hrs:	--	68.03
Rainfall 100 yrs 12 hrs:	--	77.56
FEH / FSR conversion factor:	1.19	1.01
SAAR (mm):	762	790
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	--	0.61
Q_{BAR} for net site area (l/s):	--	0.12

Site discharge rates

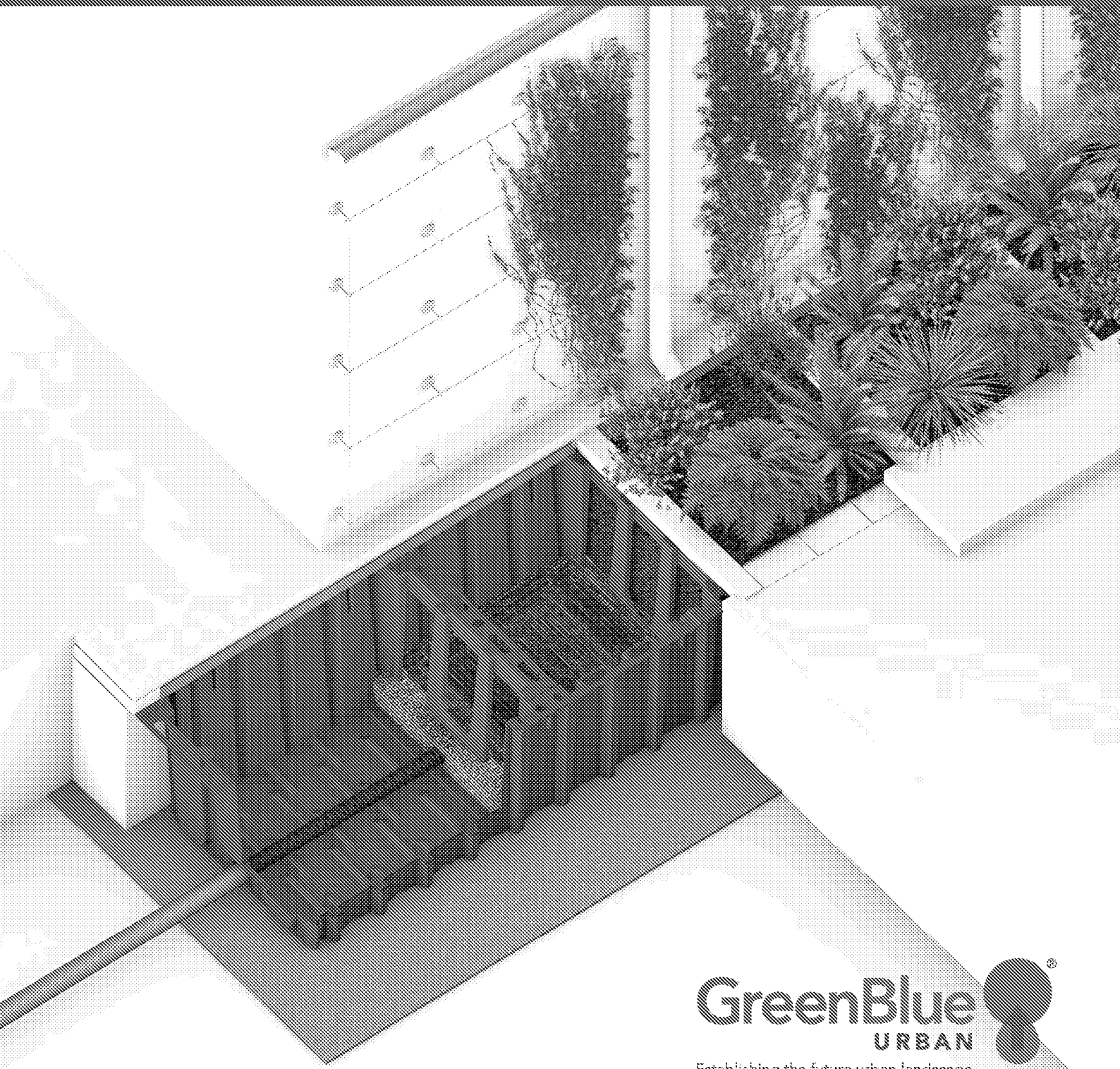
	Default	Edited
1 in 1 year (l/s):	--	2
1 in 30 years (l/s):	--	2
1 in 100 year (l/s):	--	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	--	5
Long term storage 1/100 years (m^3):	--	0
Total storage 1/100 years (m^3):	--	5

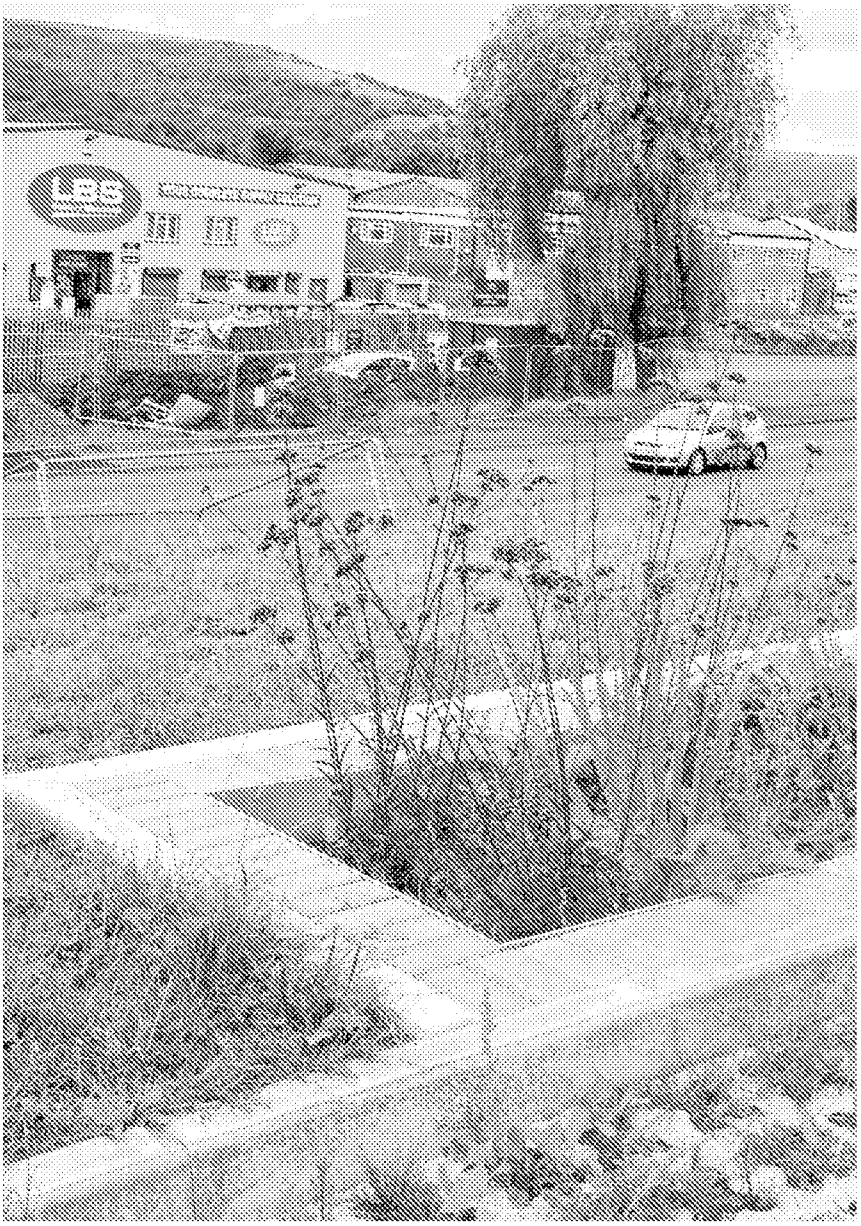
HydroPlanter™

'Plug and Play' Raingarden



GreenBlue URBAN

Establishing the future urban landscape



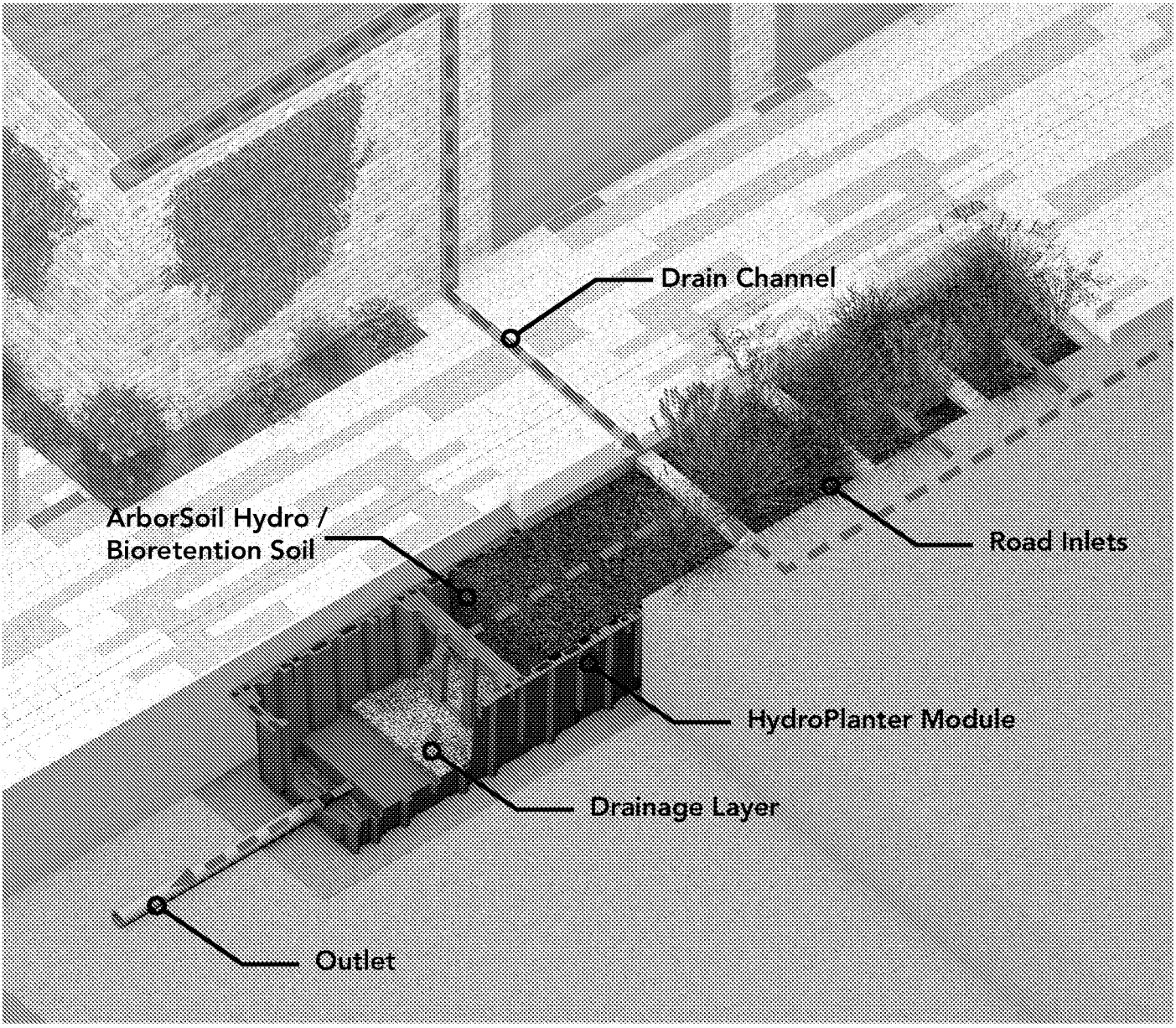
Introducing the **HydroPlanter**

A modular bioretention raingarden system, the HydroPlanter, that can be retrofitted into highways schemes and on new developments of any size.

This is a 'plug and play' sustainable urban drainage solution that can attenuate and cleanse storm water and provide amenity and biodiversity to new and existing spaces. The modules will be filled with a particular soil specification and planted wildflowers and biodiverse grasses.

The concept is flexible, scalable and each unit stacks together to be a convenient solution that any subcontractor can work with and install. Installation is fast, simple and offers significant savings to alternative methods.

The modular characteristics with pre-calculated hydrological performance statistics mean that specification and design is very simple for any given catchment area.



Manufactured in the UK from 100% recycled material

Modular, stackable 'plug and play' system makes for economic freight

Highly effective filtration & flow control

Provides amenity and biodiversity

HydroPlanter
SuDS Made Simple

Cost Effectiveness & Rapid Install

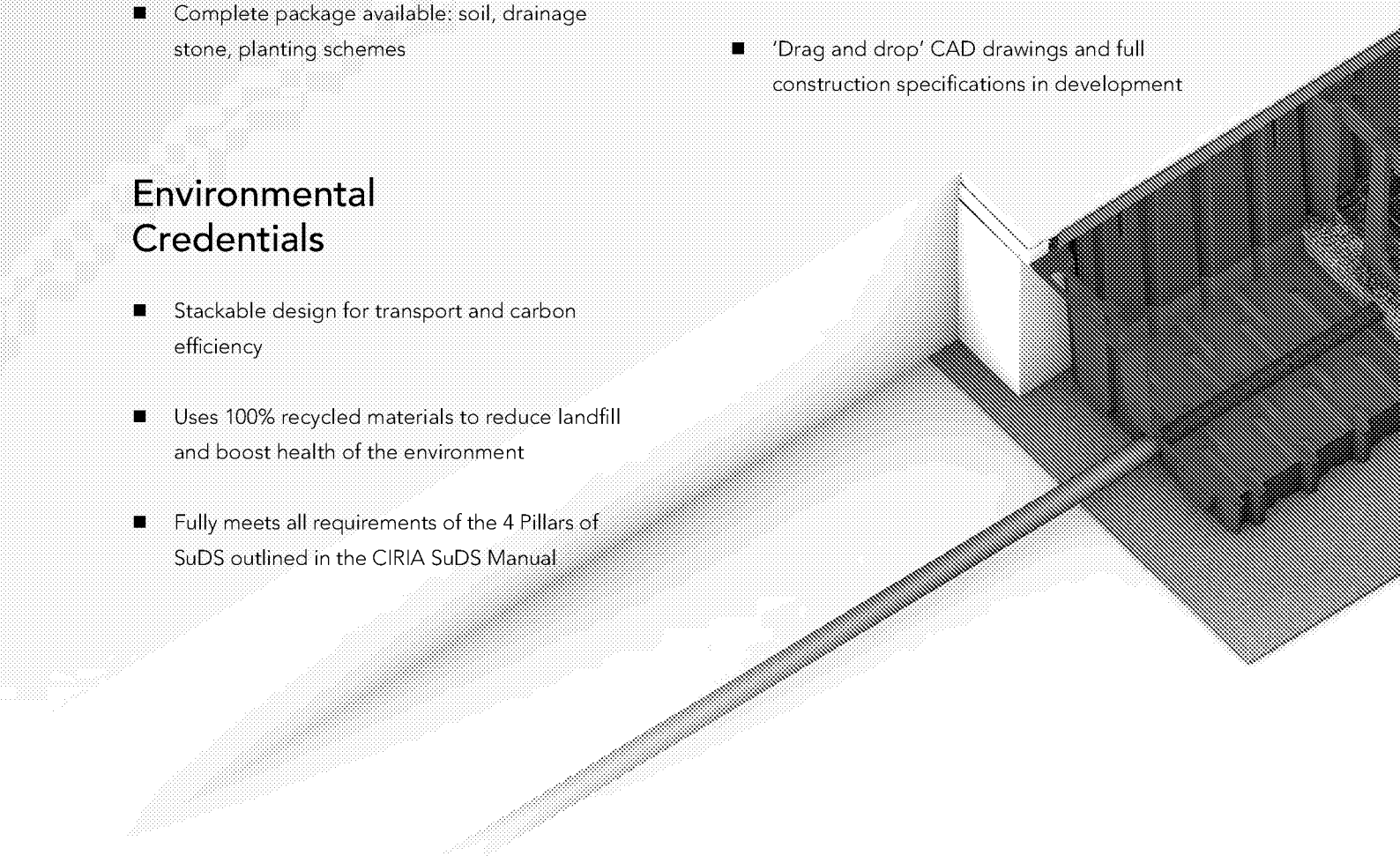
- Very simple and fast installation process
- Simple, off-the-shelf solution more cost-effective method than over-engineered hybrid geocellular/raingarden approaches
- Low weight units do not require machine handling. Transport efficient product design
- Complete package available: soil, drainage stone, planting schemes

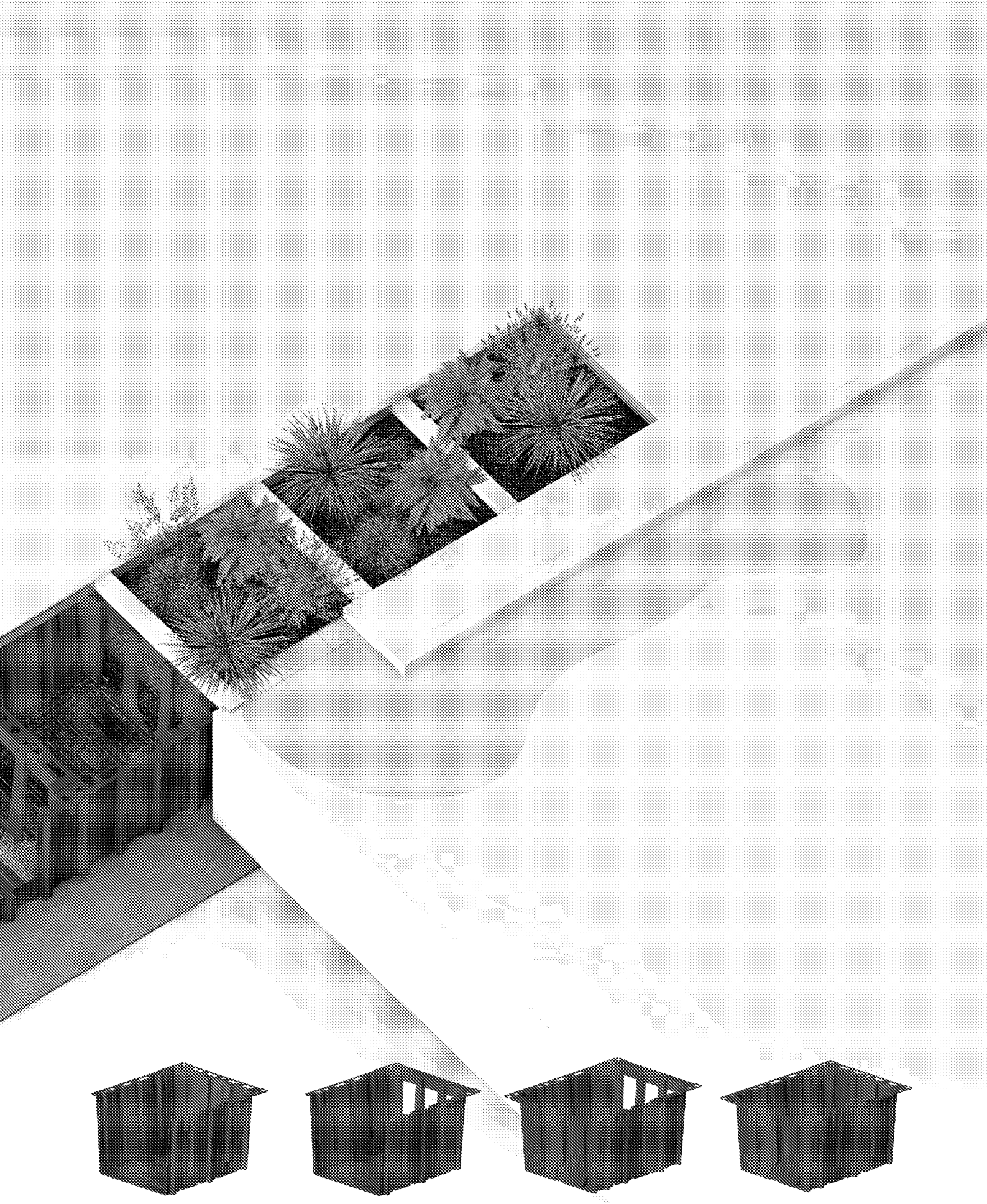
Modularity & Simplicity

- Scalable from stand-alone applications to large civic schemes
- Ease of calculation using off the shelf system including the potential to integrate into modelling software
- 'Plug and play' system eliminates detailed bespoke design work
- 'Drag and drop' CAD drawings and full construction specifications in development

Environmental Credentials

- Stackable design for transport and carbon efficiency
- Uses 100% recycled materials to reduce landfill and boost health of the environment
- Fully meets all requirements of the 4 Pillars of SuDS outlined in the CIRIA SuDS Manual





GBUHPSM1A
HydroPlanter Starter Module

GBUHPCM1A
HydroPlanter Continuation Module

GBUHPEM1A
HydroPlanter End Module

GBUHPIM1A
HydroPlanter Individual Module

Case Study
Newmarket, Grosvenor Yard

Grosvenor Yard Car Park is in the town of Newmarket, Suffolk, approximately 65 miles north of London.

As we have seen from a previous case study All Saints School, the operating water board for the region is Anglian Water. Back in late 2019 we were in direct contact with Andy Bird and Emma Richardson from Anglian who were working collaboratively with West Suffolk Council to develop a long-term strategy to manage the stormwater flows of Newmarket.

Initial meetings ascertained that this particular car park had an approximate catchment area of 1,960 square meters and the amount of attenuation required was 33 cubic meters based on a 1:30 year event.

After preliminary Tree Pit discussions, it was soon suggested that Anglian consider the soon to be launched Rain Garden solution the HydroPlanter. All workings regarding the HydroPlanter were discussed including correct depths, the correct use of soil, protection against vehicle overrun and pedestrian hazard. GreenBlue were also able to assist with flow rates using the hydraulic modelling guidance as supported by MicroDrainage.

Unfortunately, the installation was put on hold, however, we were pleased that the opportunity had been passed to tender by the local authority.

GreenBlue were delighted that the council had agreed with the recommendation of the use of HydroPlanters and at the end of April 21 for 4 weeks the car park was closed for the new drainage system to be incorporated along with resurfacing, relining and a new footpath.

Assisting with the installation GreenBlue supported contractors DW Surfacing with the rain garden solution that consisted of; 4 starter, 4 end and 7 continuation modules, specialised AborSoil Hydro for SuDS pits along with required Weir walls for on-site safety and protection.

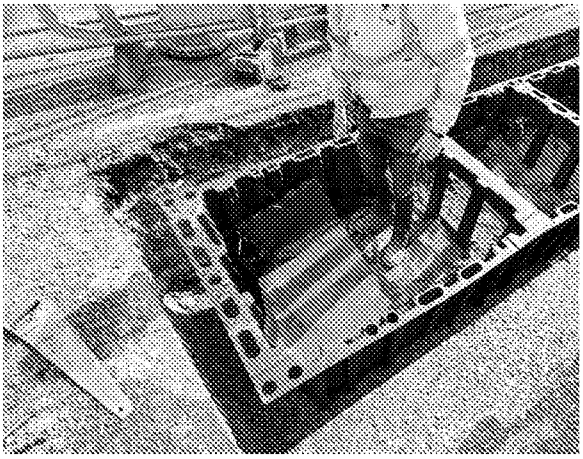
Also on-site was Cheryl Froud from West Suffolk County Council, overseeing this exciting new drainage installation, asked if there were any constraints on site:

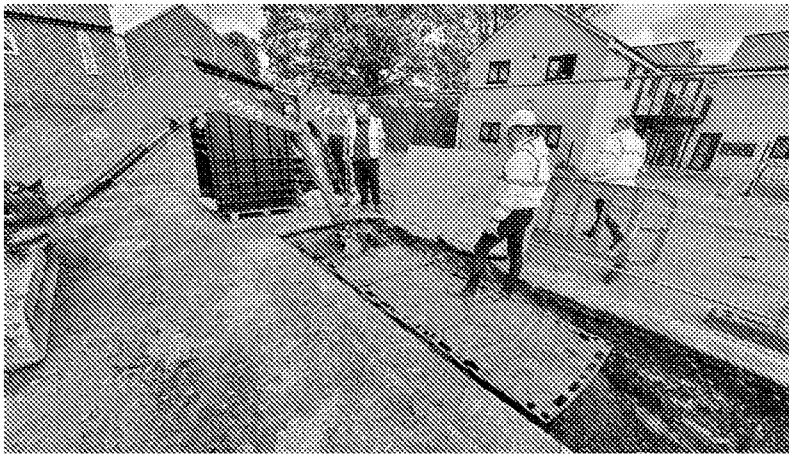
> **Yes, digging down we found an old Well which we left alone and covered the hole back over. There were several utility services within the car park and near to the new planters. Hand digging was carried out and the planters made to fit around these. On the plans the scheme looked complicated but when the works were carried out, the installation was quite simple.**

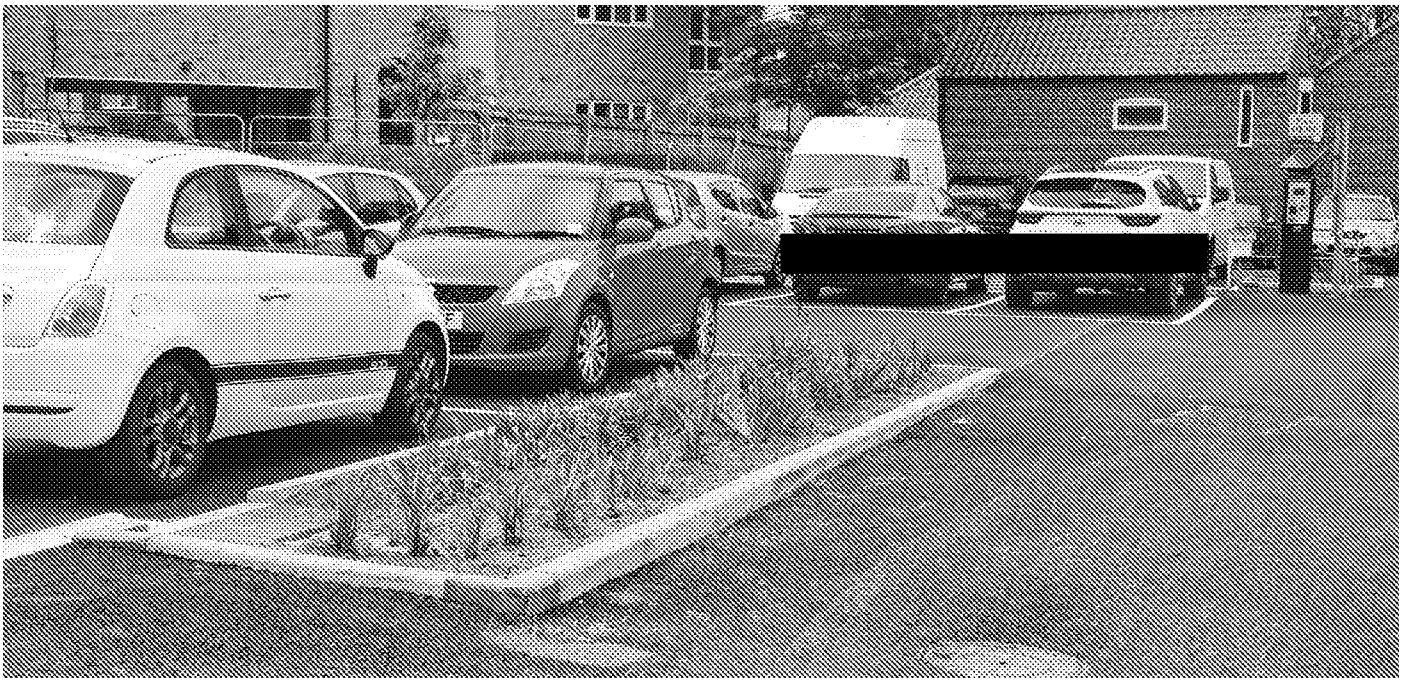
Complementing the final look of the scheme and recommending for future use, Cheryl highlighted:

> **They have made the car park more appealing, broken up all the tarmac etc.**

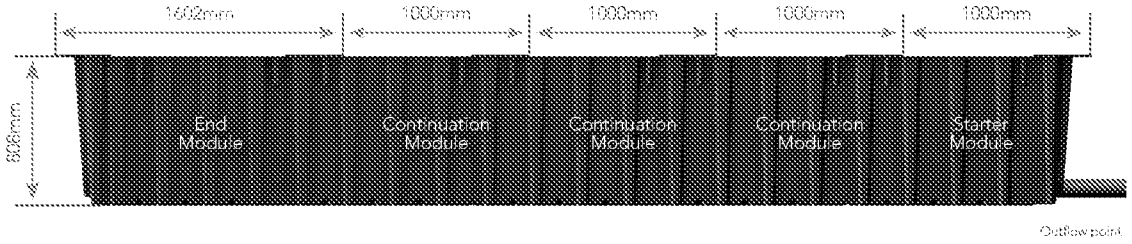
Commending Anglian Water and West Suffolk for pursuing a new and innovative solution we recommend others to follow suit – there are more options available than just storage, let's soften our environments and consider amenity and biodiversity moving forward.



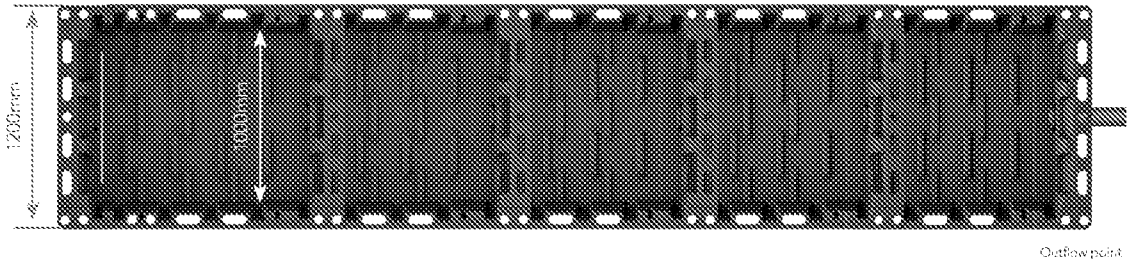




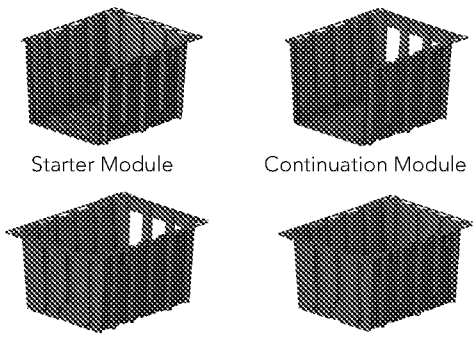
HydroPlanter
Components

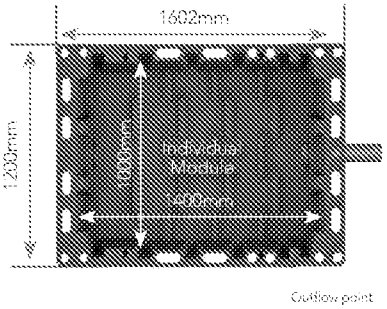


Continuation run (Section view)



Continuation run (Plan view)



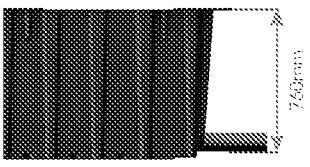


Product code	Description
GBUHPSM1A	HydroPlanter Starter Module
GBUHPCM1A	HydroPlanter Continuation Module
GBUHPEM1A	HydroPlanter End Module
GBUHPIM1A	HydroPlanter Individual Module

Outlet point

Connectivity to 110mm drainpipe provided, pipe not included.

Invert level: 760mm (excluding weir walls if used)



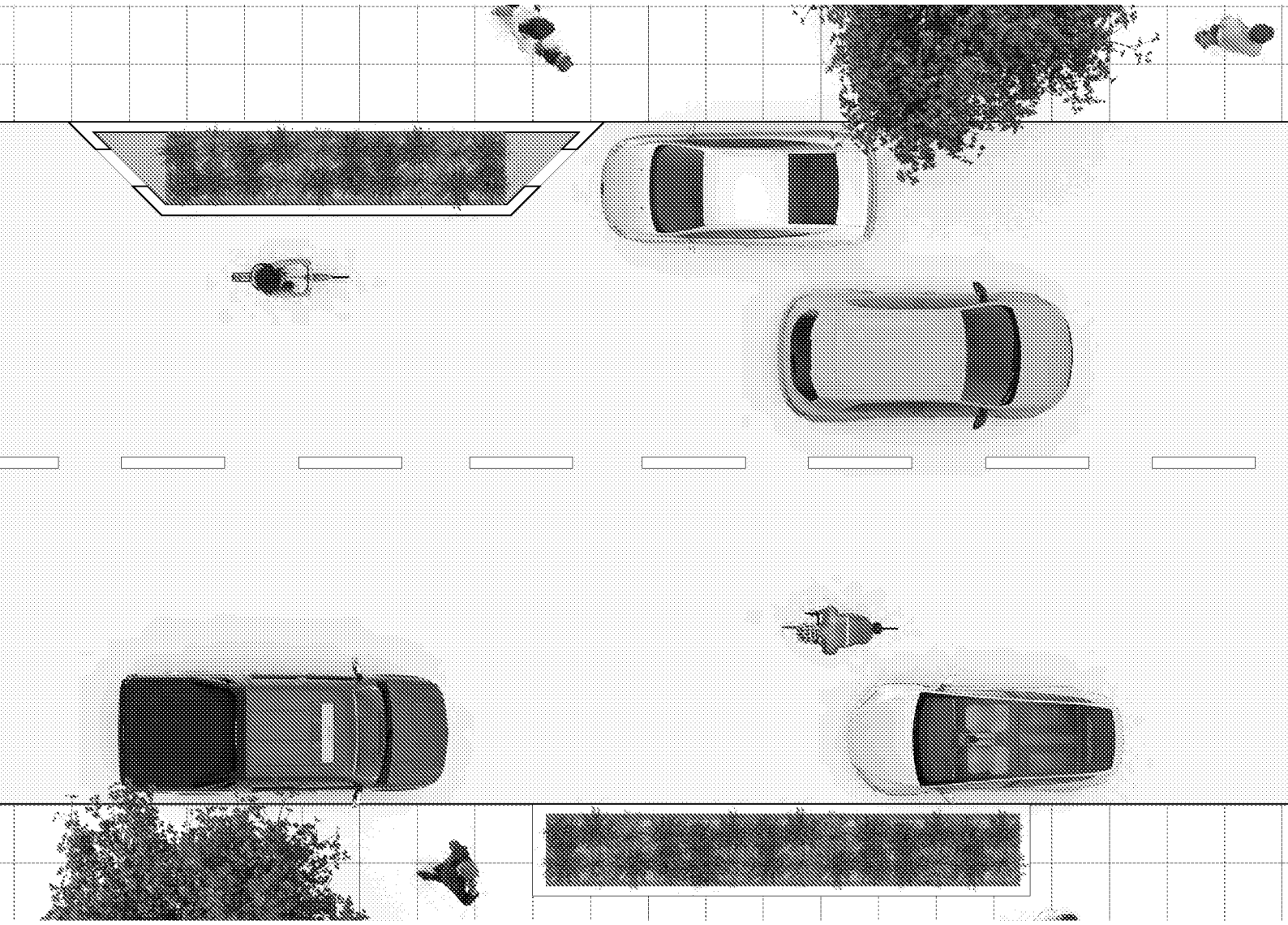
Included in the system:

- Internal pipework
- Geotextile
- Fixing kit
- Joint sealant
- Exceedance overflow drain system

Available to order:

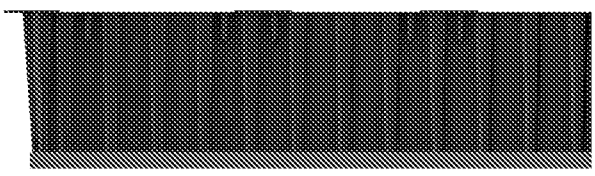
- External pipework
- Growing media
- Drainage media
- 110mm external pipe seal kit
- Concrete weir walls

Typical Scenarios

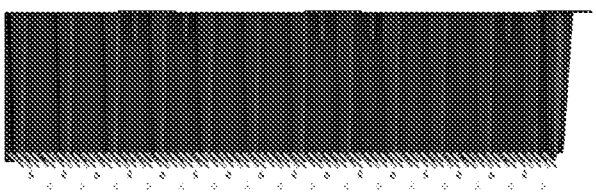


We recommend 1 kerb inlet or opening for every 3-4 HydroPlanter units to maximise the water inflow from the road.

Lined



Infiltration

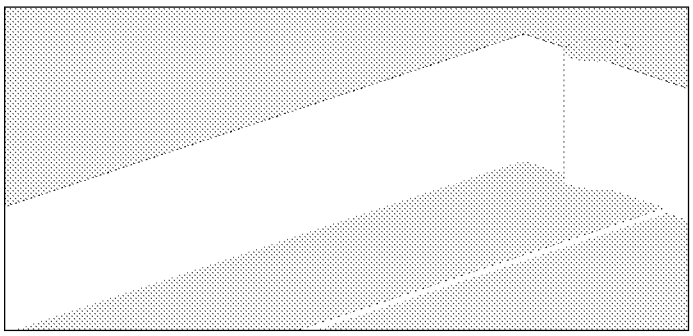


System is fully sealed and completely impermeable as standard - no lining of the excavation is required.
Infiltration functionality is available to order if infiltration is required.

Installation
Overview

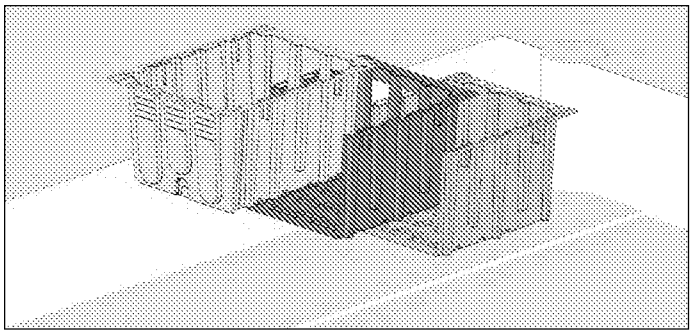
STEP 1

- Dig trench 1700mm wide / 980mm below road surface
- Level 50mm sand blinding layer min 930mm below road level



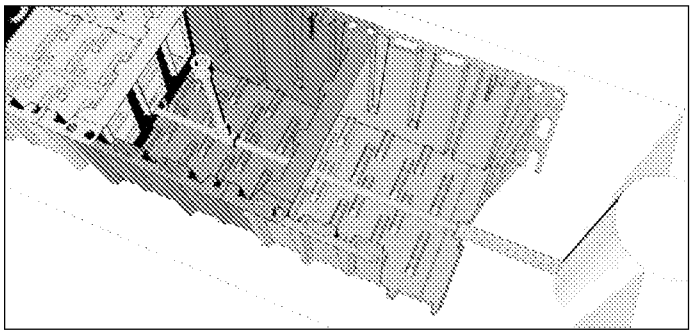
STEP 2

- Check architects drawings for configuration of HydroPlanter Modules
- Starter Module first, then as many Continuation Modules as specified, then End Module



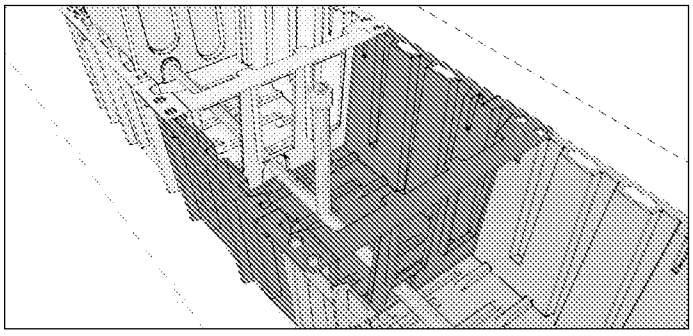
STEP 3

- Connect 110mm outflow pipework to the outlet in the Starter Module
- Install 60mm perforated drainage pipe within HydroPlanter Modules - threading pipe through the 60mm holes in the internal wall
- Install overflow inlet: cut 60mm perforated drainage pipe and fit 60mm Tee-piece, fit vertical riser with RootRain Civic top to the Tee-piece
- (Civic top to be 10mm below road surface level)



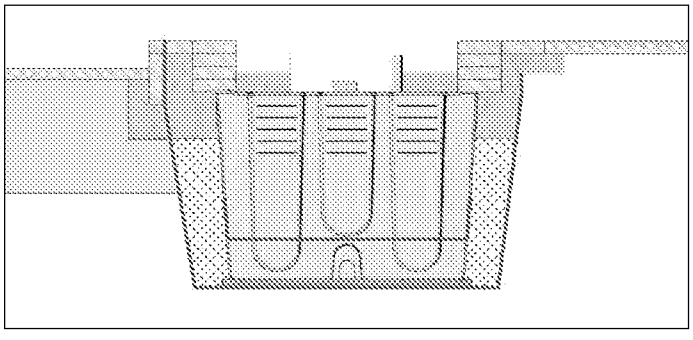
STEP 4

- Apply mastic internally around joints (see red lines on diagram)
- Screw HydroPlanter Modules together at the top flange
- Repeat mastic and screws at every joint



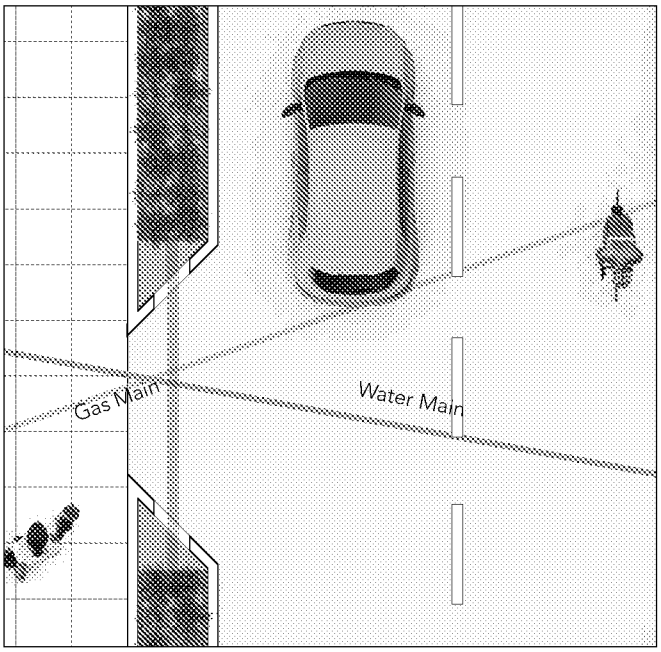
STEP 5

- Install drainage stone 180mm depth
- Lay geotextile over drainage stone – lap 200mm up the side walls
- Fill with soil / Backfill with MOT 1



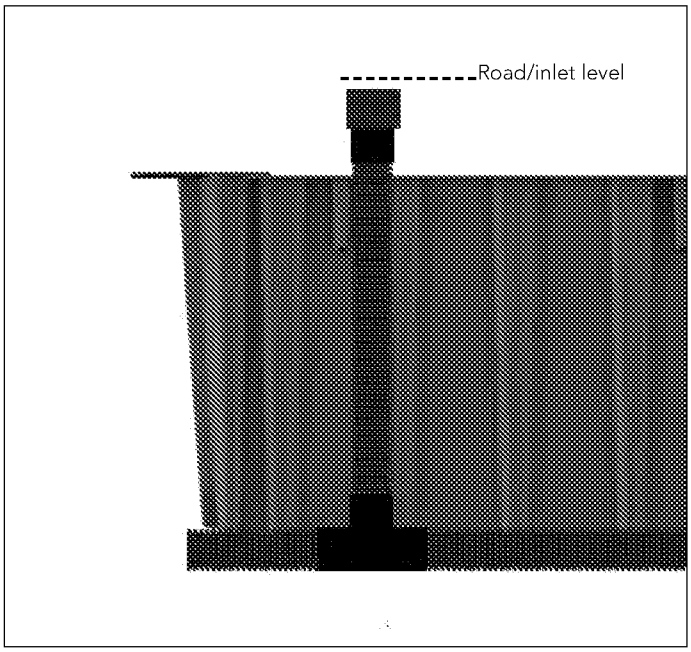
Managing Services

Services and utilities can be worked around by 'bridging' between two units with pipe.



Exceedance Flow Facility

Exceedance flow, where required, can be directed simply to the outflow via a simple, optional overflow pipe



Hydraulic Performance
Design Tables

Catchment area and interception for HydroPlanter schemes can be simply calculated using the UK M5-60 Rainfall map and design tables.

These tables provide the maximum catchment that can drain to a HydroPlanter in order to achieve the required attenuation storage for a given return period. Maximum catchments are provided for 1m2 surface area within the HydroPlanter (a single unit).

If is often beneficial to use the HydroPlanter to provide attenuation storage for low return period events (which allows a greater catchment area to drain to it) and pass forward excess flows to the following parts of the management train via an overflow.

Step 1
M5-60 Rainfall Map

Identify your location on the map, and the correct reference colour

Step 2
Table 1 - Catchment area

Refer to the corresponding line on Table 1 and find the appropriate catchment area for a range of return periods and climate change factors

Step 3
Calculate number of HydroPlanter units required

Divide the scheme catchment area by the catchment area from Table 1 to find the total number of HydroPlanter units required

M5-60 Rainfall Map

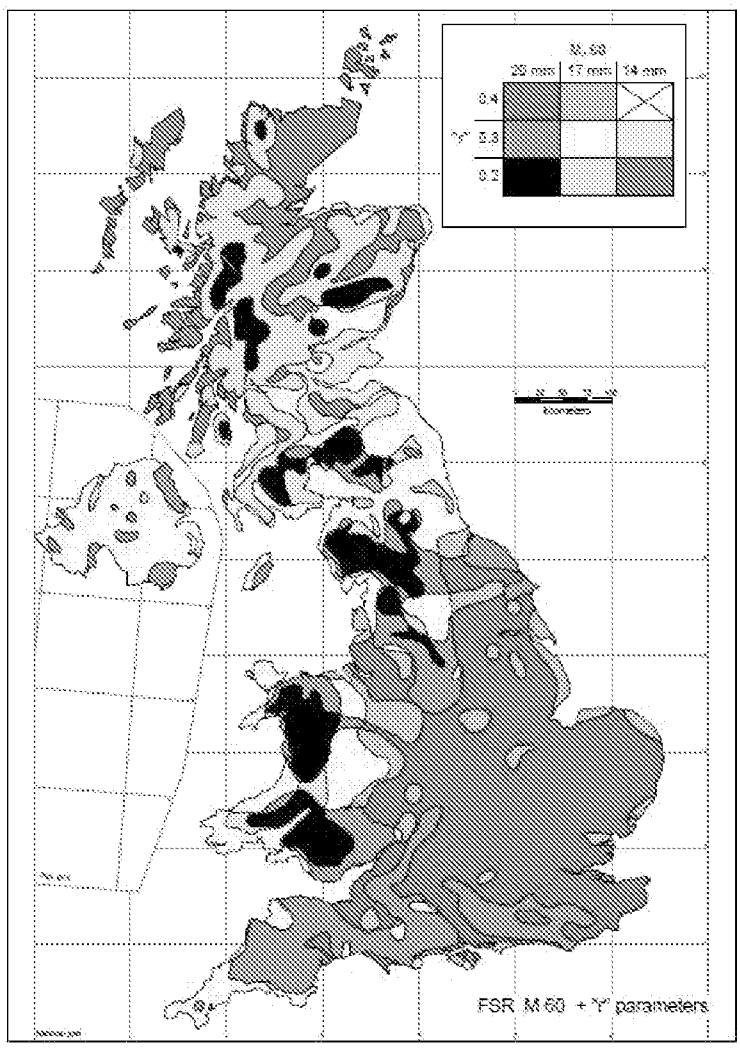


Table 1 - Maximum catchment area (m2) draining to one HydroPlanter unit (1m2)

M5-60	r	Return period (annual probability of occurrence)						
		1 in 1 (100%)	1 in 10 (10%)	1 in 30 (3.3%)	1 in 100 (1%)	1 in 100 + 20% (0.5%)	1 in 100 + 30% (0.25%)	1 in 100 + 40% (0.125%)
20	0.4	27.5	15	12.5	7.5	7.5	5	5
	0.3	25	15	10	7.5	7.5	5	5
	0.2	22.5	12.5	10	7.5	5	5	5
17	0.4	35	17.5	12.5	10	7.5	7.5	7.5
	0.3	32.5	17.5	12.5	10	7.5	7.5	7.5
	0.2	27.5	15	12.5	7.5	7.5	5	5
14	0.4	40	20	17.5	12.5	10	10	7.5
	0.3	40	20	15	12.5	10	7.5	7.5
	0.2	32.5	17.5	15	10	7.5	7.5	7.5

Water Quality Data

The HydroPlanter complies with the CIRIA SuDS Manual specification Table 26.4 'Indicative SuDS mitigation indices for discharges to groundwater' (Refer Bioretention system)

- TSS - 0.8
- Metals - 0.8
- Hydrocarbons - 0.8

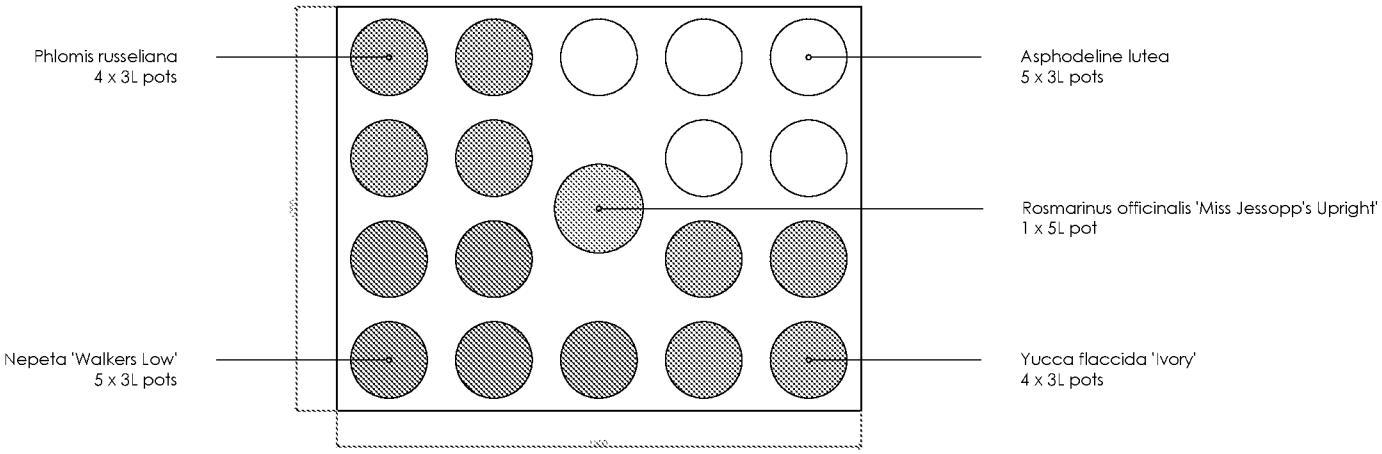
Planting Schemes
Suggested Plants

This is a suggested list of plants which are suitable for raingardens. When building a planting palette, care must be taken to select plants that are drought tolerant, rather than choosing wetland plants, as the average UK raingarden would spend a considerable proportion of its working life in dry conditions. Also bear in mind any localised constraints, challenges or objectives which may impact plant selection, such as project specific pollution risks or restrictions imposed by relevant authorities (such as height limits adjacent to highways). We recommend a knowledgeable horticulturalist is employed to review plant selection. Care must be taken when selecting trees within HydroPlanter schemes, ensure rooting volume is sufficient for selected species – refer to 'Tree Species Soil Volume Guide'.

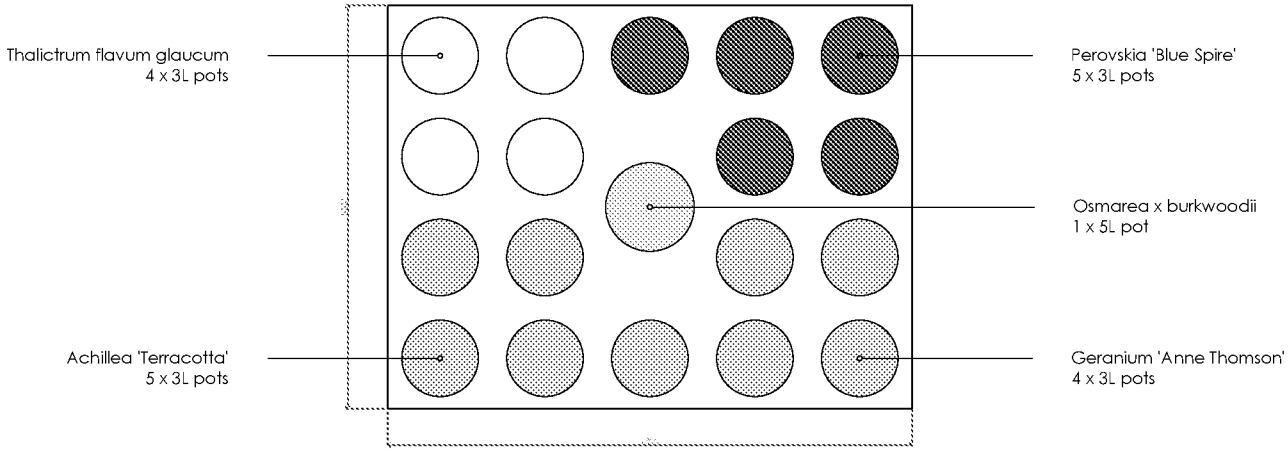
Common Name	Latin Name	Habit	Sunlight and Aspect
Guelder Rose	Viburnum opulus	Perennial shrub	Any
Dogwood	Cornus sanguinea	Perennial shrub	Any
Culvers root	Veronicastrum virginicum	Herbaceous perennial	Full sun or partial shade
Aster	Aster spp	Herbaceous perennial	Full sun or partial shade
Black eyed susan	Rudbeckia hirta	Herbaceous annual or biennial	Full sun or partial shade
Stinking hellebore	Helleborus foetidus	Herbaceous perennial	Full sun or partial shade
Montbretia	Crocosmia spp.	Deciduous rhizomatous perennial	Partial shade
Bugle	Ajuga reptans	Rhizomatous perennial	Partial shade
Columbine	Aquilegia spp.	Herbaceous perennial	Full sun or partial shade
Inula	Inula hookeri	Herbaceous perennial	Partial shade
Hemp agrimony	Eupatorium cannabinum	Herbaceous perennial	Full sun or partial shade
Bellflower	Campanula glomerata	Herbaceous perennial	Full sun or partial shade
Sneezeweed	Helenium sp.	Herbaceous perennial	Full sun
Lesser periwinkle	Vinca minor	Perennial sub-shrub	Any
Elephants ear	Bergenia sp.	Rhizomatous perennial	Full sun or partial shade
Plantain lilies	Hosta spp.	Herbaceous perennial	Partial shade
Yellow flag	Iris pseudocorus	Rhizomatous perennial	Full sun or partial shade
Siberian flag	Iris sibirica	Rhizomatous perennial	Full sun or partial shade
Garlic and onions	Allium spp	Bulbous perennial	Full sun
Soft rush	Juncus effusus	Evergreen perennial	Full sun or partial shade
Pendulous sedge	Carex pendula	Rhizomatous perennial	Full sun or partial shade
Zebra grass	Miscanthis sinensis	Deciduous perennial grass	Full sun
Switch grass	Panicum virgatum	Deciduous perennial grass	Full sun
Royal fern	Osmunda regalis	Deciduous fern	Any
Male fern	Dryopteris felix-mas	Deciduous or evergreen fern	Full sun or partial shade
Broad buckler fern	Dryopteris dilatata	Deciduous or evergreen fern	Full sun or partial shade

Planting Schemes

Scheme 1



Scheme 2



Scheme 1

Species	Pot Size	Number
Phlomis russeliana	3L	4 No.
Nepeta 'Walkers Low'	3L	5 No.
Asphodeline lutea	3L	5 No.
Rosmarinus officinalis 'Miss Jessopp's Upright'	5L	1 No.
Yucca flaccida 'Ivory'	3L	4 No.

Total: 19 No.

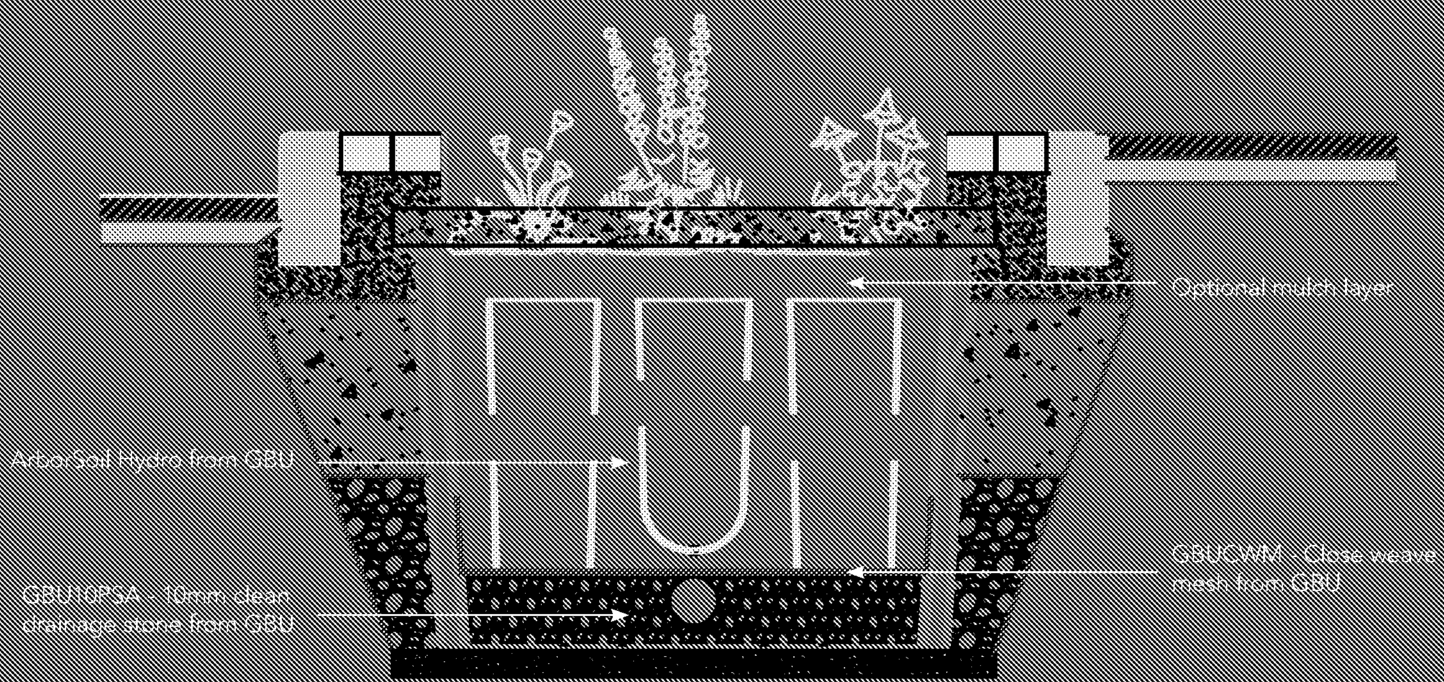
Scheme 2

Species	Pot Size	Number
Thalictrum flavum glaucum	3L	4 No.
Achillea 'Terracotta'	3L	5 No.
Perovskia 'Blue Spire'	3L	5 No.
Osmarea x burkwoodii	5L	1 No.
Geranium 'Anne Thomson'	3L	4 No.

Total: 19 No.

(Note that care must also be taken when selecting trees within the planting pallette, ensure that rooting volume provided is sufficient for the selected species. Please review our publication 'Tree Species Soil Volume Guide')

Internal Build-up



ArborSoil Hydro Parameters	Unit	Typical Test Results
Texture:		
Clay (<0.002mm)	%	9
Silt (0.002 - 0.63mm)		
Very Fine Sand (0.05 - 0.15mm)	%	21
Fine Sand (0.15 - 0.25mm)		
Medium Sand (0.25 - 0.50mm)	%	45
Coarse Sand (0.50 - 1.0mm)	%	25
Very Coarse Sand (1.0 - 2.0mm)		
Stones (2 - 6mm)	%	1.6
Organic Matter (LOI)	% w/w	2.7
Ph (1:2.5 water extract)	units	8.4
Exchangeable Sodium Percentage	%	3.6

Phytotoxic Contaminants:		
Total Zinc	mg/kg	40.2
Total Copper	mg/kg	10.0
Total Nickel	mg/kg	13.1

Available Nutrients:		
Nitrogen	mg/l	0.11
Phosphorus	mg/l	43
Potassium	mg/l	651
Magnesium	mg/l	77
Carbon:Nitrogen Ratio	:1	14.55
Calcium Carbonate	% m/m	1.4

Additional Analysis:		
Electrical Conductivity (1:25 water extract)	µS/cm	808
Electrical Conductivity (1:2 CaSO4 extract)	µS/cm	2908

Additional Criteria:		
Saturated Hydraulic Conductivity	mm/h	90
Total Porosity	%	46.5
Air Filled Porosity	%	21.0
Capillary Porosity	%	25.5
Bulk Density	g/cc	1.42
Particle Density	g/cc	2.66

Hydraulic Modelling Guidance & GreenBlue Stormwater Solutions

Our new Hydraulic Modelling Guidance has been created to provide technical guidance when incorporating GreenBlue Urban SuDS/LID Products into installations within both the MicroDrainage Hydraulic and Causeway Modelling Software.

The Innovyze drainage software, MicroDrainage, is an advanced design that optimises the performance and effectiveness of drainage systems; including SuDS/LID for both greenfield and retrofit. It has been made possible to represent GreenBlue Urban's solutions in several MicroDrainage modules including the following: Network, Source Control and MDSuDS. The Hydraulic Modelling guidance document has been based upon 'MicroDrainage 2019.1' version of the software.

Causeway Flow is a hydraulic modelling package for the design and analysis of optimal, compliant, and cost-effective storm and foul water drainage networks. The solution has been developed by industry experts for organisations looking for a robust, intuitive, and complete solution. Whether standalone (Causeway PDS) or embedded within the AutoDesk environment (Causeway SmartTools), the powerful CAD interface provides a single, all-encompassing solution enabling any flow controls and storage devices in addition to the drainage networks.

GreenBlue offers two products that are designed to incorporate SUDS/LID features into designs. The first being our ArborFlow Tree Pit System that has been developed as an effective and environmentally robust means of managing surface water run-off. Ideal for use in urban areas where space is at a premium, ArborFlow markedly reduces the velocity and flow rate of surface water run-off in urban areas. The second HydroPlanter the 'plug and play' sustainable urban drainage solution (SuDS/LID) that can attenuate and cleanse stormwater and provide amenity and biodiversity to new and existing spaces. The modules will be filled with a particular soil specification and planted wildflowers and biodiverse grasses. The modular characteristics with pre-calculated hydrological performance statistics mean that specification and design are very simple for any given catchment area.

Each document illustrates these products can be integrated into bespoke schemes, through tree pit Modelling methodologies as well as technical data and dimensions. The data is portrayed through a variety of CAD/BIM drawings to allow the reader to easily identify structural layouts and visualise the product in situ.

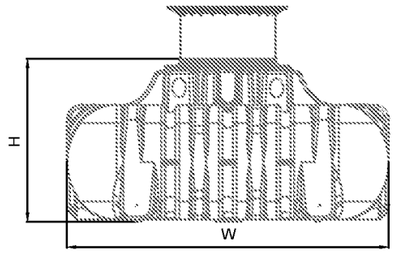
Each product has been sectioned out methodically to segment into components from aggregates and their outflow rate.

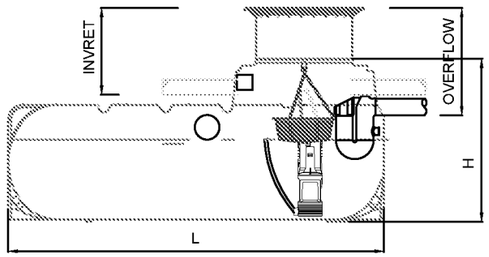
Also covered are different porosity rates in the drainage layer, inflow, interception losses, and storage rates alongside GreenBlue Urban's RootSpace and the modelling interception storage as an attenuation system.

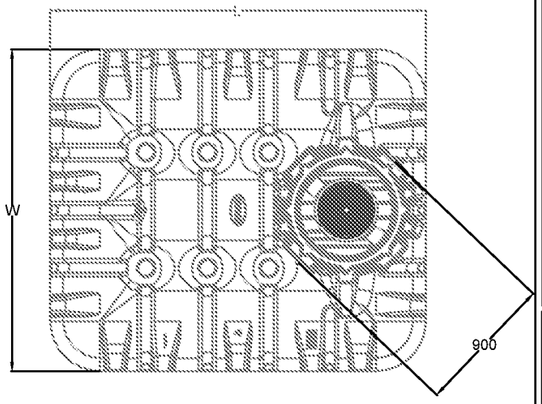
Follow the documents through step-by-step visual guides on how to use the software to meet the discharge rates set by regulatory authorities.

Appendix 5: Standard Details for GRAF Rainwater Harvesting Tank

TANK SIZES & DIMENSIONS



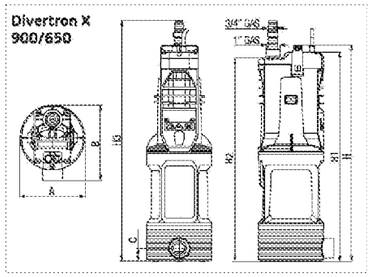


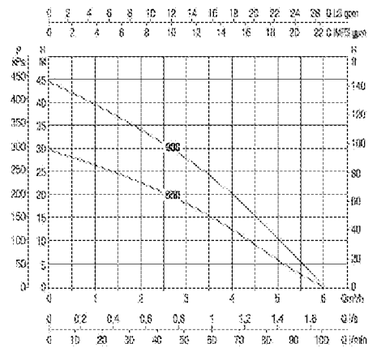


	1,500L	3,000L	5,000L	7,500L
LENGTH	2,100mm	2,450mm	2,890mm	3,600mm
WIDTH	1,250mm	2,100mm	2,300mm	2,250mm
HEIGHT	1,015mm	1,050mm	1,265mm	1,565mm
INVERT	375-575mm	375-575mm	375-575mm	375-575mm
OVERFLOW	455-655mm	455-655mm	455-655mm	455-655mm

SUBMERSIBLE PUMP DETAILS

DAB DIVERTRON 900X





The performance curves are based on kinetic viscosity veules = 1 mm²/s and density equivelent to 1000 kg/m³. Curve tolerance according to ISO 9906.

SYSTEM ACCESSORIES

HOSE CONNECTION BOX - EXTERNAL (STANDARD SUPPLY)

HOSE CONNECTION BOX - INTERNAL (STANDARD SUPPLY)

SPRING WATER SHAFT (OPTIONAL EXTRA)

INTERNAL CLEANING UNIT (OPTIONAL EXTRA)

DIGITAL FILL LEVEL SENSOR (OPTIONAL EXTRA)

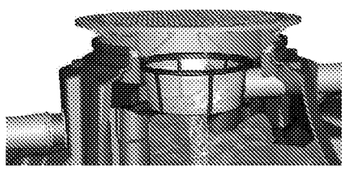
TANK ACCESSORIES

Item	Diameter ø	Min. Height (mm)	Max. Height (mm)	Max. Loading (kg)*
Pedestrian Loading Lid (Mini)	ø 600mm	60mm	360mm	150kg
Pedestrian Loading Lid (Maxi)	ø 600mm	60mm	476mm	150kg
Vehicle Loading Lid	ø 625mm	60mm	476mm	3,500kg
Extension Sleeve (1m)	ø 670mm	500mm	1,000mm	
Extension Sleeve	ø 680mm	250mm		
Tank Dome (Maxi)	ø 650mm	610mm		

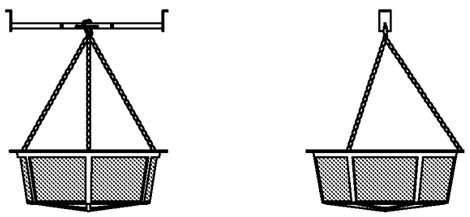
* Loading up to 12,000kg achievable (suitable cover to be provided by others)

** Tank Dome (Maxi) available with DN100 or DN150 connections

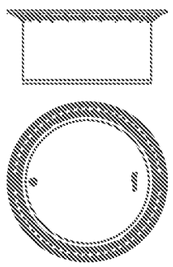
FILTER DETAILS



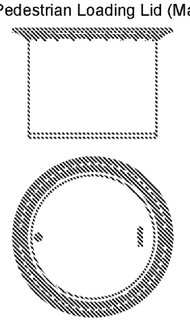
BASKET FILTER (INTERNAL)



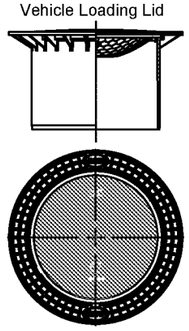
Pedestrian Loading Lid (Mini)



Pedestrian Loading Lid (Maxi)

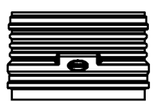


Vehicle Loading Lid

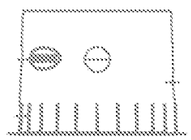


Extension Sleeve (1m)

Extension Sleeve



Tank Dome (Maxi)



NOTE:- Tank accessory suitability may vary depending on project. Please contact Graf UK for sizing and support.

DO NOT SCALE - IF IN DOUBT ASK

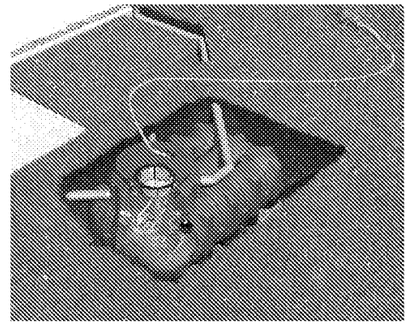
Notice: This drawing is issued only as a guideline and is an estimate of the materials required to construct the drainage system, it should not be used for construction purposes.

Graf UK Ltd makes no warranty or guarantee in relation to the suitability of any of the layout details shown on this drawing in relation to a particular scheme.

NOTES:-

1. All dimensions in mm, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing tolerances.
3. All site temporary enabling works by others.
4. Graf products to be installed in strict accordance with Graf recommendations.
5. This drawing is intended for guidance only. Confirmation of the suitability for a particular project should be sought from the consulting engineers prior to final design or commencement of any construction works.

GARDEN COMFORT PLATIN SPECIFICATION



REV.	DESCRIPTION	BY	DATE
P0	LATEST REVISION	KS	16.04.24

GRAF UK Limited
GRAF UK Limited. Regen House, Beaumont Road, Banbury, Oxfordshire. OX16 1RH
T: 01608 661500 F: 01295 211333
E: info@grafuk.co.uk www.grafuk.co.uk

DRAWN : KS DATE : 16.04.2024
CHECKED : DS SCALE : VARIOUS@A3

PROJECT
GRAF STANDARD DETAILS

DESCRIPTION
GARDEN COMFORT
RAINWATER HARVESTING SYSTEM
PLATIN TANK

DRAWING No. GARDEN COMFORT_STANDARD DETAIL_PLATIN
REV. P0

ARUN DISTRICT COUNCIL BN/167/24/HH

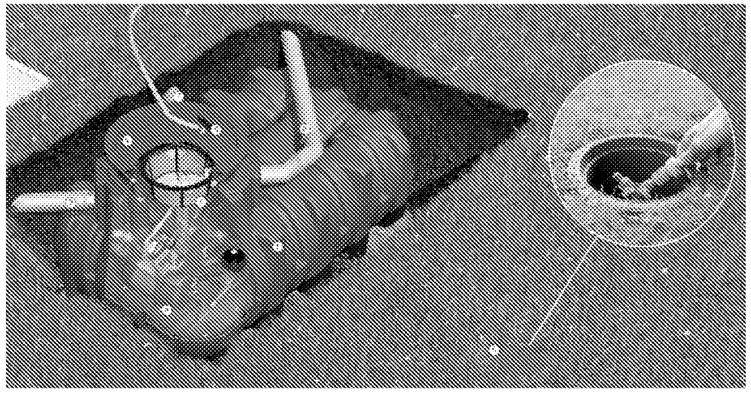
SCOPE OF SUPPLY

SUPPLIED BY GRAF:

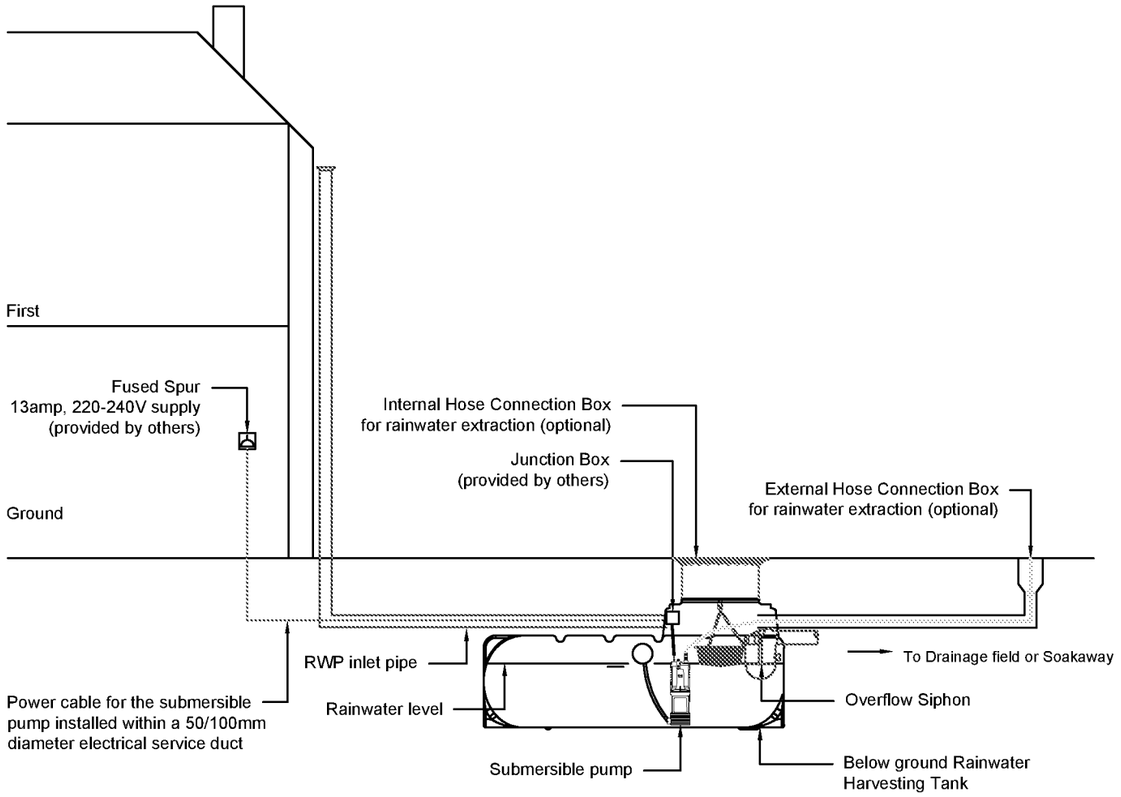
1. Underground tank
2. Telescopic lid
3. Filter
4. Submersible pump
5. Internal hose connection box
6. External hose connection box

SUPPLIED BY OTHERS:

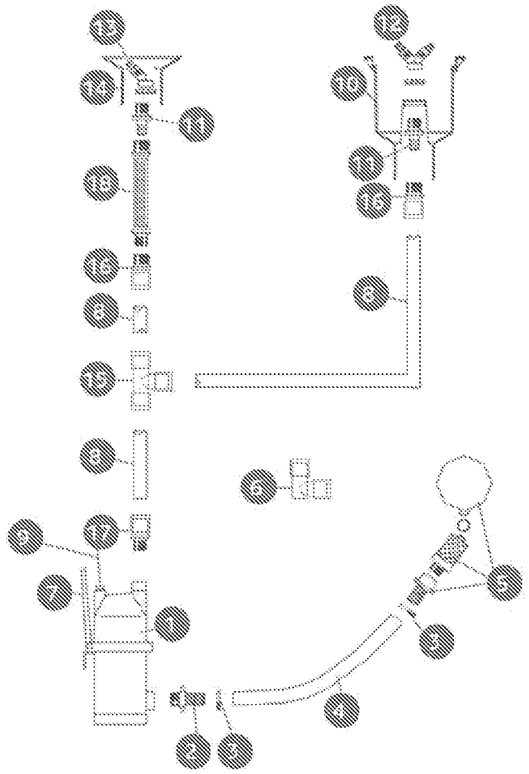
7. 100mm duct for pump cable
8. 100mm drainage pipe to connect downpipes to inlet (all downpipes to be brought into one single inlet)
9. 100mm pipe for overflow from tank



GARDEN COMFORT PLATIN SCHEMATIC



INTERNAL/EXTERNAL HOSE CONNECTION BOXES



1. Submersible pump
2. Brass hose screwing
3. Hose clip
4. Suction hose
5. Floating suction set
6. 25mm compression elbow (optional fitting used for external tap connection)
7. Fixing set for submersible pump
8. Pressure hose, black & green colour, length 25m
9. Electricity supply, length 10m, 3-core cable
10. External hose connection box
11. 3 / 4 " tank connector
12. 2-way regulating plug
13. Hose-lock connector
14. Internal hose connection box, located on manhole cover of rainwater tank
15. 25mm compression T-fitting
16. 25mm compression x 3 / 4 " female threaded fitting
17. 25mm compression x 1 " male threaded fitting
18. 1m length of braided hose, 3 / 4 " male x 3 / 4 " female connections

NOTE:- Tank accessory suitability may vary depending on project. Please contact Graf UK for sizing and support.

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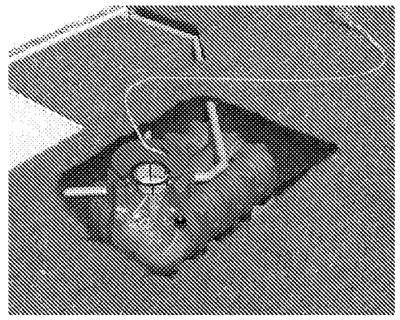
GARDEN COMFORT
PLATIN
SCHEMATIC



REV.	DESCRIPTION	BY	DATE
P0	LATEST REVISION	FC	16.04.24

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DRAWN : KS DATE : 16.04.2024
CHECKED : DS SCALE : VARIOUS@A3

PROJECT
GRAF STANDARD DETAILS

DESCRIPTION
GARDEN COMFORT
RAINWATER HARVESTING SYSTEM
PLATIN TANK

DRAWING No. GARDEN COMFORT_STANDARD DETAIL_PLATIN
REV. P0

TRENCH DETAILS

FOR SUFFICIENT WORKING ROOM, THE BASE AREA OF THE TRENCH MUST EXCEED THE DIMENSIONS OF THE TANK BY 100mm ON ALL SIDES.

MINIMUM DISTANCE FROM SOLID STRUCTURES TO BE 1000mm.

THE TRENCH EMBANKMENT MUST BE DESIGNED SO SLIPPAGE OR COLLAPSE OF THE EMBANKMENT WALL IS NOT TO BE ANTICIPATED.

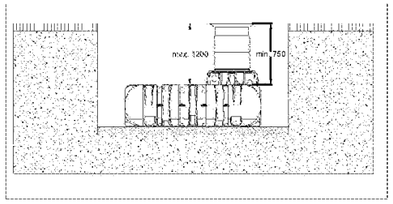
THE CONSTRUCTION SITE MUST BE HORIZONTAL AND PLANE AND MUST GUARANTEE SUFFICIENT LOAD-BEARING CAPACITY.

THE DEPTH OF THE TRENCH MUST BE DIMENSIONED SO THAT THE MAXIMUM COVER ABOVE THE TANK IS NOT EXCEEDED (SEE BELOW DETAILS).

THE TANK AND ANY OTHER COMPONENTS THAT CARRY WATER MUST BE INSTALLED IN A FROST-FREE AREA. THE FROST-FREE DEPTH IS USUALLY APPROX. 600mm-800mm. EXACT DEPTHS CAN BE OBTAINED FROM THE RESPONSIBLY AUTHORITY.

A 100mm-150mm COMPACTED LAYER OF 10-20mm ROUND GRAIN GRAVEL IS INSTALLED AT THE BASE OF THE EXCAVATION.

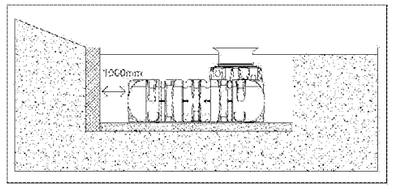
MINIMUM & MAXIMUM COVER



MINIMUM COVER IN A LANDSCAPED AREA TO BE 455mm FROM SHOULDER OF TANK.

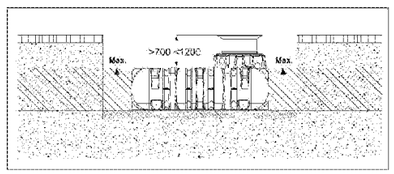
MAXIMUM COVER IN A LANDSCAPED AREA TO BE 1200mm FROM SHOULDER OF TANK.

SLOPE/EMBANKMENT INSTALLATIONS



IF THE TANK IS TO BE INSTALLED IN THE IMMEDIATE VICINITY (<5m) OF A SLOPE OR EMBANKMENT, A STATICALLY CALCULATED RETAINING WALL MUST BE ERECTED TO ABSORB ANY ADDITIONAL LOADING FROM THE SOIL. THE WALL MUST EXCEED THE DIMENSIONS OF THE TANK BY AT LEAST 500mm IN ALL DIRECTIONS AND MUST BE LOCATED AT LEAST 1000mm AWAY FROM THE TANK.

GROUNDWATER INSTALLATIONS



IF IT IS ANTICIPATED THAT THE TANK WILL BE IMMERSED IN GROUNDWATER DEEPER THAN SHOWN IN THE BELOW TABLE, SUFFICIENT DISSIPATION MUST BE ENSURED. DISSIPATION OF THE DRAINAGE WATER (E.G. VIA AN ANNULAR DRAINAGE SYSTEM) IS RECOMMENDED IN CASES OF COHESIVE, WATER-IMPERMEABLE SOIL.

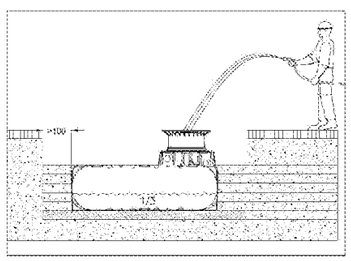
TANK SIZE	1,500L	3,000L	5,000L	7,500L
IMMERSION DEPTH	700mm	735mm	1,000mm	1,250mm

MINIMUM COVER TO BE 700mm FROM SHOULDER OF TANK IN AREAS WITH GROUNDWATER.

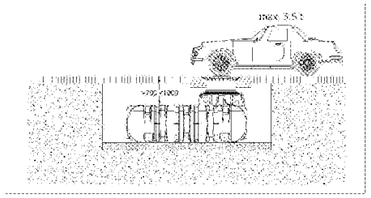
MAXIMUM COVER TO BE 1,200mm FROM SHOULDER OF TANK IN AREAS WITH GROUNDWATER.

INSERTION & FILLING

THE TANK MUST BE INSERTED, IMPACT-FREE, INTO THE PREPARED TRENCH USING SUITABLE EQUIPMENT.
THE TANK IS FILLED WITH ½ WATER BEFORE BACKFILLING.
THE 10-20mm ROUND GRAIN GRAVEL IS BACKFILLED IN LAYERS OF MAX. 300mm STEPS AND IS TO BE WELL COMPACTED WITH A MANUAL TAMPER.
MECHANICAL COMPACTION MACHINES ARE NOT TO BE USED UNDER ANY CIRCUMSTANCES.
SURROUND MUST BE AT LEAST 100mm ON ALL SIDES OF THE TANK.



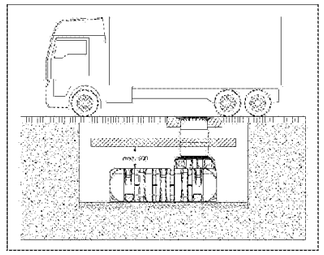
VEHICLE LOADING CONDITIONS



FOR LOADINGS OF UP TO 3,500KG IN TRAFFICKED AREAS WITH NO GROUNDWATER, THERE MUST BE;

MINIMUM COVER OF 700mm FROM THE SHOULDER OF THE TANK, AND

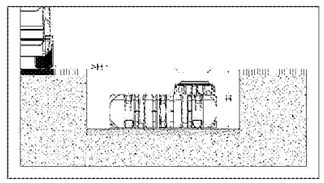
MAXIMUM COVER OF 1,000mm FROM THE SHOULDER OF THE TANK.



FOR LOADINGS OF MORE THAN 3,500KG AND UP TO HGV LOADING IN AREAS OF NO GROUNDWATER, THERE MUST BE;

A SELF-SUPPORTING IRON-REINFORCED CONCRETE PLATE, THAT WILL ENSURE THAT NO ADDITIONAL FORCES OR EFFECTS FROM THE HGV-BEARING WILL TRANSFER TO THE TANK/S.

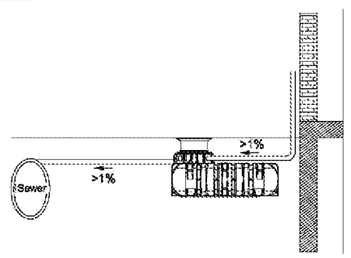
THE MAXIMUM DISTANCE FROM THE BODY OF THE TANK TO THE REINFORCING PLATE IS 500mm.



FOR INSTALLATIONS ADJACENT TO SURFACES USED BY VEHICLES OF OVER 3,500KG, THE TANK MUST BE INSTALLED AT A DISTANCE FROM THE ROAD SURFACE THAT IT AT LEAST THE DEPTH OF THE TRENCH.

PIPE CONNECTIONS

ALL PIPE CONNECTIONS MUST BE INSTALLED WITH A FALL OF AT LEAST 1% IN THE DIRECTION OF FLOW (POSSIBLE, SUBSEQUENT SETTLING MUST BE TAKEN INTO ACCOUNT).
IF THE TANK OVERFLOW IS CONNECTED TO A PUBLIC SEWER, THIS MUST BE PROTECTED AGAINST REFLUX BY MEANS OF A LIFTING STATION OR REFLUX SEAL IN ACCORDANCE WITH DIN 1986.
ALL SUCTION, PRESSURE & CONTROL LINES MUST BE INSTALLED IN AN EMPTY PIPE / DUCT AND AS STRAIGHT AS POSSIBLE.
ANY NECESSARY BENDS MUST BE FORMED IN 30 DEGREE MOULDED SECTIONS.
IMPORTANT: THE EMPTY PIPE / DUCT MUST BE CONNECTED TO AN APERTURE **ABOVE** THE MAX. WATER LEVEL.



PLEASE REFER TO TANK INSTALLATION GUIDE FOR DETAILS ON; SAFETY, PRODUCT FEATURES, IDENTIFICATION OBLIGATIONS, TECHNICAL DATA, TANK STRUCTURE, TANK ASSEMBLY & SERVICING AND INSPECTION.

DO NOT SCALE - IF IN DOUBT ASK

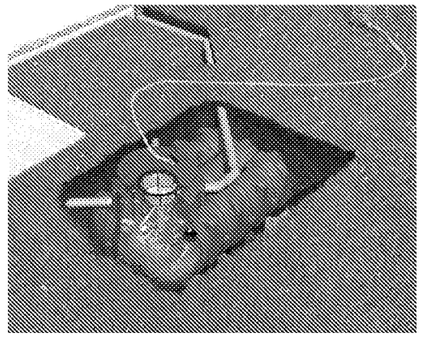
Notice: This drawing is issued only as a guideline and is an estimate of the materials required to construct the drainage system, it should not be used for construction purposes.

Graf UK Ltd makes no warranty or guarantee in relation to the suitability of any of the layout details shown on this drawing in relation to a particular scheme.

NOTES:-

1. All dimensions in mm, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing tolerances.
3. All site temporary enabling works by others.
4. Graf products to be installed in strict accordance with Graf recommendations.
5. This drawing is intended for guidance only. Confirmation of the suitability for a particular project should be sought from the consulting engineers prior to final design or commencement of any construction works.

GARDEN COMFORT PLATIN TANK INSTALLATION



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GARDEN COMFORT
RAINWATER HARVESTING SYSTEM
PLATIN TANK

DRAWING No. GARDEN_COMFORT_STANDARD_DETAIL_PLATIN
REV. P0

ARUN DISTRICT COUNCIL BN/167/24/HH