



Surface Water Drainage Assessment

Development at 39 Wieland Road, Northwood, HA6 3QX



On behalf of
Construct 360 Ltd

Date: 29th November 2019

Reference: WtFR-FRA-2019/11/Q30

WTFR-FRA-2019/11/Q30

Issue sheet

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0	JH	28/11/19	JD	02/12/19

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1. Introduction

WtFR Ltd has been commissioned by Construct 360 Ltd to undertake a Surface Water Drainage Assessment in connection with discharging condition 10 of approved planning application 22452/APP/2018/3575 from Hillingdon Council. The development is at 39 Wieland Road, Northwood, HA6 3QX.

This document has been produced to provide an assessment and recommendations for the surface water management of the development.

2. Site Description

Area Size: 740m²

Grid reference: TQ 10370 91370

The proposals are for a part two storey front extension, first floor side extensions, single storey rear extension, detached outbuilding to rear for use as a gym/games room and alterations to elevations.

Figures 1 and 2 below show location details of the development site. Figure 3 shows an oblique aerial photograph of the development site.

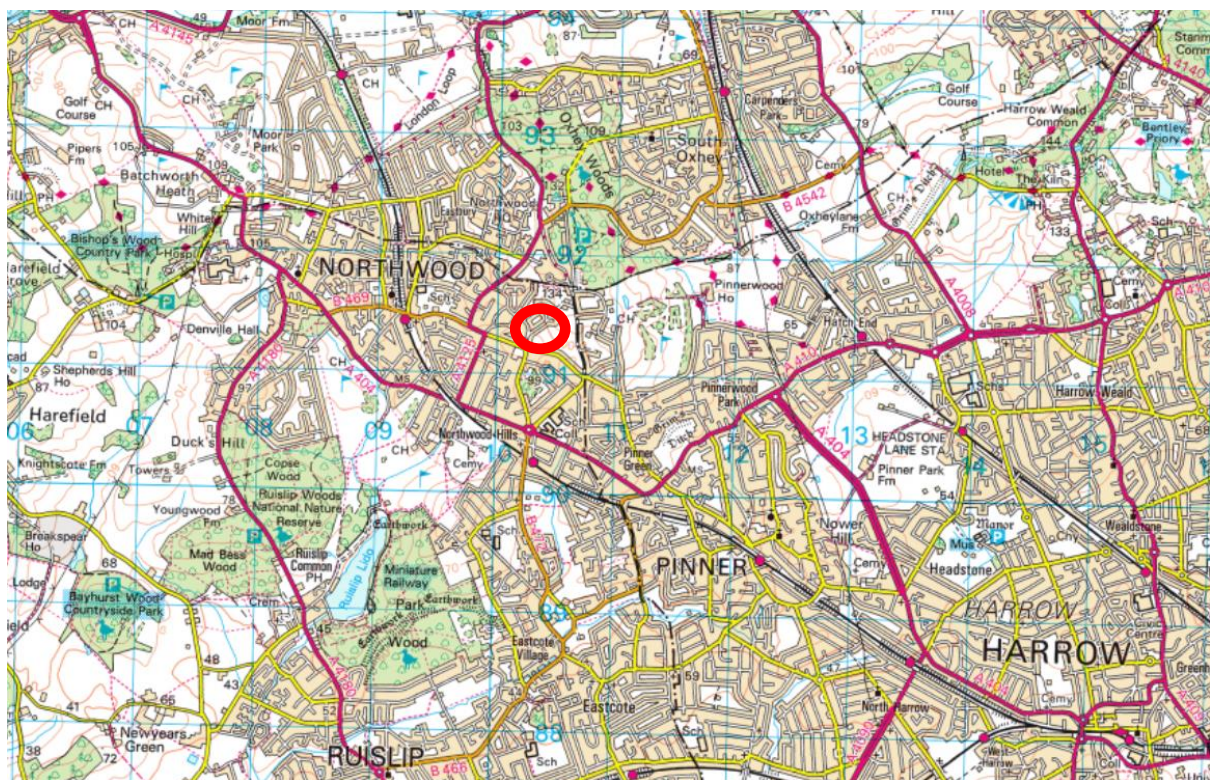


Figure 1 – Location of the site, highlighted.

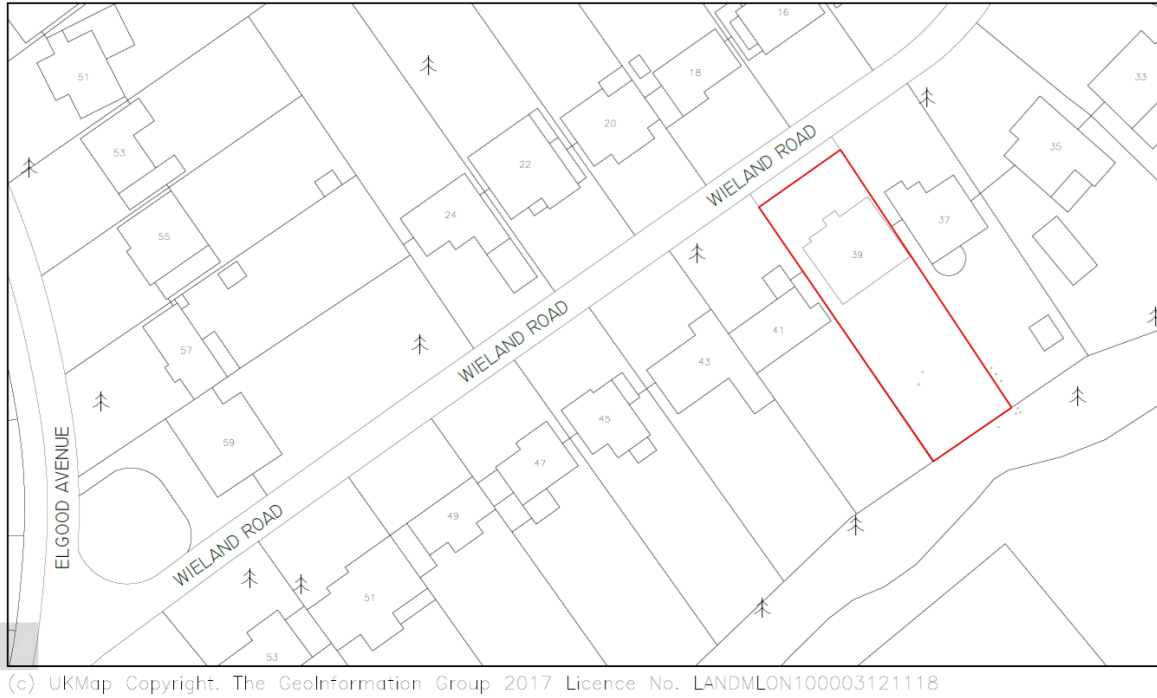


Figure 2 –detailed location of the development site, highlighted



Figure 3 – aerial photograph of the development site.

3. Proposed development and planning permission

This assessment is prepared to support discharging condition 10 of approved planning application 22452/APP/2018/3575 from Hillingdon Council. The development is at 39 Wieland Road, Northwood, HA6 3QX.

The proposals are for a part two storey front extension, first floor side extensions, single storey rear extension, detached outbuilding to rear for use as a gym/games room and alterations to elevations.

Figure 4 shows the existing layout, with the proposed layout at Figure 5.

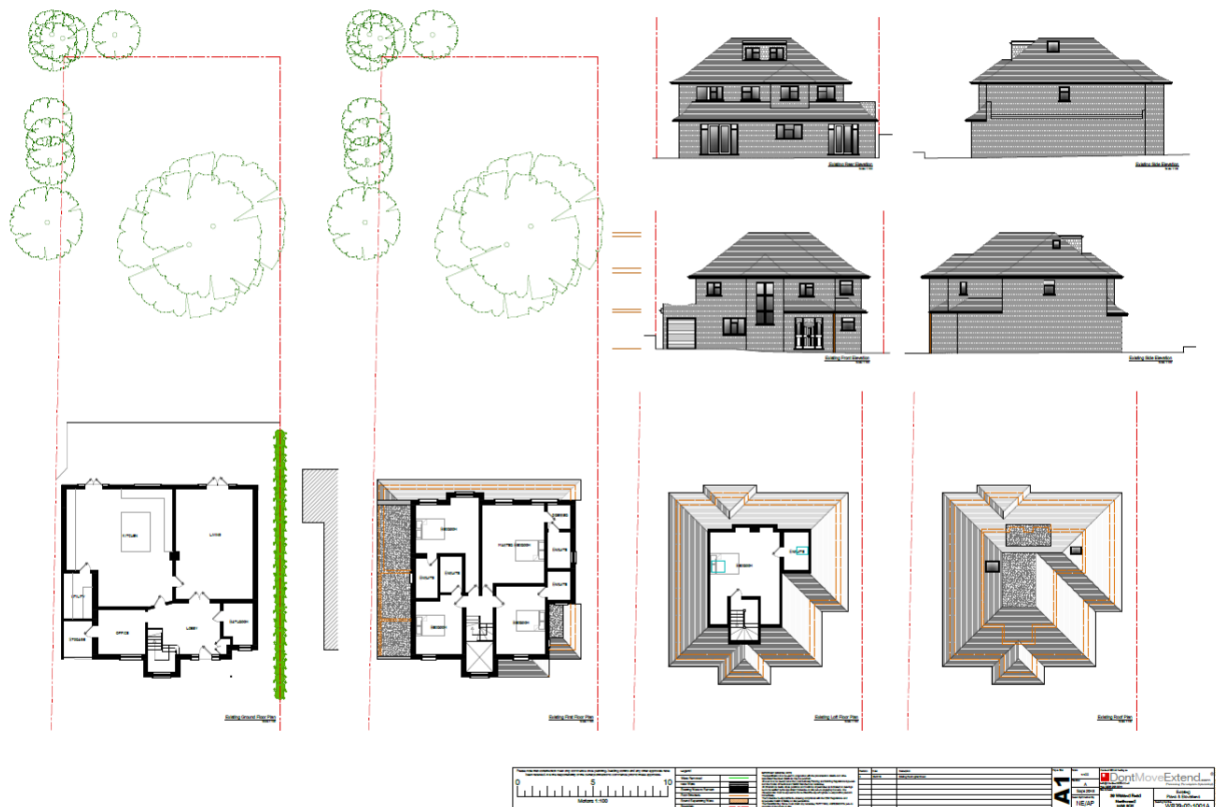


Figure 4 – Existing layout

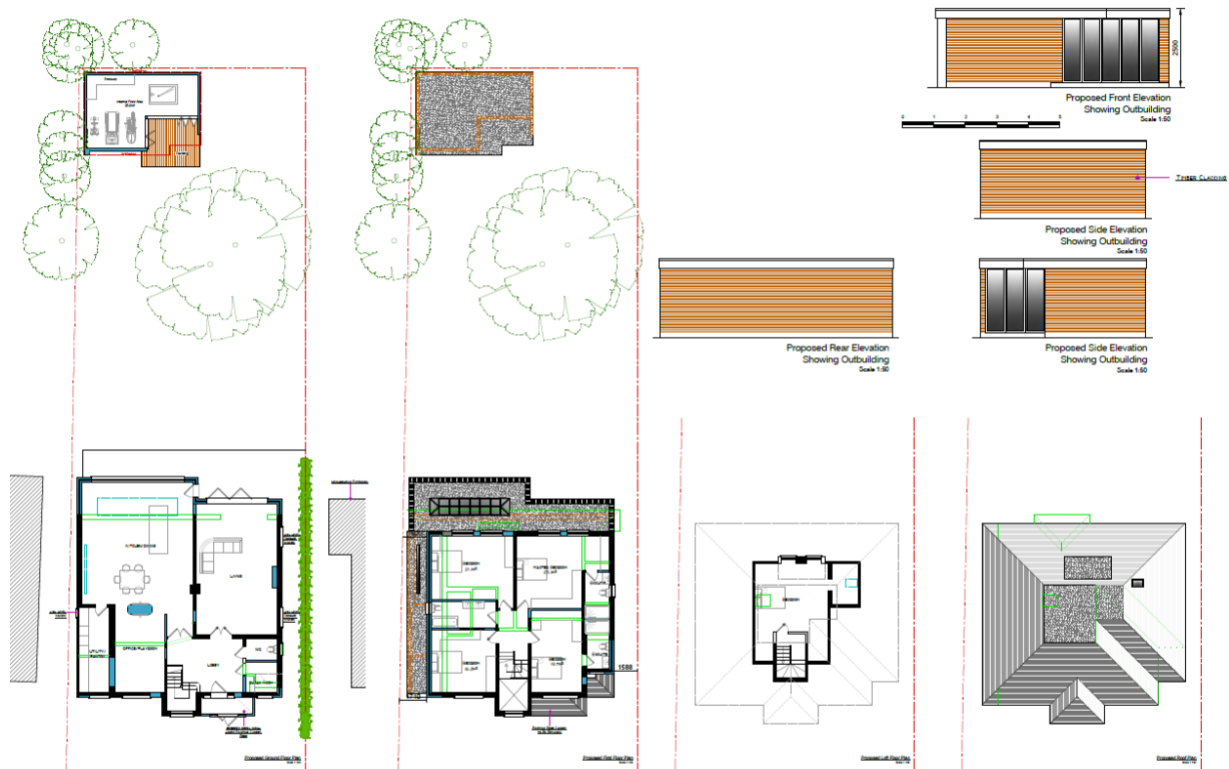


Figure 5 – Proposed layout

Condition 10 wording

No development approved by this permission shall be commenced until a scheme for the provision of sustainable water management has been submitted to and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate that sustainable drainage systems (SUDS) have been incorporated into the designs of the development in accordance with the hierarchy set out in accordance with Policy 5.15 of the London Plan and will:

- i. provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;
- ii. include a timetable for its implementation; and
- iii. provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.

The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will:

- iv. provide details of water collection facilities to capture excess rainwater;

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v. provide details of how rain and grey water will be recycled and reused in the development.

Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence.

REASON

To ensure the development does not increase the risk of flooding in accordance with Policy OE8 Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and London Plan (2016) Policy 5.12.

4. Hierarchy of disposing surface water

The Planning Practice Guidance and part H of the Building Regulations state that “generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer”.

4.1 Infiltration

The underlying bedrock geology is said to be London Clay Formation consisting of - clay, silt and sand. For the new detached outbuilding it is proposed that infiltration is used as the primary method of disposing surface water from this source. An overflow pipe could be connected as a precaution. Further details are given in section 7 of this report.

4.2 Surface Water Body

There are no watercourses within the immediate vicinity of the development site.

4.3 Surface Water or Combined Sewer

For the small front, side and rear extensions, it is proposed to dispose of surface water into the Thames Water public sewerage system as per the existing dwelling, with separate connections to the foul and surface water systems. Further details are given in section 7 of this report.

5. Surface Water Drainage

The greenfield runoff rate has been calculated using IH124 methodology.

The Q_{BAR} Greenfield runoff rate is 0.46l/s. It is recommended that post development discharge rates are limited to 1.2l/s in line with best standard practice.

Table 1 below looks at the required attenuation that will be required on site. The figures include an allowance of 1.4 (+40%) for climate change.



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Greenfield runoff rate estimation for sites

www.ukuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

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:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

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):	671	671
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

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 ≤ 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):	0.46	0.46
1 in 1 year (l/s):	0.39	0.39
1 in 30 years (l/s):	1.06	1.06
1 in 100 year (l/s):	1.47	1.47
1 in 200 years (l/s):	1.72	1.72

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.ukuds.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.ukuds.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, CEM, Hydro Solutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Table 1 – greenfield runoff rate calculations



what's the flood risk

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With the proposed extensions to the main dwelling they measure to be:

Front – $2\text{m} \times 1.5\text{m} = 3\text{m}^2$

Side – $2\text{m} \times 2\text{m} = 4\text{m}^2$

Rear – $4\text{m} \times 7\text{m} + 3\text{m} \times 5\text{m} = 43\text{m}^2$

The front and side extensions are too small to calculate any necessary attenuation. As such these areas have been omitted from the calculations.



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:
 Site name:
 Site location:

Site Details

Latitude:
 Longitude:

Reference:
 Date:

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 characteristics

Total site area (ha):
 Significant public open space (ha):
 Area positively drained (ha):
 Impermeable area (ha):
 Percentage of drained area that is impermeable (%):
 Impervious area drained via infiltration (ha):
 Return period for infiltration system design (year):
 Impervious area drained to rainwater harvesting (ha):
 Return period for rainwater harvesting system (year):
 Compliance factor for rainwater harvesting system (%):
 Net site area for storage volume design (ha):
 Net impermeable area for storage volume design (ha):
 Pervious area contribution to runoff (%):

* 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_{SAAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:
 Urban creep allowance factor:
 Volume control approach:
 Interception rainfall depth (mm):
 Minimum flow rate (l/s):

Methodology

estl:
 Q_{SAAR} estimation method:
 SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	89.32
FEH / FSR conversion factor:	1.16	1.16
SAAR (mm):	671	671
M5-60 Rainfall Depth (mm):	20	20
"r" Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{SAAR} for total site area (l/s):	0.05	0.05
Q_{SAAR} for net site area (l/s):	0.09	0.09

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	1.2	1.2
1 in 30 years (l/s):	1.2	1.2
1 in 100 year (l/s):	1.2	1.2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	1	1
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	1	1

This report was produced using the storage estimation 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: http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. 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, CEM, HydroSolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Table 2 – Required attenuation calculations for the rear extension



The calculations show that due to the discharge rate being limited to 1.2l/s then 1m³ of attenuation storage is required.

With regards to the outbuilding, it is proposed to dispose the surface water from this area via a soakaway. Using an area of 43m², an infiltration rate of 8x10⁻⁵m/s, a soakaway consisting 1.5m length x 1.5m width x 1.25m depth, with a 30% void ratio will be acceptable for all events up to and including the 1 in 100 year plus climate change event (+40%).

ALTERNATIVE SOAKAWAY SIZES

width of trench [mm]:	trench soakaways		
	2000	2000	1000
required trench length [m]:	1.06	1.06	2.11
diameter of ring [mm]:	ring soakaways		
	1050	1350	1500
required pit diameter [m]:	0.63	0.22	0.11

*Based on effective depth and number of pits as in Soakaway Data table

SUMMARY OF CALCULATIONS

critical design rainfall duration 't _{crit} ' =	30	min
required storage volume 'V _{req} ' =	0.80	m ³
provided storage volume 'V _{prov} ' =	0.84	m ³
utilisation factor =	0.95	.OK
required time to discharge 50% 't ₅₀ ' =	0.33	hours
utilisation factor =	0.01	.OK

GENERAL DATA

site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m ²] =	43
30 min rainfall depth of 5 year return period 'R' [mm] =	15
M5-60 to M5-2d rainfall ratio 'r' =	0.50
allowance for climate change:	40%

8.00E-05

SOAKAWAY DATA

soakaway width 'W' [m] =	1.50
soakaway length 'L' [m] =	1.50
total depth from ground level 'D _t ' [m] =	1.75
depth to drain invert level 'D _i ' [m] =	0.50
soakaway effective depth 'D _{eff} ' [m] =	1.25
free volume in infill aggregate [%] =	30

SOIL INFILTRATION DATA

allowance for infiltration through soakaway base:	30%
available on-site infiltration test results:	☐ Yes ☒ No
soil infiltration rate 'i' [m/s] =	8.00E-05

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M50-D			M100-D			outflow from soakaway [m ³ /s]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³ /s]	Z2	rainfalls [mm]	inflow [m ³ /s]	Z2	rainfalls [mm]	inflow [m ³ /s]		
5	0.39	5.85	1.20	9.79	0.42	1.58	12.90	0.55	1.81	14.83	0.64	0.11	0.53
10	0.54	8.10	1.21	13.71	0.59	1.62	18.32	0.79	1.86	21.14	0.91	0.21	0.70
15	0.65	9.75	1.22	16.63	0.72	1.65	22.46	0.97	1.90	25.99	1.12	0.32	0.80
30	0.82	12.30	1.23	21.17	0.91	1.67	28.81	1.24	1.95	33.52	1.44	0.64	0.80
60	1.00	15.00	1.24	26.04	1.12	1.70	35.70	1.54	1.99	41.79	1.80	1.27	0.52
120	1.19	17.85	1.24	30.99	1.33	1.72	42.91	1.85	2.01	50.30	2.16	2.55	0.00
240	1.38	20.70	1.24	35.94	1.55	1.73	50.09	2.15	2.03	58.75	2.53	5.10	0.00
360	1.51	22.65	1.24	39.32	1.69	1.72	54.69	2.35	2.02	64.04	2.75	7.65	0.00
600	1.68	25.20	1.24	43.72	1.88	1.72	60.65	2.61	2.01	70.86	3.05	12.74	0.00
1440	2.03	30.45	1.22	51.95	2.23	1.70	72.36	3.11	1.97	83.83	3.60	30.59	0.00

Table 3 – soakaway calculations

6. Use of SuDS

The NPPF, Planning Practice Guide and the Ministerial Statement look at the use of SuDS as a priority to aid the disposal of surface water from new developments. Below is a list of different SuDS options and their appropriateness for this development.

An effective SuDS scheme controls both runoff quantity and quality and can provide amenity value. A range of different SuDS techniques are described below.

Source Control

Rainwater harvesting / water butts

This is the direct capture of runoff on site. Rainfall runoff can be extracted for domestic use e.g. flushing toilets. Simple devices such as water butts can be installed for a relatively low cost and are easy to construct, install and operate.

Permeable Paving

Permeable paving provides a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored before infiltration into the ground (which may not be appropriate at this location), reuse, or discharge into a watercourse or other drainage system.

The CIRIA document C753 – The updated SuDS Manual states that permeable paving offers such advantages as “suitable for installation in high density development”, “low maintenance” and “eliminates surface ponding and surface ice”.

Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.

The advantages of green roofs are that they can be applied in high density developments, require no additional land take, improve air quality and can insulate buildings against temperature extremes.

Infiltration devices

Soakaways

Soakaways are square or circular excavations, with filled with rubble or lined with brickwork, pre-cast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. Some of the advantages for these devices are that they require minimal land take, provide groundwater recharge and are generally easy to construct and operate. However, it must be stressed that these are not suitable for poor draining soils.

Infiltration basins

Infiltration basins are vegetated depressions designed to store runoff and infiltrate it gradually into the ground. The advantages of using infiltration basins include being simple and cost-effective to construct, they reduce the volume of runoff from a drainage area and can be very effective at pollutant removal via filtering through the soils.

Conveyance

Swales

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. Roadside swales can replace conventional gullies and drainage pipes.

Advantages of using swales are that they are easy to incorporate into landscaping, they reduce runoff rates and volumes and that maintenance can be incorporated into general landscape management.

Rills and canals

Rills and canals are open surface water channels with hard edges. They can have a variety of cross sections to suit the urban landscape and can also be planted to provide water treatment. In dense urban developments where space can be at a premium, they are an effective way of providing SuDS and can also act as pre-treatment to remove silt before water is conveyed into further SuDS features.

Attenuation features

Detention basins

Detention basins are surface storage basins or facilities that provide flow control through attenuation of storm water runoff. According to The CIRIA document C697 – The SuDS Manual, they “can be used where the groundwater is vulnerable, if lined”, “simple and easy to construct” and “easy to maintain”.

Ponds

Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Runoff from each rain event is detained and treated in the pool.

Attenuation is required to control runoff quantity, and could be provided by subsurface storage or, if the levels are suitable and land is available, pocket wetlands. To control the quality of runoff, other components such as filter trenches and permeable paving could be provided upstream of the attenuation to treat the surface water.

Summary of SuDS for the development

It is recommended that soakaways, water butts and permeable paving is used within the development, rainwater gardens are also encouraged, in order to minimise surface water runoff. Due to site constraints of the development basins and ponds cannot be incorporated. Any hardstanding through the development should be made of a permeable material, where practicable.

7. Management of surface water

Surface water disposal will be a combination of soakaway and to the public sewerage system. The outbuilding will utilise a soakaway, with the extension to the existing surface water sewerage network, connecting from the existing down comers from the dwelling. This will ensure separate surface and foul water connections from the site itself will still be undertaken. Figure 6 shows a scheme, with a soakaway and with a 1.2l/s flow restriction. As per section 5, 1m³ of attenuation storage will be required. As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

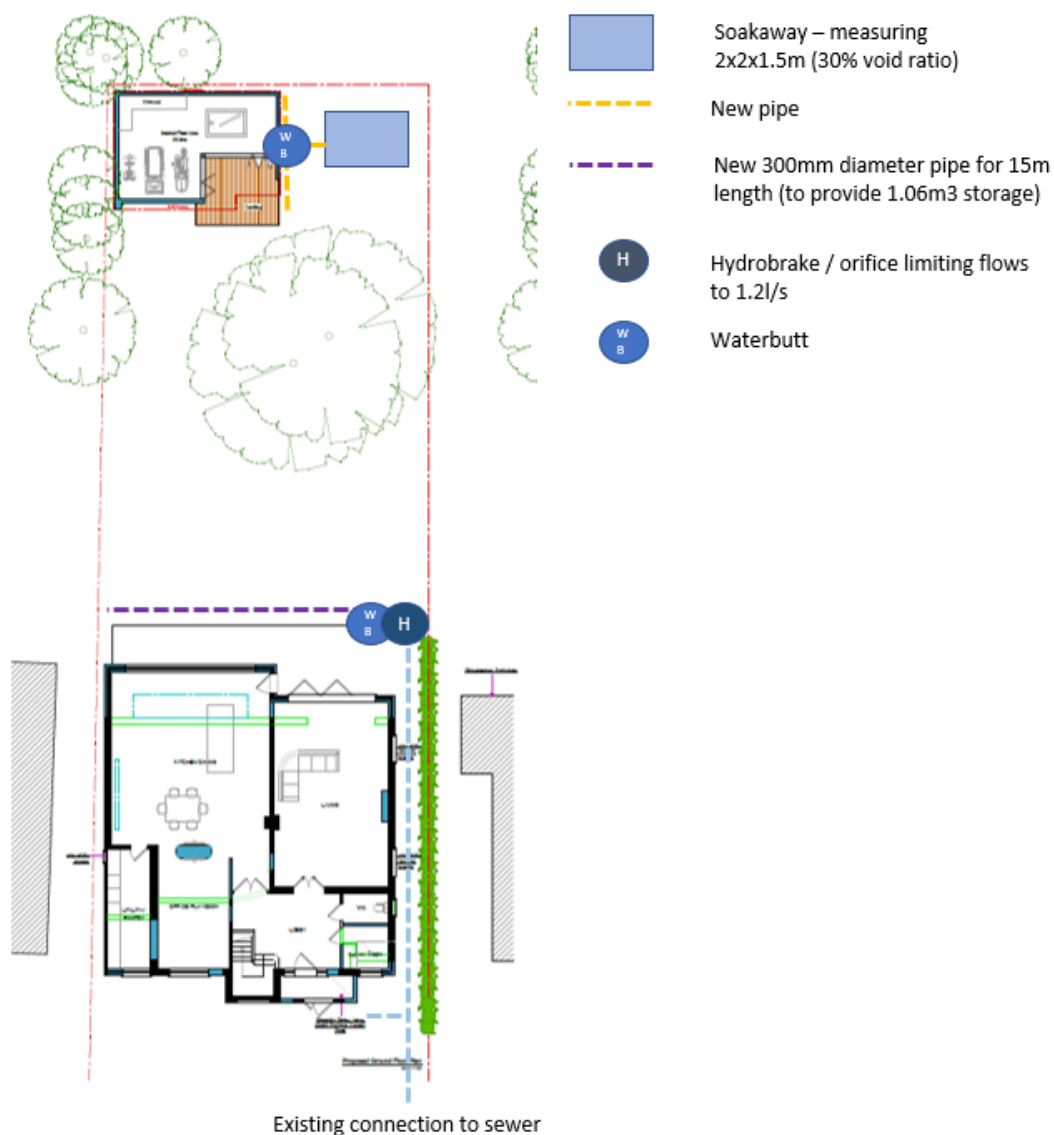


Figure 6 – Schematic of indicative surface water scheme – with a 1.2l/s flow restriction and soakaway for outbuilding.

With regards to maintenance of the surface water system on site, we make reference to the House of Commons Ministerial Statement (HCWS161) on Sustainable Drainage Systems. "in considering planning applications, local planning authorities should consult the relevant lead local flood authority on the management of surface water; satisfy themselves that the proposed minimum standards of operation are appropriate and ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development".

As such a maintenance schedule has been produced. This can be found in Table 4 below.

Item	SuDS Feature	Maintenance schedule	Requirement	Frequency	Responsibility
1	Waterbutts	Regular maintenance	Clearing of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters and other debris	Annual (or following poor performance)	Landowner
		Occasional maintenance	Replacement of any filters	As required	Landowner
		Remedial actions	Repair any erosion damage, or damage to tank	As required	Landowner
		Monitoring	Inspection of tank for debris and sediment build up	Annual (or following poor performance)	Landowner
			Inspection of inlets, outlets and withdrawal devices	Annual (or following poor performance)	Landowner
			Inspection of areas receiving overflow, for evidence of erosion	After extreme storms	Landowner
			Inspection of roof drain filters	Annual (or following poor performance)	Landowner
2	Permeable paving	Regular maintenance	Brushing and vacuuming	Three times/year at end of winter, mid-summer, after autumn leaf fall - or as required	Landowner
		Occasional maintenance	Removal of weeds	As required	Landowner
		Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required	Landowner
			Rehabilitation of surface and upper surface sub-structure	As required	Landowner
		Monitoring	Initial inspection	Monthly for three months after installation	Landowner
			Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	3-monthly, 48 hour after large storms	Landowner
			Inspect silt accumulation rates and establish brushing frequencies	Annually	Landowner
			Monitor inspection chambers	Annually	Landowner
3	Flow Control Device	Regular maintenance	Clearance of any debris	Annually and after large storms	Landowner
		Remedial actions	Repair / replace feature	As required	Landowner
		Monitoring	Inspect feature of condition and debris	As required	Landowner
4	Soakaway	Regular maintenance	Clearing of inlets, outlets, gutters, withdrawal devices and roof drain filters and other debris. Ensure grass is cut on and around feature	Annual (or following poor performance)	Landowner
		Occasional maintenance	Protect grass surface from compaction and siltation and manage main area of basin for design function or appearance.	As required	Landowner
		Remedial actions	Replace stones / granular fill in soakaway	As required	Landowner
		Monitoring	Inspection of feature (when required and if suspecting poor performance)	Annual (or following poor performance)	Landowner

Table 4 – suggested surface water scheme maintenance.

The following is a timetable of when different surface water features shall be installed throughout the development.

- Install new pipe before damp proof course of extension of dwellings;
- Dig out trench for soakaway;
- Fill soakaway with geopermeable membrane and granular fill (30% void ratio);
- Connect pipe to sewer and install temporary silt prevention measures;
- Install hydrobrake/orifice to manufactures specifications;
- Install pipes to connect to downcomers and permeable paving (if applicable);
- Connect pipe work to soakaway;

- Install permeable paving (if applicable);
- Install drainpipes and connect;
- Install waterbutts;
- Remove temporary silt prevention measures;
- Jet and clear entire system before completion.

8. Conclusions

This assessment is prepared to support discharging condition 10 of approved planning application 22452/APP/2018/3575 from Hillingdon Council. The development is at 39 Wieland Road, Northwood, HA6 3QX.

The proposals are for a part two storey front extension, first floor side extensions, single storey rear extension, detached outbuilding to rear for use as a gym/games room and alterations to elevations.

For the new detached outbuilding it is proposed that infiltration is used as the primary method of disposing surface water from this source. An overflow pipe could be connected as a precaution.

A soakaway measuring 1.5m length x 1.5m width x 1.25m depth, with a 30% void ratio will be acceptable for all events up to and including the 1 in 100 year plus climate change event (+40%).

For the small front, side and rear extensions, it is proposed to dispose of surface water into the Thames Water public sewerage system as per the existing dwelling, with separate connections to the foul and surface water systems

The calculations show that the discharge rate will be limited to 1.2l/s and 1m³ of attenuation storage is required.

It is recommended that soakaways, water butts and permeable paving is used within the development, rainwater gardens are also encouraged, in order to minimise surface water runoff.

As such points i – v (inclusive) of condition 10 of application 22452/APP/2018/3575 have been suitably addressed within this report.

Disclaimer

WtFR Ltd expressly disclaims responsibility for any error in, or omission from, this assessment arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on circumstances encountered and information evaluated at the time of preparation and WtFR expressly disclaims responsibility for any error in, or omission from, this report arising from or in connection with those opinions, conclusions and any recommendations.

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