



Sustainable Drainage Strategy

Higher Ash Farm Barn

Hawkshaw lane

Bury

BL8 4LB

16.03.18

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1 SUMMARY

The following proposal outlines the foul and storm water management system proposed for a new barn conversion development at Higher Ash Farm, Farm, Hawkshaw Lane, Hawkshaw, Bury, BL8 4LB. The site falls from North to South with shared access from Hawkshaw lane.

Foul Water Drainage

The performance objectives are to collect, convey and discharge all foul effluents from within the confines of the new development to the existing field drainage system located within the adjacent field to the South of the site (refer to section 4).

Surface Water Drainage

The performance objectives are to collect, treat, attenuate and convey all stormwater prior to discharge into the existing field drainage system located within the adjacent field to the South of the site (refer to section 4).

A 1 in100 year storm event plus 40% for climate change has been considered for the stormflow calculations. The rainwater from the part of the proposed new building roof area will be collected and conveyed via a below ground drainage pipework system to a suitably sized geocellular attenuation tank. Surface water from the remaining roof areas and proposed driveway will be attenuated within a porous sub base prior to discharge.

2 BACKGROUND

2.1 General

The site currently comprises of an agricultural barn with the existing farm house to the north of the site. It is proposed to redevelop the barn into a two storey residential property.



2.2 Sustainable Drainage Systems (SuDS)

The use of sustainable drainage systems to reduce the impact of development on the natural water environment has become increasingly common over the past decade, in response to government guidance and the proactive approach of regulatory agencies such as the Environment Agency (EA) and the National Planning Policy Framework. Limited discharge consents for surface water outfalls are now routinely applied to development sites across the UK and the rate of water leaving development sites is controlled by a number of SuDS techniques.

3 DRAINAGE PROPOSALS

3.1 Design Parameters

Accordingly, EPG has reviewed the information provided and considered an approach based on previous experience of similar sites and current SuDS guidance provided in:

- National Planning Policy Framework (NPPF 25)
- Bury Rochdale and Oldham Strategic Flood Risk Assessment Volume 1, 11 & III – Level 2 SFRA November 2009
- CIRIA report C753 (2016); The SUDS manual
- CIRIA report C680 (2008); Structural design of modular geocellular drainage tanks
- CIRIA Report C724 (2013) Creating water sensitive places–scoping the potential for water sensitive urban design in the UK
- BS 8582:2013, Code of practice for surface water management for development sites
- BS EN 12056–2:2000: Gravity drainage systems inside buildings– Part 2: Sanitary pipework, layout and calculation
- BS EN 12056–3:2000: Gravity drainage systems inside buildings– Part 3: Roof drainage, layout and design

Foul water

The foul water drainage system will pick up the above ground drainage connections at various locations at ground level and convey the discharge to a new septic tank.

The design of the above ground foul drainage systems shall meet the Environmental Agency binding rules guidance.

5 Bedroom house = minimum 6 person system

$6p \times 150 \text{ (litres/p/day)} + 2000 = 2900 \text{ litres minimum storage capacity tank.}$

The proposed septic tank will be installed with the site boundary in line with the existing foul water discharge pipework system. The discharge will outfall into the existing field drainage infiltration system located to the south of the new development.

Surface water

The NPPF requires that surface water arising from a developed site should as far as practicable be managed in a sustainable manner to mimic the surface water flows arising

from the site prior to re-development. Opportunities to reduce the surface water run-off and the associated flood risk should be identified and climate change should be taken into account. Building Regulations

(Part H), NPPF and Environment Agency advice notes require the consideration of sustainable drainage techniques for new developments. Surface water drainage should be considered in accordance with a prescribed hierarchy aimed at minimizing the impact of the development.

Surface water flows should be designed to discharge to:

1. Infiltration based systems e.g. soakaways / porous pavements etc.
2. Watercourses
3. Surface water sewers
4. Combined water sewers

Discharge via infiltration

Where possible, infiltration should be incorporated into the final design of the drainage. Infiltration should be the first consideration for drainage outfall.

The SuDS system is designed to store below ground a 100yr return period storm event plus an additional 40% for climate change.

Catchment areas:

New roof catchment	0.0196 ha
New driveway	0.0166 ha (approx.)

Runoff coefficient roofs:	95%
Runoff coefficients car park	90%

4 OVERVIEW OF DRAINAGE PROPOSALS

4.1 Outline Design

The rainwater runoff from the rear of the building will free discharge to be collected at ground level into a new Polystorm geocellular attenuation tank, as manufactured by Polypipe Civils, via back inlet filter gullies. The tank will be wrapped in an impermeable geomembrane and geotextile protection layer and will incorporate a row of inspection units.

The stormwater is retained in the geocellular tank until it can flow through the flow control inspection chamber to discharge into the existing field drainage system to the south of the site.

The rainwater runoff from the front of the building will free discharge into the new driveway porous sub-base via back inlet filter gullies and permavoid diffusers. The new

driveway will incorporate a permeable finish allowing rainwater to permeate into a porous sub base via a Permafilter treatment geotextile. The dimpled geotextile comprising of a proprietary blend of polyester fibres incorporates hydrophilic and hydrophobic properties to achieve effective oil retention. Trapped hydrocarbons are biodegraded by naturally occurring microorganisms providing a self-cleansing mechanism. Access to the new building will be protected via a linear drainage channel discharging into the driveway porous sub base.

The attenuated rainwater will discharge into the site stormwater drainage pipework system via flow control inspection chamber.

The collective discharge is restricted to 2l/s

All other paved areas around the new building will incorporate a permeable surface to allow infiltration into the surrounding ground.

The foul water drainage system will pick up the above ground drainage connections at various locations at ground level and discharge to the drainage pipework system via a system of below slab drainage access chambers.

The location of all access chambers shall be coordinated with the architectural layouts to ensure they provide sufficient access for maintenance and are aesthetically acceptable.

Please refer to:

EPG general layout drawing 8824-EPG-ZZ-XX-DR-D-0001(-)

4.2 SuDS Components

4.2.1 Catchpit Inspection Chambers

Catchpit inspection chambers are a traditional SuDS device that reduces the velocity of the flow of stormwater flowing through the chamber to allow the settling of detritus and silts in the pit at the bottom of the inspection chamber.

4.2.2 Modular Plastic Geocellular Units (Polystorm)

Polystorm (PSM1a) is a 1000 x 500 x 400mm deep modular interlocking plastic geocellular unit system designed for use as a subterranean drainage storage component and has a high compressive strength (610kN/m²) and a high void ratio (95%) to achieve highly efficient water storage capacity.

Polystorm inspect is a 1000 x 500 x 400mm deep modular interlocking plastic geocellular unit incorporating a tunnel along the length of a fully installed Polystorm structure to

enable access for inspection and maintenance. It has a high compressive strength (440kN/m²) and a high void ratio (94%) to achieve highly efficient water storage capacity.

4.2.3 Permatex 300 SuDS Geotextile

The Permatex 300 SuDS geotextile is a heavy duty, non-woven, needle punched polypropylene geotextile designed to protect and separate sub base layers. It comprises a three-layer composite scrim reinforced with low elongation. The geotextile should be laid continuously around the Polystorm Attenuation tank, 300mm joint lapping is recommended.

4.2.4 Permavoid Geomembrane

An impermeable robust and heavy duty liner that is resistant to puncture used to form water tight sustainable drainage systems. Jointing shall be formed using fusion or extrusion bead welding in accordance with manufacturing recommendations.

4.2.5 Orifice Flow Control Chamber and Protection Filter

A flow control is provided within the system to ensure that water is held back and temporarily stored in the SuDS. The orifice is sized to give a proportion of the discharge rate appropriate to the drained area (sub-catchment) and the available storage volume. Orifice plates are used as they are simple flow control devices that restrict the flow of surface water through a conveyance system by narrowing the area the water can flow through at the entry to pipe-work. They are particularly appropriate in shallow drainage systems where the effect of large differences in hydraulic head on flow rate is negligible. For pre-screened surface water systems such as this one, orifice plates of diameters less than 100mm require a protection filter to protect the orifice from debris/ detritus that may make its way into the system. Permafilter flow controls incorporate removable protection filters on the upstream side of the orifice plates, to prevent clogging of the orifice.

4.2.6 Permeable Sub-base

Permeable Sub-base layers have an extensive track record as an effective sustainable drainage component providing filtration and treatment of daily effluent loadings associated with car park run-off. The granular sub-base tanks would be, surrounded by the Permafilter SuDS treatment geotextile or can be surrounded by an impermeable membrane to prevent infiltration into the sub-soils.

4.2.7 Oil separation, retention and infiltration via specialized geotextile

The Permafilter SuDS geotextile is to be wrapped around the base and sides of the Permavoid/Pervious Sub-Base where the storm water is discharging via direct infiltration. It comprises a non-woven, dimpled, needle punched geotextile that has been specifically

designed for hydrocarbon pollution treatment in civil engineering applications (such as filtration, drainage and pavement reinforcement). The dimpled geotextile comprises a proprietary blend of polyester fibres that incorporate hydrophilic (water attracting / oil repellent) and hydrophobic (oil attracting / water repellent) properties to achieve oil retention to the upper surface. The Permafilter geotextile is capable of retaining oil contamination ranging from daily car drip losses up to catastrophic spillages e.g. originating from car oil-sump failures. The entrapped hydrocarbons are biodegraded by naturally occurring micro-organisms providing a self-cleansing and maintenance free mechanism.

5 MAINTENANCE

We would recommend that Pre-handover inspections and cleaning of all, rainwater inlet, flow control and overflow chambers is carried out.

Routine Inspection

Routine inspection should include:

- Monthly inspections of linear drainage, back inlet filtration gullies, flow control chamber and inspection manholes
- Yearly inspection of attenuation tank

Routine maintenance

The following routine maintenance procedures are recommended:

- Remove silt from linear channel, back inlet filtration gullies, all manholes, catchpit and flow control chambers as required.
- Records of inspections and maintenance undertaken should be kept by the client.

6 CALCULATIONS

StormFlow Stormwater Management Software

Project: Higher Ash Farm Barn
Client: Acland Bracewell
Location: Bury

Catchment Details:

Buildings	92	m ² x 95 %
Dense surfacing	166	m ² x 90 %
Effective Area	236.8	m ²

Storage Details:

Length	12.5 m
Bed Slope	Horizontal
Width	12.5 m
Crossfall	None
Depth	0.25 m
Porosity	30 %
Slope Efficiency	100 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.4
M5-60	19 mm

Summer Storm Profile

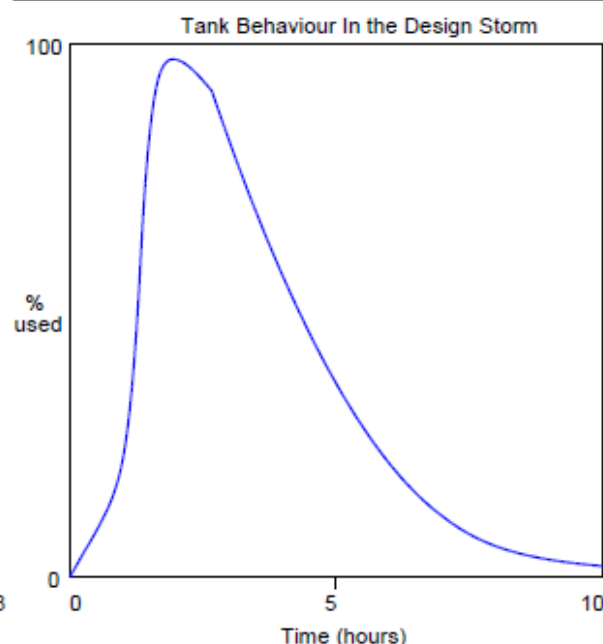
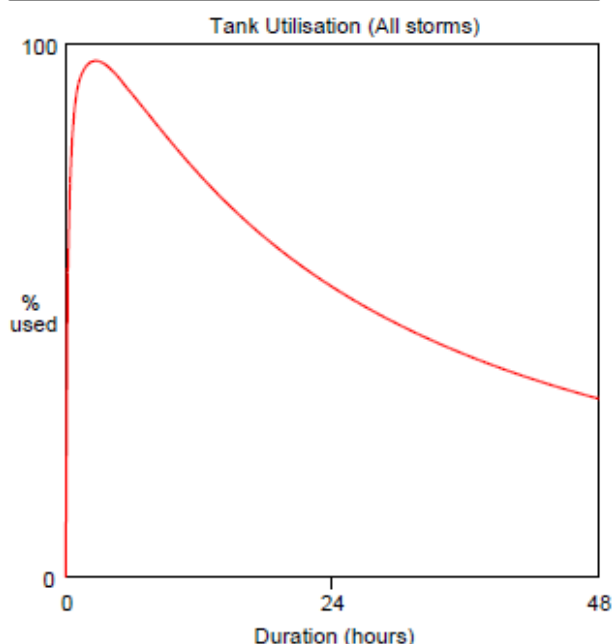
Duration	Intensity mm	mm/h	Required storage(m ³)
30 min	42.9	85.8	9.227
45 min	49.2	65.6	10.150
60 min	53.8	53.8	10.655
2 hours	65.2	32.6	11.274
6 hours	83.7	14.0	10.617
24 hours	111.4	4.6	6.383

Outflow Details:

Design Flow	1 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	31 mm

Results:

Outcome	Pass
Critical Storm Duration	2.7 hrs
Critical Rainfall Rate	26 mm/h
Hmax	0.242 m
Time to half empty	1.6 hrs
Volume Required	11.344 m ³



Project: Higher Ash Farm Barn

Client: Acland Bracewell

Location: Bury

Catchment Details:

Buildings	103	m ² x 95 %
Dense surfacing		m ² x 90 %
Effective Area	97.85	m ²

Storage Details:

Length	4 m
Bed Slope	Horizontal
Width	2.5 m
Crossfall	None
Depth	0.4 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FSR Method:

Return Period 100 years

Climate Change Factor 40 %

r value 0.4

M5-60 19 mm

Summer Storm Profile

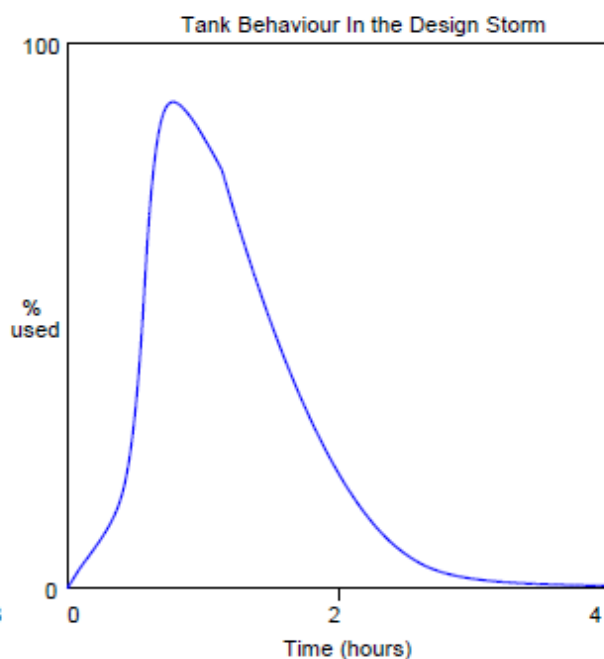
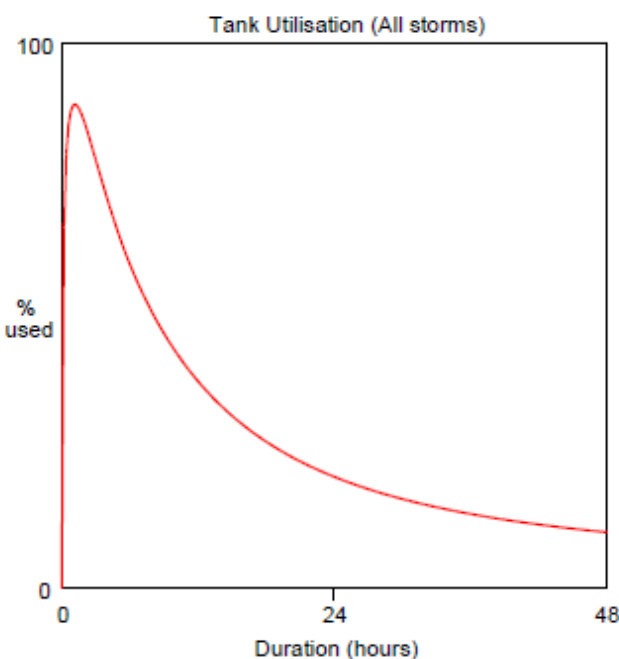
Duration	Intensity mm	mm/h	Required storage(m ³)
30 min	42.9	85.8	3.147
45 min	49.2	65.6	3.307
60 min	53.8	53.8	3.367
2 hours	65.2	32.6	3.251
6 hours	83.7	14.0	2.260
24 hours	111.4	4.6	0.776

Outflow Details:

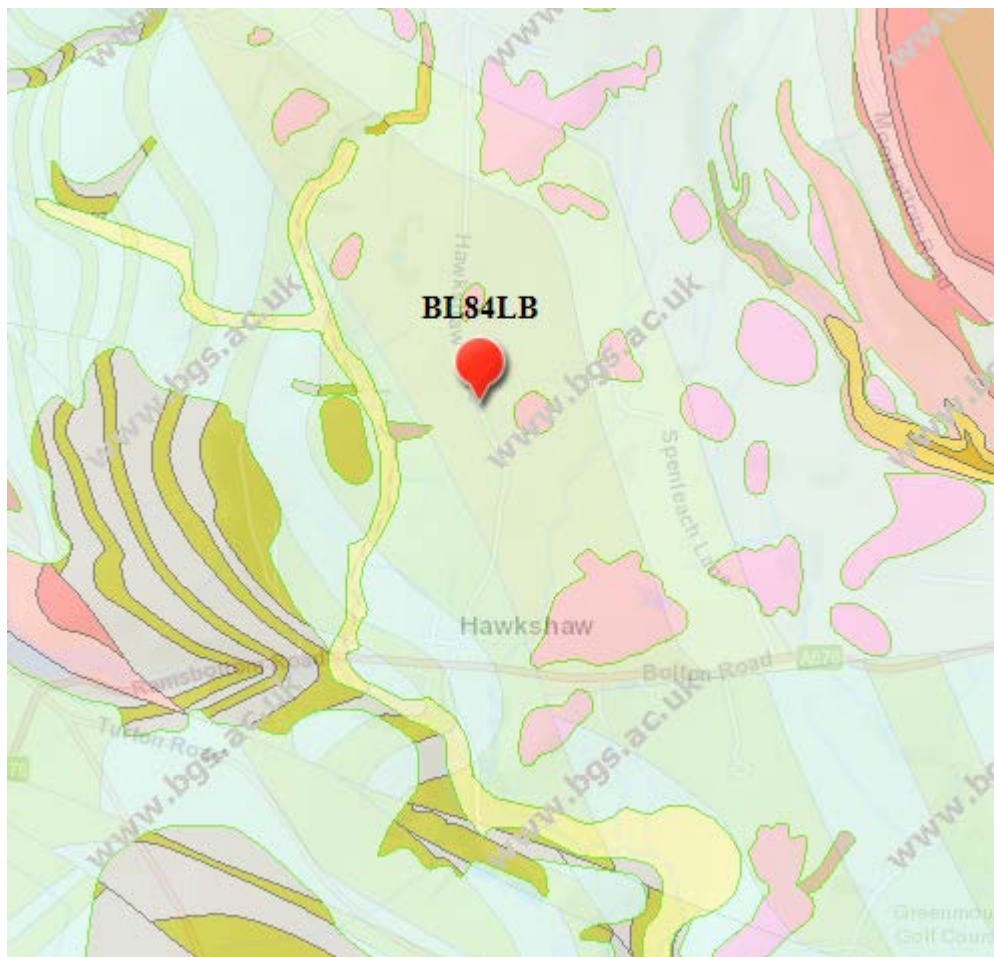
Design Flow	1 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	28 mm

Results:

Outcome	Pass
Critical Storm Duration	1.15 hrs
Critical Rainfall Rate	48.7 mm/h
Hmax	0.355 m
Time to half empty	28.1 min
Volume Required	3.372 m ³



7 BRITISH GEOLOGICAL SURVEY (BGS) MAP



www.bgs.ac.uk

Surface geology consists of superficial Till, Devensian-Diamicton deposits overlying brooksbottom grit and sandstone bedrock.

There is a borehole log dated 1983 for Higher Ash Farm giving information on a water well and pumping requirements for a domestic water. The rest level of the water is 25.0m below the well top (see below).

RECORD OF WELL		For Institute use only Licence No.	
At <u>HIGHER ASH FARM</u>		SD 71/95 N <u>N</u>	
..... <u>HAWKSHAW LANE</u>		76/120	
Town or Village <u>RAMSBOTTOM</u>			
County <u>LANCASHIRE</u>			
EXACT SITE	Six-inch National Grid sheet and reference <u>SD 71 NE</u>	<u>761 163</u>	
OF WELL	For <u>MR. SHIPLEY</u>		
	State whether owner, tenant, builder, contractor, consultant, etc. <u>OWNER</u>		
	Address (if different from above)		
	Level of ground surface above sea level (O.D.)	ft (.....m)	
DELETE	If well top is not at ground level state how far above:	ft (.....m)	
AS	SHAFT	ft (.....m); diameter.....ft (.....m);	
NECESSARY	HEADINGS (please attach details—dimensions and directions)		
	BORE	ft (.....m); diameter: at top.....in (.....mm);	
	at bottom	in (.....mm) <u>PERCUSSION DRILLING</u>	
	Full details of permanent lining tubes (position, length, inner and outer diameters, plain slotted etc.):		
	<u>48: 8 M X 150 MM PLAIN STEEL FROM SURFACE</u>		
	Water struck at depths of	ft (.....m) below well top	
	Rest level of water	ft (.....m) above* well top. Suction at.....ft (.....m)	
TEST	Yield on.....hours* test pumping at.....galls per hour	(.....l/s) with	
CONDITIONS	depression to.....ft (.....m) below well top. Recovery to rest level in.....mins*	hours	
	Capacity of pump.....g.p.h. (.....l/s)		
	Date of measurements.....		
	DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:		
	Make and/or type <u>ELECTRIC</u>	Motive power.....	
NORMAL	Capacity.....galls (.....m³) per hour. Suction at.....ft (.....m)		
CONDITIONS	below well top. Amount pumped.....galls (.....m³) per day. Estimated		
	consumption.....galls (.....m³) per week		
	Well made by <u>J.P. WHITTER</u>	Date of sinking <u>APRIL 1983</u>	
	ADDITIONAL NOTES ANALYSIS (please attach copy if available)		
LOG OF	<u>DOMESTIC SUPPLY FROM COAL MEASURES</u>		
STRATA			
OVERLEAF			
Received from..... Date..... Observation well..... Recorder..... ER log..... Site marked on..... 1" map..... 6" map..... (use symbol) Copy to..... Date.....			