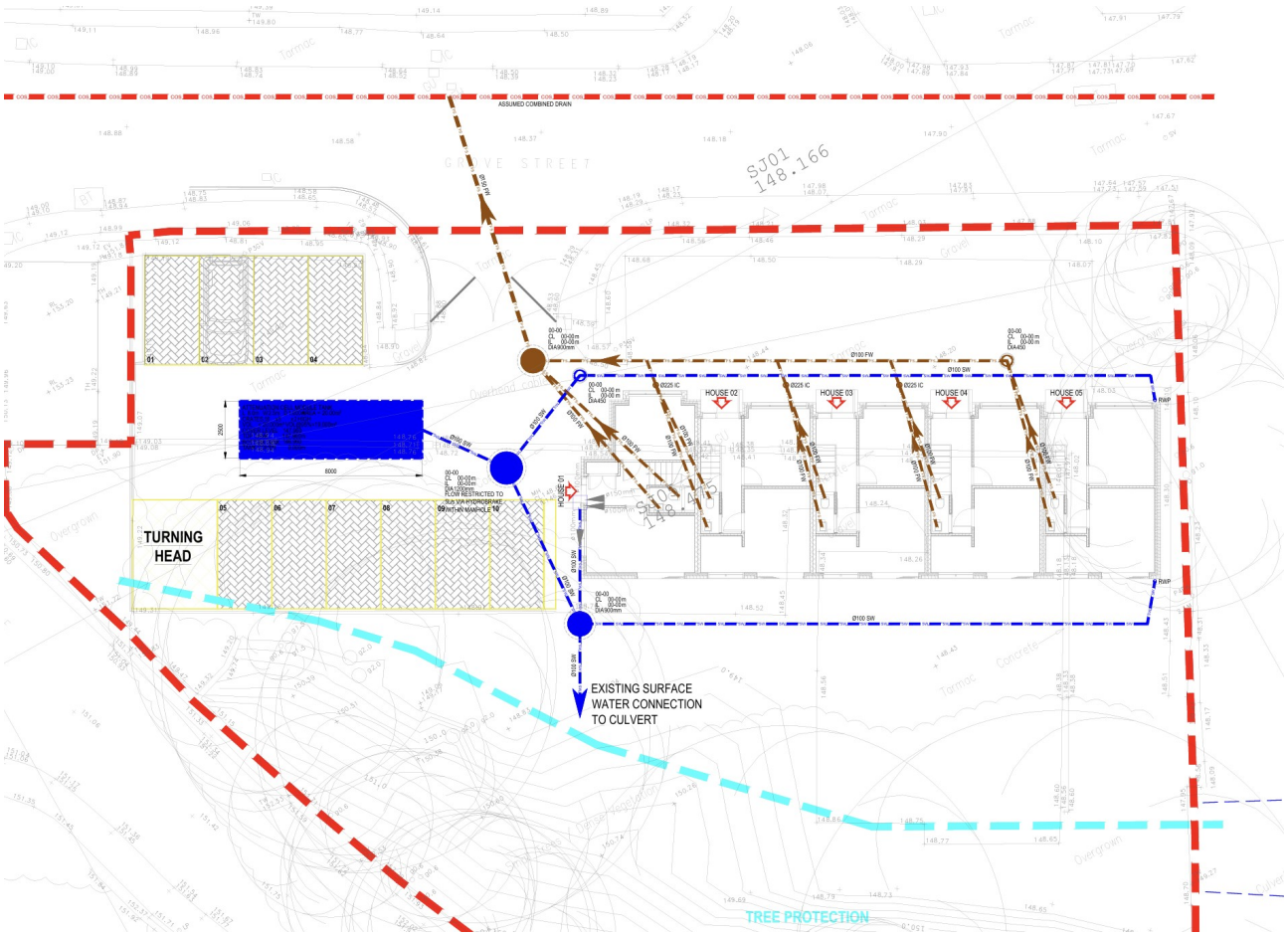
DRAINAGE STRATEGY

PROPERTY ADDRESS
5No New houses, Grove Street, Huddersfield

CLIENT
Virtu Homes

REPORT REFERENCE
8548-ADS-00-XX-RP-S- P1

DATE
November 2024



EXECUTIVE SUMMARY

Item	Assessment	Criteria
1.	Site Classification	BROWNFIELD
2.	Site Area	0.173Ha
3.	Existing Brownfield surface water run off rate	8l/s M100-360
4.	Proposed surface water peak flow run off rate	5.0 l/s
5.	Existing Greenfield Run off volume	723m^3 M100-360 + 45% CCF
6.	Outfall	Reuse of existing drainage system to discharge to existing surface water culvert passing under the site.
7.	Flooding assessment	M100-15 to M100-360 + 45% CCF
8.	Storage assessment	M100-15 to M100-360 + 45% CCF
9.	Preliminary Storage assessment	21m^3
10.	Storage System	• Attenuation tank composed of crate units
11.	Foul water discharge	Reuse of existing connection into foul sewer beneath Grove Street pending further investigation.

1. Introduction

1.1. ADS consult has been appointed to prepare a drainage strategy in support of the proposed residential redevelopment of 5 number new dwelling houses at Grove Street in Huddersfield.

1.2. The national Grid reference for the site is SE104168 and the nearest postcode to the site is HD3 4ZQ.

1.3. The subject site is an existing car park to be redeveloped alongside construction of new car parking. The total site area is approximately 0.173 hectares. The site is within a largely residential area.

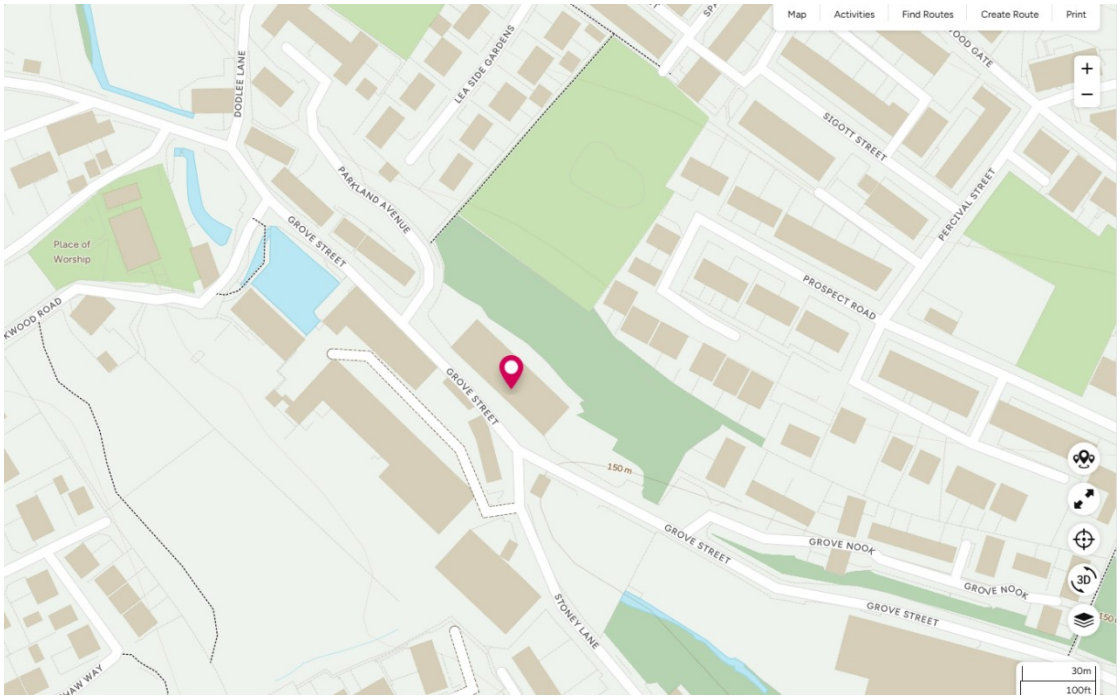


Figure 1: Site Location
Contains OS data © Crown copyright [and database right] [2024]

1.4. The existing site is noted to drain via gullies into the underlying surface water culvert. For the purposes of the drainage strategy the site is to be classed as brownfield.

1.5. This Drainage Strategy has been prepared on behalf of Virtu Homes ("the Applicant") to support the proposed redevelopment and associated access with parking. The site plan can be found in Appendix A.

2. Proposed Drainage Strategy

2.1. In order to demonstrate the development is of low risk the report should show:

- That it will be feasible to restrict surface water run-off to a suitable rate for all events up to the 1 in 100 year storm (including a 45% allowance for climate change) and set out how this will be achieved.

- How sustainable drainage techniques (SuDS) will be used with any obstacles to their use clearly justified.

2.2. Climate change (CC) will be taken into account by increasing the rainfall intensity by 45% in line with the Environment Agency and NPPF Technical Guidance.

3. Existing Site Drainage

3.1. As mentioned previously, the site is derelict but has been assumed to historically drain to the underlying surface water culvert. The topographical survey for the site is included within Appendix B.

3.2. The Existing Greenfield run off rates for the site are as follows, taken from the IH124 approach

Return period	Peak flow (l/s)
QBar	1.01
1 in 1 year	1.2
1 in 30 year	2.1
1 in 100 year	3.2

4. Consideration of the Sustainable Drainage Systems and Water Quality

4.1. Following the Hierarchy of Sustainable Drainage Systems (SUDS) the following options must be considered

- Soakways for roof run-off and permeable surfacing for roads, drives, car parks and private access roads
- Discharge to local watercourse
- Discharge to local sewer
- Discharge to adjacent land drains and ponds

4.2. The first option to be considered must be infiltration into the ground. Even when there are alternative sewer connections or water courses available, infiltration must be utilised unless it is unfeasible.

4.3. A review of geology maps had been undertaken which identifies the site to be located over 'freely draining slightly acid loamy soils'. A copy of the soil mapping is provided as figure 2 below.

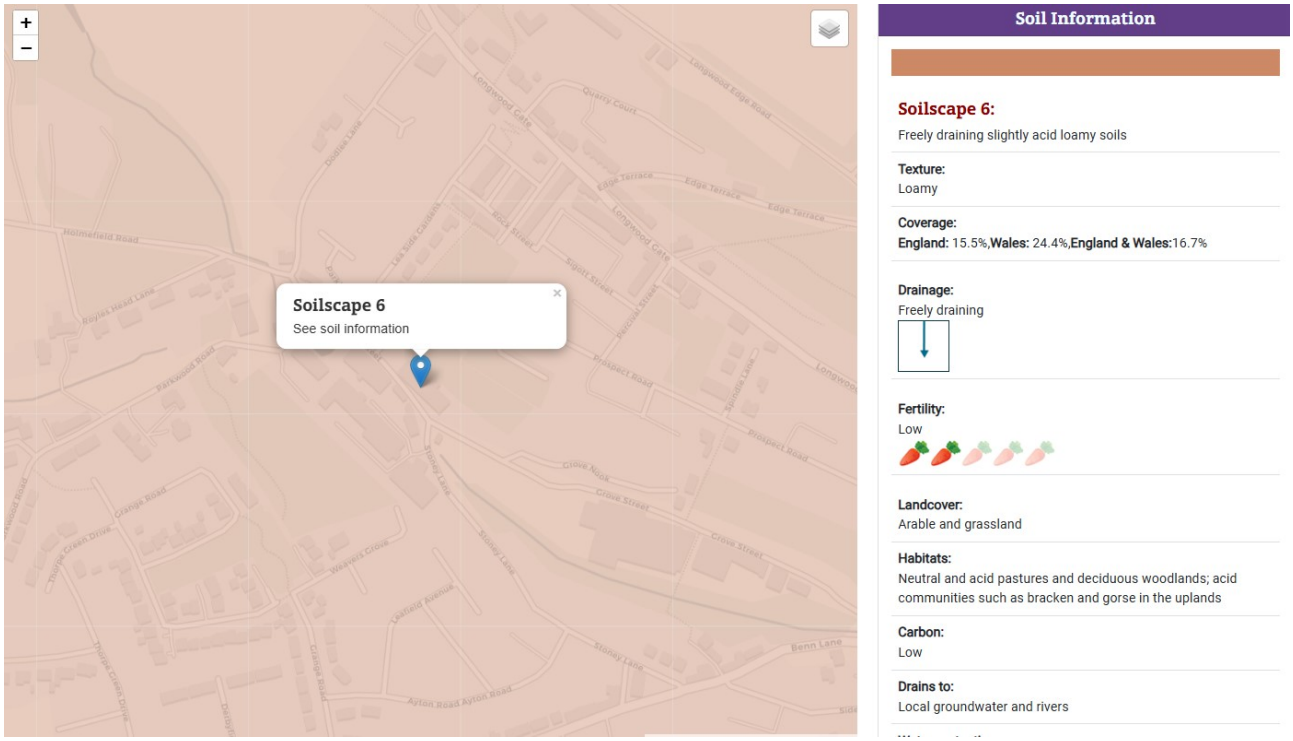


Figure 2: Excerpt from Soilscapes Mapping

4.4. The site is currently brownfield and occupied by an existing car park with direct drainage to the underlying culvert. Given the size and location of the culvert we

would not recommend infiltration drainage which could inducehydrostatic pressures onto the stone culvert walls

4.5. The second option to be considered must be discharge to a local watercourse.

4.6. The closest watercourse to site is an unnamed tributary of the River Colne that is culverted beneath the site and has existing connections that discharging to watercourse is a viable option for this development.

4.7. A public surface water sewer within "Grove Street" under UU ownership borders the site. It is anticipated that this sewer will prove a viable discharge point subject to Yorkshire Water approval. The existing drainage system for the mill building and car park are assumed to have drained into this sewer.

4.8. Based on the information within 4.7, it is our belief that discharging into the existing Yorkshire Water surface water sewer forms a viable solution for the site's surface water run off.

4.9. Current guidance promotes sustainable water management through the use of SuDS. SuDS measures should be used to control the surface water runoff from the proposed development site therefore managing the flood risk to the site and surrounding areas from surface water run off.

A hierarchy of techniques is identified:

- Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- Source Control - control of runoff at or very near its source (such as the use of rainwater harvesting, permeable paving, soakaways and/or green roofs).
- Site Control - management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site, swales and/or infiltration trenches).
- Regional Control - management of runoff from several sites, typically in a detention pond, basins, tanks and/or wetland.

It is generally accepted that the implementation of SUDS as opposed to conventional drainage systems, provides several benefits by:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream.

- reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;

- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources

- reducing potable water demand through rainwater harvesting;

- improving amenity through the provision of public open spaces and wildlife habitat; and

- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

The most appropriate attenuation system will need to satisfy three main characteristics, firstly, provide the required volume of storage, secondly, minimise the loss of developable land and thirdly, where possible provide local amenity. The application of the SuDS Manual requires that the runoff from sites is not only restricted to meet the pre-development runoff characteristics but also that SuDS systems are utilised to improve the quality of the runoff prior to outfall to watercourses. The SuDS Manual and Environment Agency guidance applies a sustainability hierarchy to the various types of SuDS systems, this is summarised in Table A overleaf.

Table A - Sustainability Hierarchy

Most Sustainable	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife
	Green / Living roofs /	X	X	X
	Basins and ponds - Constructed wetlands - Balancing ponds	X	X	X
	Filter strips and swales	X	X	X
	Infiltration Devices	X	X	X
	Permeable Surfaces and Filter Drains - Gravelled areas	X	X	
Least Sustainable	Tanked systems - Over-sized pipes/tanks - Cellular storage	X		

Systems at the top of the hierarchy provide a combination of attenuation, treatment and ecology and are deemed the most sustainable options. There are always specific scenarios where systems are more suitable than others and at this stage it is not possible to guide the development towards a particular strategy.

The usual approach is to consider the 'SUDS train' where each of the above options are considered in turn until a suitable solution is found. Thus, source control techniques such as soakaways, rainwater harvesting and/or infiltration trenches, if suitable on a site, are considered preferable to permeable conveyance and passive treatment systems such as tanks or ponds. The various options are considered in outlined in Table B below

Table B - SuDS Techniques

SuDS Technique	Comments	Suitability for Development
Green / Living Roofs / Living Wall	A green roof is a multi-layered system that covers the top of a building with soil and vegetation and which can provide a degree of rainstorm attenuation and a reduction in site runoff. Can be used to reduce the volume and rate of runoff so that other SuDS techniques in the scheme can be significantly reduced in size.	Not suitable for this development.
Basins / Ponds	Provides storage of runoff and flow attenuation. Vegetated surfaces can be used to support the prevention of runoff from the site for small rainfall events (interception) and improve water quality associated with the removal of sediment and buoyant materials.	There is insufficient space within the development boundary.
Filter Strips / Swales	Good removal of urban pollutants, reduces runoff rates and volumes.	No suitable areas have been identified.
Infiltration Devices (e.g. soakaways)	Reduces total runoff volume from the development.	Soakaways are not suitable due to site ground conditions.
Permeable Surfaces and Filter Drains	Permeable surfaces together with their associated substructures are an efficient means of intercepting runoff, reducing the volume and frequency of runoff and providing a treatment medium.	Potential for permeable surface to be used for driveway/access.
Tanked systems	Ideal for sites with insufficient space for basins etc., provide a volume of below ground storage with a high void ratio.	Potential to be installed under access area
Flow reduction	Manages and reduces the flood risk to the local surface water sewers and watercourses.	A pump units can be installed downstream of the attenuation tank to control flows to the proposed run off rates.

5. Proposed Drainage Design

5.1. A drainage survey has been carried out for the existing car park drainage and this can be seen to discharge directly into the culvert.

5.2. It is proposed that a new drainage system for both foul and surface water be installed and the existing system be grubbed out.

5.3. Preliminary calculations have been undertaken at this stage to model and analyse the potential storage requirements for the site The peak flow for the 1 in 100 yr +45% CC will be restricted to 50% of the current brownfield rate – 5.0 l/s via a hydrobrake unit. The proposed discharge point is the existing surface water sewer beneath the site. The current brownfield discharge rate has been calculated based on a 1 in 100 year storm event with a 360 minute duration.

5.4. The storage required to achieve the required discharge rate is to be provided by an attenuation tank composed of crate units and located beneath the existing car park.

5.5. Peak run of volumes will not exceed the pre-development greenfield run off volumes.

5.6. Foul water runs will discharge to the existing foul sewer beneath Grove Street via a new foul system. Discharge will be via gravity.

5.7. Storage will be provided up to and including the 1 in 100 year storm event plus an allowance of 45% increase for climate change.

6. Summary

- The development is currently a brownfield site with a mill building and parking to be converted and refurbished to residential dwellings.
- Surface water run-off from the proposed development will discharge to the existing surface water culvert in the centre of the site via a hydrobrake flow control unit. The drainage system is to discharge at a maximum 5.0 l/s rate.
- Storage for the impermeable areas will be provided up to and including the 1 in 100 year + 45% climate change event within the site boundary. The attenuation will be in the form of crate attenuation tank storage.
- The drainage proposals will be designed in accordance with the techniques set out within the SUDS manual.

7. Conclusion

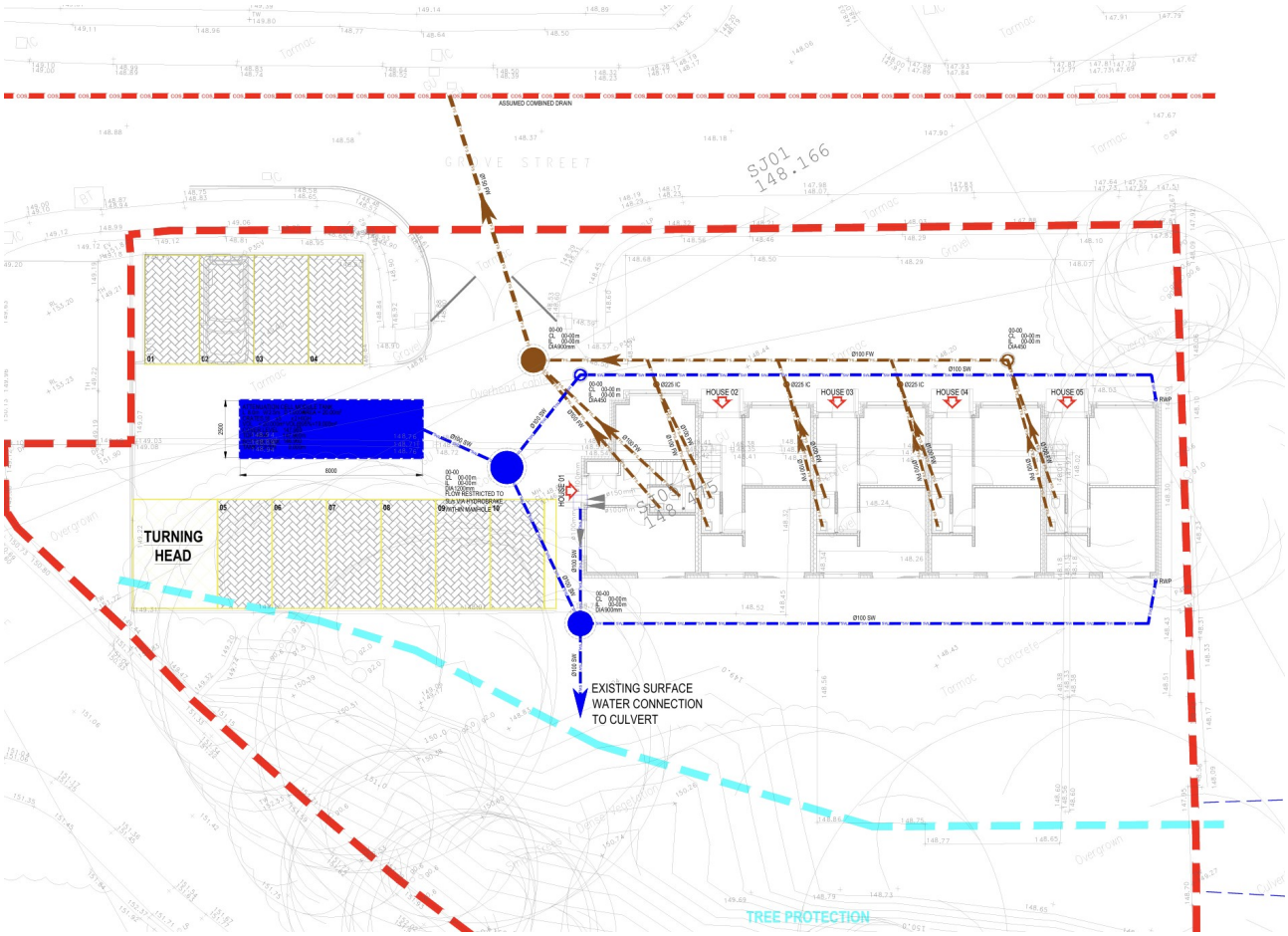
The strategy outlined above shows a viable sustainable drainage solution is achievable within the constraints of the site. Detailed design of the system following a successful planning application can be delivered to meet the NPPF, Environment Agency, Local Authority and United Utilities requirements.

Report Prepared By: S. T. Johnston.

Report Reviewed By: S. Hornby.

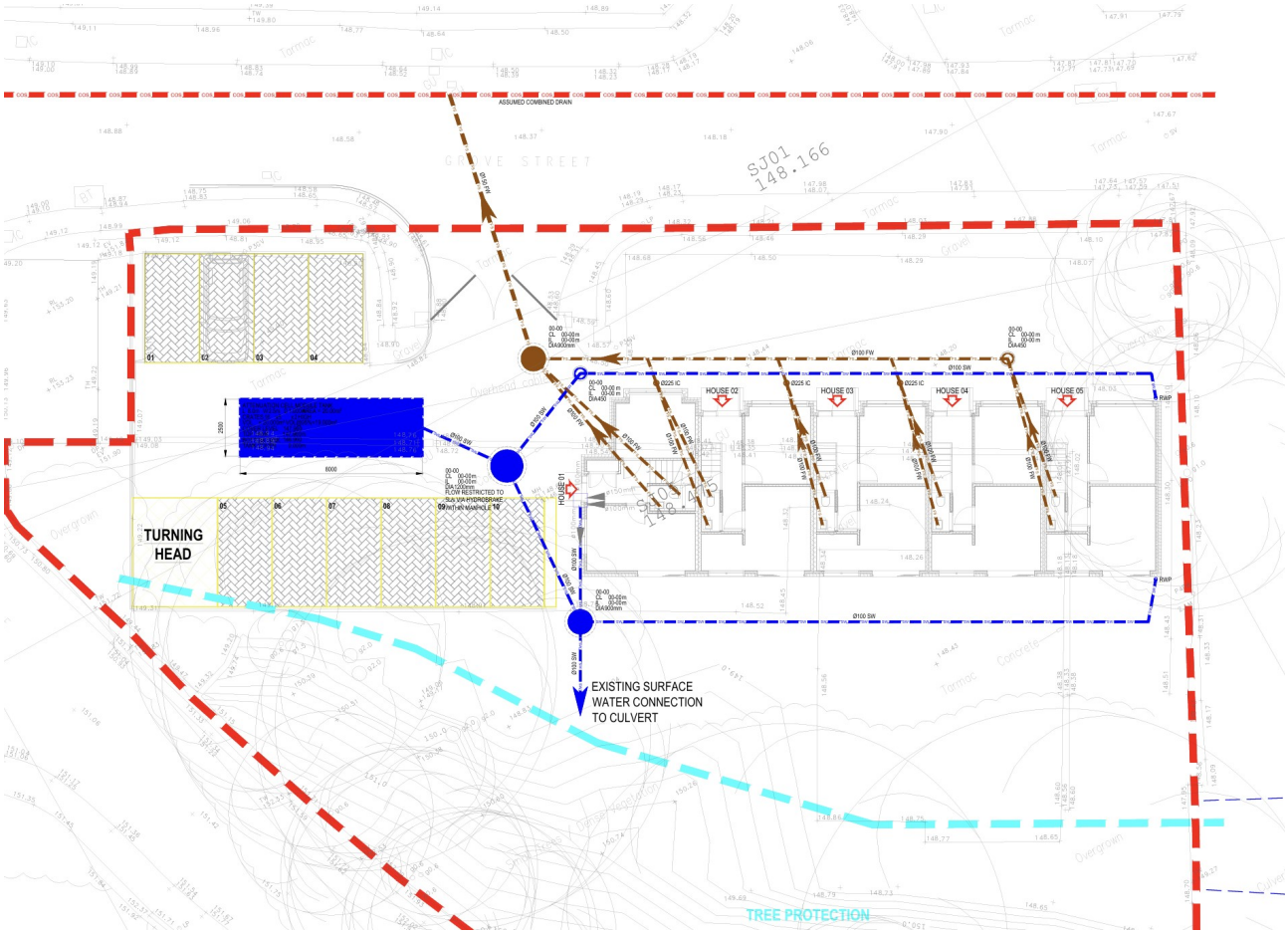
For and on behalf of
ADS Consult Limited.

APPENDIX A
PROPOSED SITE PLAN



APPENDIX B
EXISTING TOPOGRAPHICAL SURVEY

APPENDIX C
SCHEMATIC DRAINAGE LAYOUT



APPENDIX D
SUDS MANAGEMENT AND MAINTENANCE

APPENDIX E
DRAINAGE MODELLING

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Surface water storage requirements for sites

www.uksuds.com | Storage estimation too

Calculated by:	Glyn Ratcliffe
Site name:	GROVE ST
Site location:	HUDERSFIELD

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:	53.64758° N
Longitude:	1.84306° W
Reference:	1658209699
Date:	Nov 29 2024 14:56

Site characteristics

Total site area (ha):	0.1
Significant public open space (ha):	0
Area positively drained (ha):	0.1
Impermeable area (ha):	0.1
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.1
Net impermable area for storage volume design (ha):	0.1
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

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	70
Rainfall 100 yrs 12 hrs:	--	99.96
FEH / FSR conversion factor:	1.19	1.19
SAAR (mm):	1058	1058
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 10 year:	1.45	1.45
Growth curve factor 30 year:	1.75	1.75

Design criteria

Climate change allowance factor:	1.4		Growth curve factor 100 years:	2.08	2.08
Urban creep allowance factor:	1.1		Q_{BAR} for total site area (l/s):	0.3	0.3
Volume control approach	Use long term storage		Q_{BAR} for net site area (l/s):	0.3	0.3
Interception rainfall depth (mm):	5				
Minimum flow rate (l/s):	2				

Site discharge rates

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

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	64	64
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	64	64

This report was produced using the storage estimation tool developed by HRWallingford 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, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

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Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Glyn Ratcliffe
Site name:	GROVE ST
Site location:	HUDERSFIELD

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:	53.64758° N
Longitude:	1.84306° W
Reference:	2733517482
Date:	Nov 29 2024 15:12

Site characteristics

Total site area (ha):	0.1
Significant public open space (ha):	0
Area positively drained (ha):	0.1
Impermeable area (ha):	0.1
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.1
Net impermable area for storage volume design (ha):	0.1
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

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	70
Rainfall 100 yrs 12 hrs:	--	99.96
FEH / FSR conversion factor:	1.19	1.19
SAAR (mm):	1058	1058
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 10 year:	1.45	1.45
Growth curve factor 30 year:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Q_{BAR} for total site area (l/s):	0.3	0.3
Q_{BAR} for net site area (l/s):	0.3	0.3

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):	5

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	5	5
1 in 30 years (l/s):	5	5
1 in 100 year (l/s):	5	5

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	23	23
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	23	23

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Glyn Ratcliffe
Site name:	Grove Street
Site location:	Huddersfield

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

Site Details

Latitude:	53.64750° N
Longitude:	1.84301° W
Reference:	4049899410
Date:	Nov 29 2024 15:28

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.1

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1058	1058
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 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):	0.3	0.3
1 in 1 year (l/s):	0.25	0.25
1 in 30 years (l/s):	0.52	0.52
1 in 100 year (l/s):	0.61	0.61
1 in 200 years (l/s):	0.7	0.7