UNIVERSITY OF HUDDERSFIELD BARBARA HEPWORTH AND EDITH KEY FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

CLIENT:	University of Huddersfield
ARCHITECT:	GSS Architecture
SITE ADDRESS:	Barbara Hepworth Building / Former Edith Key Building, University of Huddersfield, Queensgate, HD1 3DH
REFERENCE (REV):	24462-DCE-XX-XX-T-C-001-P04
DATE:	12/06/2025

AUTHOR:	O.Bastain	DATE:	12/06/2025
CHECKER:	S.Reid	DATE:	12/06/2025

CONTENTS

REVISION	DATE	AUTHOR	CHECKER	COMMENTS
P01	03/01/2025	S.Reid	A.Walker	Initial Issue
P02	11/06/2025	O.Bastain	S.Reid	Drainage Redesign – Appendices Updated
P03	12/06/2025	O.Bastain	S.Reid	Appendices Updated
P04	12/06/2025	O.Bastain	S.Reid	Tree pits removed

1 INTRODUCTION

1.1 Dudleys Consulting Engineers have prepared this site-specific Flood Risk Assessment for the University of Huddersfield for the new public open space works at the Barbara Hepworth Building and at the former site of the Edith Key building.

1.2 The assessment investigates the potential flood risk impacts of the proposed development in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance. This FRA is considered proportionate to the degree of flood risk and to the scale, nature, and location of the development.

1.3 This Flood Risk Assessment has been carried out generally in accordance with:

- National Planning Policy Framework (December 2024)
- Planning Practice Guidance: Flood Risk and Coastal Change (August 2022)
- BS 8533:2017 "Assessing and managing flood risk in development, Code of Practice"
- CIRIA Report C753" The SUDS Manual"
- Environment Agency Report SC030219 Rainfall Runoff Management for Developments.
- Building Regulations Part H
- Kirklees Local Flood Risk Management Strategy

2 CONSULTATION AND EVIDENCE

2.1 The site is located in the University of Huddersfield Queensgate campus, located to the south of Huddersfield City Centre and to the north west of the River Colne and the Huddersfield Narrow Canal.

2.2 Kirklees Council is the Lead Local Flood Authority and the Planning Authority.

2.3 The Environment Agency data for site has been included within Appendix C and D for reference purposes.

2.4 Planning policy requires that the site be developed in accordance with NPPF requirements in terms of flood risk management, climate change allowances and reduced runoff from the development.

2.5 SuDS design guidance requires sustainable drainage systems to be provided for the management of the surface water runoff for redeveloped areas.

2.6 Planning policy requires that the site be developed in accordance with NPPF requirements in terms of flood risk management, climate change allowances and reduced runoff from the development.

2.7 The Strategic Flood Risk Assessment for the area states that the site is in a non critical drainage area and is at a low risk of flooding.

3 EXISTING SITE DESCRIPTION

3.1 The sites are located on the University of Huddersfield Queensgate campus. The Barbara Hepworth site is located outside the existing building on an area of open space underneath the building canopy. The Edith Key site is located on the now demolished site of the former building which is located 100m to the north, adjacent to the walls of the MOD Barracks.

3.2 The approximate grid reference of the site is E414728, N416160.

3.3 The Barbara Hepworth site is an existing steep slope which is positioned around the existing ramps serving the building. It is retained by a large stone retaining wall and is currently open land with some planting which has died. There is currently limited access to this area for pedestrians.

3.4 The Edith Key site was demolished some time ago and has been remediated and left open for redevelopment. The site is fenced off and doesn't have much existing planting. It is surrounded by public highway and levels tie into the existing around the entire site.

3.5 The Barbara Hepworth site is serviced by existing land drainage located in the existing retaining wall. The Edith Key site was served by existing drainage which managed foul and surface water from the previous building. The topographical survey indicates that the outfall manhole to the public sewer has been retained.

3.6 Both sites are brownfield, but as they will be converted into vegetated public open spaces, it is assumed that their runoff will be greenfield in future, and runoff will be managed at or as close as possible to greenfield rates.

3.7 The boundary of the site is as shown in Figure 1 below. A topographical survey of the existing site is in Appendix A.

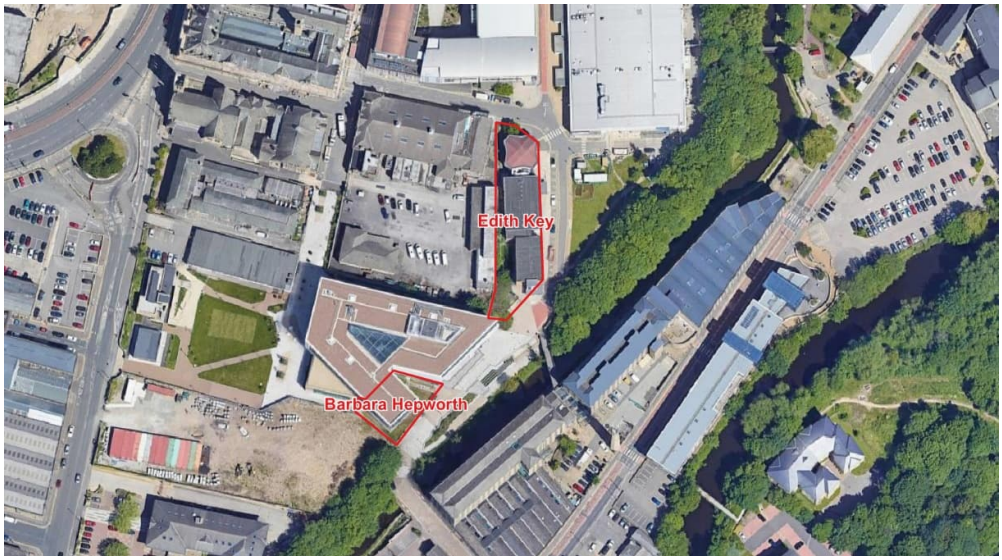


Figure 1 - Site Location Plan with boundary

4 DEVELOPMENT PROPOSALS

4.1 The proposed layout for the schemes are shown in Appendix B.

4.2 The works at the Barbara Hepworth building are the planting and terracing of the existing planted area to form a usable public open space for use by students and staff. The new planting will provide a biodiversity and amenity benefit for the space and the planting will consist of species which are compatible with the lower rainfall under the canopy and the soils.

4.3 The works on the site of the former Edith Key building will include the construction of a number of small public spaces which will all be planted and themed around different uses. There is to be a new performance space, several eating and sitting areas and planted areas set aside for wildlife and planting.

4.4 Levels at the Barbara Hepworth building will be generally similar to existing, but with terraces cut to allow for seating areas and flat access. Any water runoff will be directed as per the current site arrangements.

4.5 The Edith Key park will be generally kept to the existing levels for the walking areas to allow for a level access to the public footpaths surrounding the park. The planted areas will be raised to allow for sufficient growing depth in these areas. These planted areas will fall towards the pathways.

4.6 It is expected that the runoff from both areas will be managed through the use of SUDS methods and water will be allowed to infiltrate into root beds and planting areas through filter beds before being discharged into existing land drainage and surface water drainage connections at a greenfield or minimum practicable rate.

5 FLOOD ZONE COMPATIBILITY

5.1 The Flood Risk Vulnerability Classification has been determined in accordance with Planning Practice Guidance, Flood Risk and Coastal Change. The Flood Risk Vulnerability Classification is Less Vulnerable. This classification is in accordance with National Planning Policy Framework, Annex 3.

5.2 The sites are located within Flood Zone 1 as indicated on the Environment Agency Flood Zone map in Appendix C and in Figure 3 and 4 below.

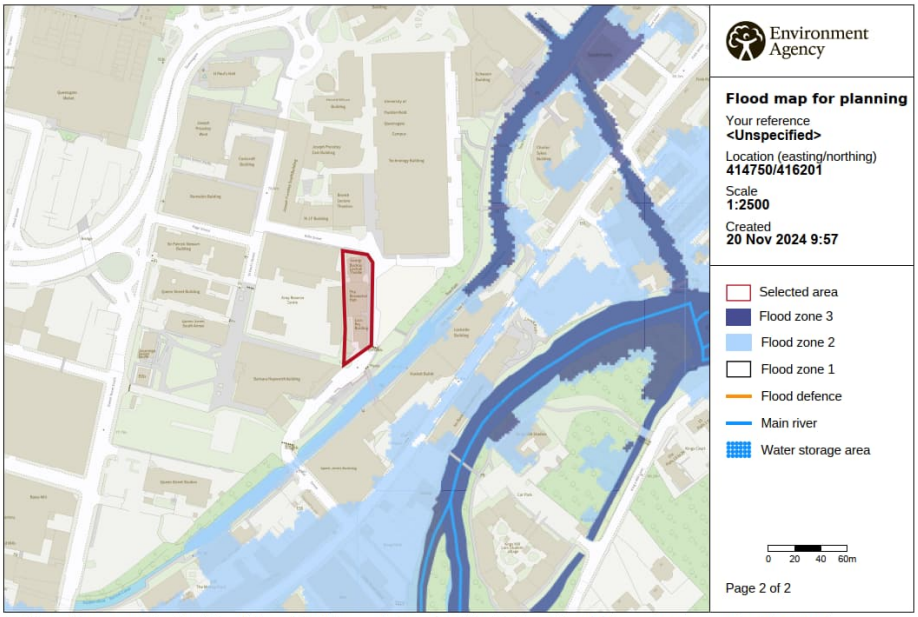


Figure 2 – Edith Key Building - Flood Map for Planning (EA)

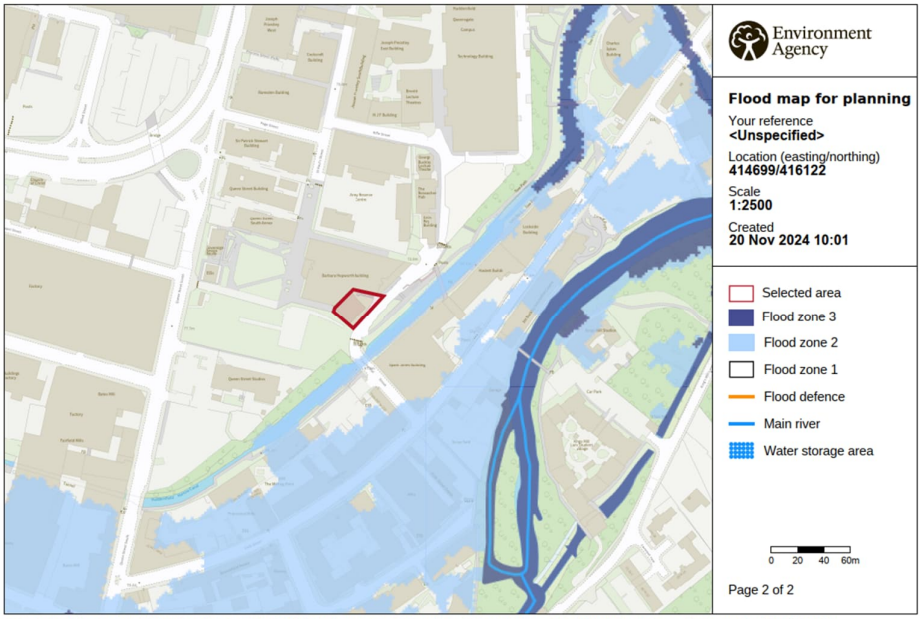


Figure 3 - Barbara Hepworth Building - Flood Map for Planning (EA)

5.3 The Flood Zone Compatibility has been reviewed in accordance with Planning Practice Guidance, Flood Risk and Coastal Change, paragraph 078 Table 2. This compatibility is summarised in Table 3 below.

Flood Zones	**Flood Risk Vulnerability Classification**				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water **compatible**
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Table 1 - Flood Risk Vulnerability Classification (NPPF)

5.4 In Table 3 above, ✓ is permitted and X is not permitted.

5.5 The developments are wholly suitable for their flood zone.

6 FLUVIAL FLOODING (FLOODING FROM RIVERS AND THE SEA)

6.1 Fluvial flooding occurs when high flows exceed the capacity of the river channel and spill out onto the floodplain, usually after a period of prolonged or heavy rainfall.

6.2 The Environment Agency Flood Map (rivers and sea) below shows that there is a no risk of flooding from Fluvial Sources.

6.3 Figure 4 below shows an output from the Environment Agency Fluvial Flood Risk mapping.

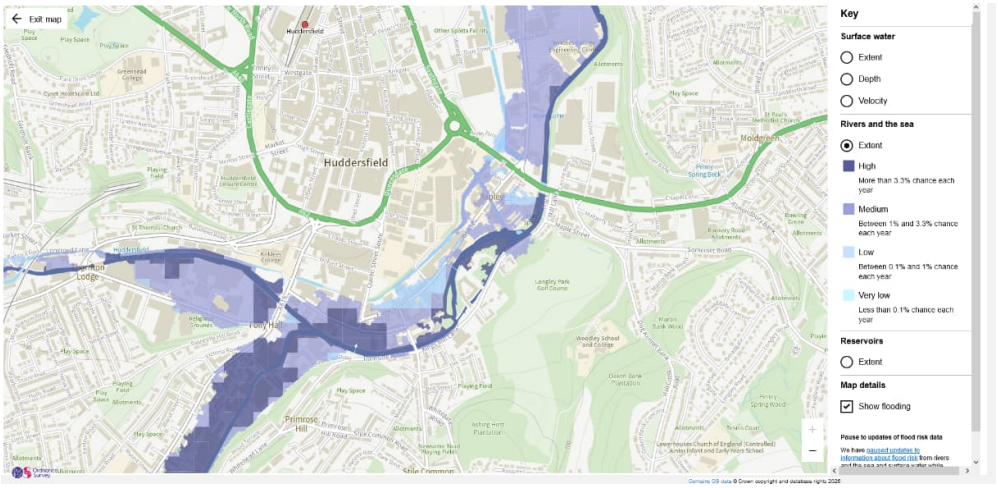


Figure 4 - Fluvial Flooding (EA)

7 PLUVIAL FLOODING (FLOODING FROM SURFACE WATER)

7.1 The Environment Agency Flood Map showing Risk of Flooding from Surface Water is shown below. This type of flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm.

7.2 Figure 5 below shows that the site is at a low risk of surface water flooding with water flowing past both sites from the public highway down to the canal, following the existing lay of the land.

7.3 The Barbara Hepworth building is at a low risk of flooding and the planting area is not in the path of any overland flows. The Edith Key park is at a higher level than the existing adjacent highway and is not at risk of flooding from surface water sources.

7.4 On this basis, the risk of flooding from surface water is low.

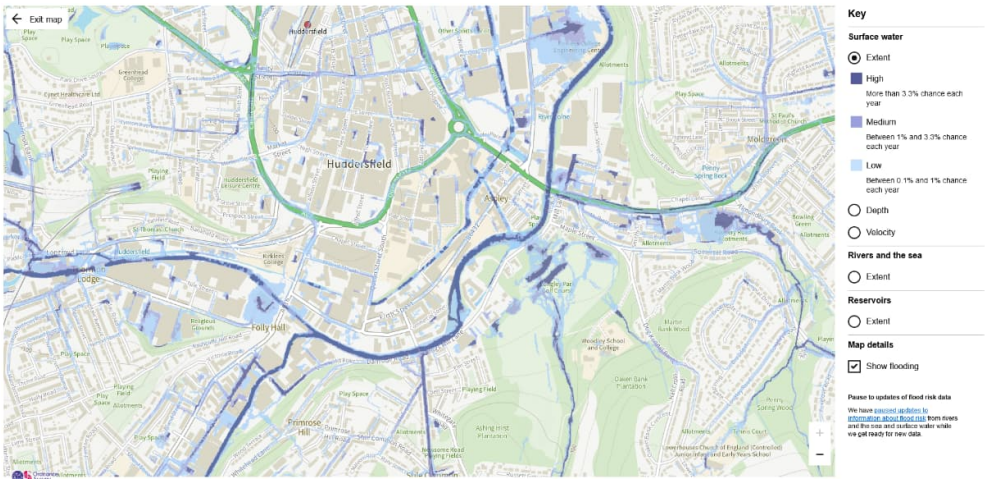


Figure 5 – Pluvial Flooding (EA)

8 GROUNDWATER FLOODING

8.1 Groundwater flooding occurs when water levels in the ground rise above surface levels this is more likely to occur in low lying areas.

8.2 The geology maps available from the British Geological Survey show that the solid bedrock geology underlying the site is the Pennine Coal Measures and Sandstone formations. The superficial deposits are clays and silts from the River Colne.

8.3 Cranfield University Soilscapes map shows that the site is loamey and clayey floodplain soils with a high groundwater table.

8.4 The site has a low groundwater flooding risk from the SFRA mapping.

8.5 It is likely that with the geology and levels falling towards the canal and the river beyond, that groundwater would flow through and past the site to these receiving watercourses with negligible effect on the site.

8.6 On this basis it is assumed that the groundwater flooding risk is likely to be Low.

9 EXISTING INFRASTRUCTURE FLOODING

9.1 Flooding caused by the existing infrastructure network occurs when the network is over capacity or there is a blockage or failure in the existing system.

9.2 Maps from the Sewerage Authority are shown below. The sewers are at a deep depth and outside of the extents of the Edith Key site. The Barbara Hepworth building is drained by an existing drainage system.

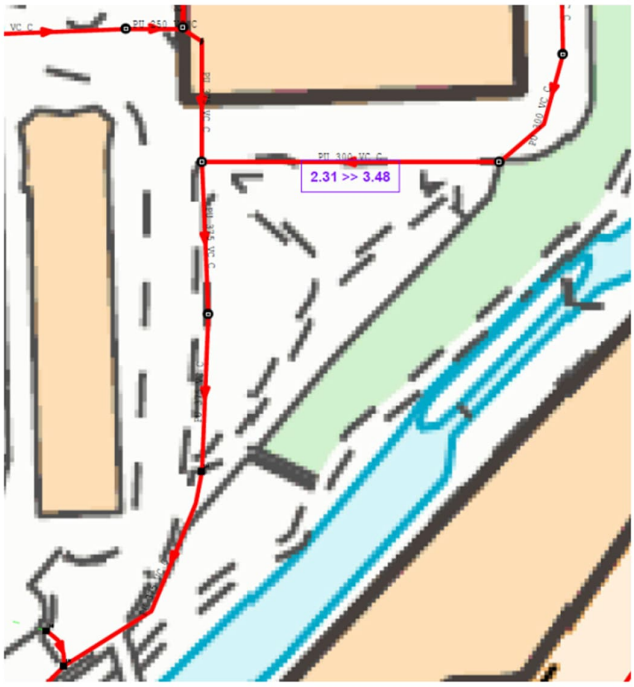


Figure 6 - Yorkshire Water sewer records

9.3 On this basis it is assumed that the existing infrastructure flooding risk is likely to be Low.

10 RESERVOIR AND OTHER ARTIFICIAL SOURCES OF FLOODING

10.1 Reservoir flooding is unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925 and even with recent events, measures are in place to monitor and protect reservoirs in event of an unlikely catastrophic event. All large reservoirs must be inspected and supervised by reservoir panel engineers.

10.2 As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly, and essential safety work is carried out. These laws are being currently reviewed and it is expected that the requirements for monitoring and maintenance will become more stringent.

10.3 However, in the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning.

10.4 The Environment Agency Map showing Risk of Flooding from Reservoirs is shown below.

10.5 The site and the surrounding area has a low risk of flooding while there is otherwise high water levels in the rivers and watercourses.

10.6 On this basis, the risk of flooding from reservoirs and other artificial sources is Low.

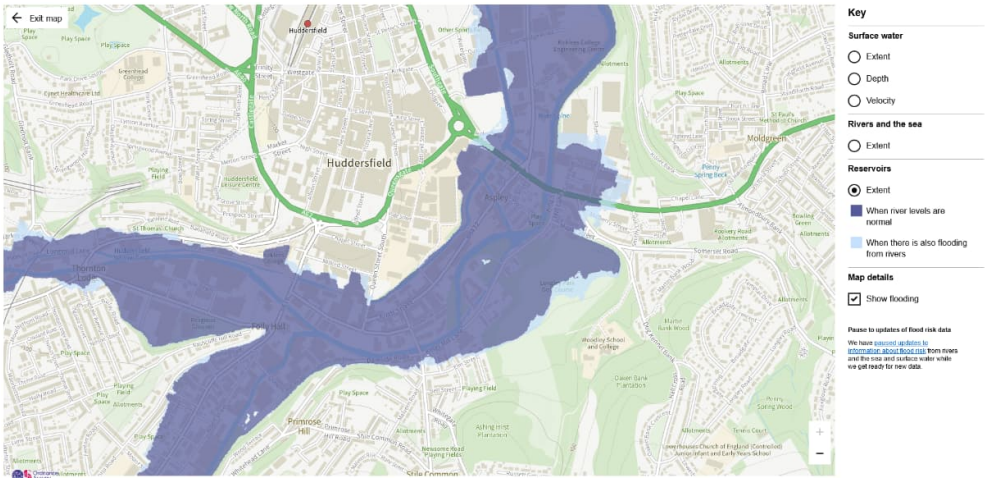


Figure 7 – Reservoir Flooding (EA)

11 DRAINAGE ASSESSMENT

SURFACE WATER DRAINAGE STRATEGY

11.1 The Barbara Hepworth Building has an existing drainage and land drainage system in the area being developed. As the proposed works involve the replanting of the existing landscaped area, with no material change to impermeable area, it is expected that no significant changes to the drainage system will be made. It is expected that the new planted areas and seating walls will utilise open graded aggregate to allow for free-draining planting and this will allow for water uptake and storage of any rainfall within the landscaped areas with negligible runoff. Additionally, the existing canopy above the planting area means that the site will only receive sideways blown rain.

11.2 The park on the former site of the Edith Key building will be designed direct runoff into gullies which are then fed into a carrier system, linked to tree pits and rain gardens. It is hoped that infiltration into the sandstone below the site will be possible, but should rates not be viable then these tree pits and rain gardens will be designed to attenuate the runoff. The graded soils and filter trenches will provide storage for the severe storm events and allow for a minimum practicable runoff rate from the site at 3.5l/s in all storm events up to the 1:100 + 45% climate change. It is expected that during spring and summer periods, that the runoff from the site will be minimal and all water will be intercepted by the vegetation, with runoff to the existing drainage connection only used during the winter months. Further SI is being undertaken to ascertain whether the underlying soils will allow for infiltration into the ground.

Drainage Strategy and Modelling

11.3 The drainage strategy documentation is in Appendix E.

11.4 The drainage strategy is shown on plan 24462-DCE-XX-XX-D-C-100.

11.5 Hydraulic Modelling has been undertaken and is in Appendix E.

12 FLOOD RISK MITIGATION MEASURES

12.1 The proposed development is Flood Zone 1.

12.2 There is negligible risk to the developments from any form of flooding. The use of the areas are water compatible public open spaces and there are no buildings or other sensitive structures of developments on the sites.

12.3 It is expected that paved areas will be positively drained so that the buildup of ice and other detritus is controlled in accordance with Building Regulations and to ensure accessibility.

12.4 As the site is adjacent to areas of higher flood risk, it is expected that the sites will need to adhere to the wider flood evacuation strategy and flood management plan and will not be occupied when there is a flood warning or severe flood warning in place in the area.

13 MAINTENANCE OF DRAINAGE SYSTEMS

13.1 The system has been designed so that the drainage system is fully accessible and maintainable with flooding easily visible if it occurs. The maintenance schedule for the individual elements of the scheme is as per manufacturer's recommendations and as follows.

Pipe Network	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions.	Monthly for 3 months as a part of normal post completion monitoring, then biannually. If flooding is identified, take immediate action.
Debris removal from manholes (where may cause risk performance)	As required, but at least twice a year
Where rainfall into network from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually, or as required and after large storms

Flow Control	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions.	Monthly for 3 months as a part of normal post completion monitoring, then biannually
Debris removal from manholes (where may cause risk performance)	Monthly
Where rainfall into network from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Repair/check all inlets, outlets and overflow pipes	As required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually and after large storms

Permeable Paving	
Operation	Frequency
Brushing and Vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations.
Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial work to any depressions or cracks in the tarmac / block paviors considered detrimental to the structural performance or a hazard to users and replace lost jointing material.	As required.

Permeable Paving	
Operation	Frequency
Rehabilitation of surface and upper substructure by remedial sweeping	As required
Inspect for evidence of poor operation	Three-monthly, 48 hours after large storms in first six months
Inspect filter media and establish appropriate replacement frequencies	Six monthly or as required by the Manufacturer.
Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly for first half year of operation, then every six months, or as required by the Manufacturer.
Note – All Permeable / Porous Paving should be maintained and monitored under a Service Plan which is compatible with the Manufacturer's warranty.	

Filter and Land Drainage	
Operation	Frequency
Remove litter and debris from filter drain surface, access chambers	Monthly or as required.
Manage Vegetation and remove nuisance plants	Twice during growing season.
Inspect filter drain surface, pipework and other systems for clogging, ponding, erosion, contamination or damage	Monthly at start, then six monthly.
Inspect chambers and perforated pipework for silt accumulation. Establish silt removal process.	Six Monthly
Remove sediment treatment devices and pipework and chambers.	Six Monthly or as required.
Remove tree roots where they are encroaching the sides of the filter drain.	As required
Repair erosion and damage to drainage	As required
Scarify surface and break up silt deposits and compacted materials. Remove build up of sediment on filter trench.	As required.
Clear pipework of blockages.	As required
Replace filter media	Every 10 – 20 years, or if identified by inspector. Higher if located in areas of very high pollution loads.

Bioretention System	
Operation	Frequency
Inspection of all components including infiltration surfaces, underdrainage and inlets, outlets, overflows.	Three to Six Months
Check operation of underdrains by inspection of flows after rainfall events.	Annually
Inspection of drain outlets to ensure unrestricted runoff.	Annually and after large storms
Inspect incoming and outgoing pipework, clear if required.	Monthly
Remove litter and debris	Monthly or as required.
Reseed areas of poor vegetation growth and monitor vegetation coverage to maintain plant density.	As required.
Repair erosion or other damage to filter media, substrate and add additional erosion control if needed.	As required.

Bioretention System	
Operation	Frequency
Remove silt accumulations by scarifying surface of mulch and replacing mulch.	As required.
Replace filter media.	Every 10 – 20 years, or if identified by inspector.
Removal of unsuitable residue (oil, pollutants, silt)	As required.

Tree Pits	
Operation	Frequency
Inspection of all components including infiltration surfaces, underdrainage and inlets, outlets, overflows.	Three to Six Months
Manage vegetation and nuisance plants .	Monthly at start, then as required.
Inspection of drain outlets to ensure unrestricted runoff.	Annually and after large storms
Inspect incoming and outgoing pipework, clear if required.	Monthly
Remove litter and debris	Monthly or as required.
Check Tree health and manage tree appropriately.	Annually.
Remove silt build up and debris from surface and inlets.	Annually or as required.
Water Tree	In periods of drought
Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly for first half year of operation, then every six months, or as required by the Manufacturer.
Removal of unsuitable residue (oil, pollutants, silt)	As required.

13.2 The maintenance of the drainage network and SuDS features are to be linked with the wider site maintenance.

13.3 A log of all maintenance activities is to be kept and made available to the local planning authority (LPA) and / or the Lead Local Flood Authority (LLFA) on request.

14 CONCLUSION AND RECOMMENDATIONS

14.1 The site is in Flood Zone 1. It is a Lesser vulnerability development which is suitable for this flood zone.

14.2 There is no risk of flooding from rivers and the sea.

14.3 There is a low risk of flooding from surface water sources due to the existing topography of both sites.

14.4 There is a low risk of flooding from reservoirs, but only when there is already high water levels on the river and canal.

14.5 There is a low risk of sewer flooding.

14.6 Both sites will drain into the underlying ground using infiltration and will rely on plant uptake of water to manage runoff where possible. The Edith Key site will have a surface water outfall to the existing sewer with runoff managed to a minimum practicable rate.

14.7 The site will be water compatible as it is a public open space with seating. Minimal flood mitigation measures will be required.

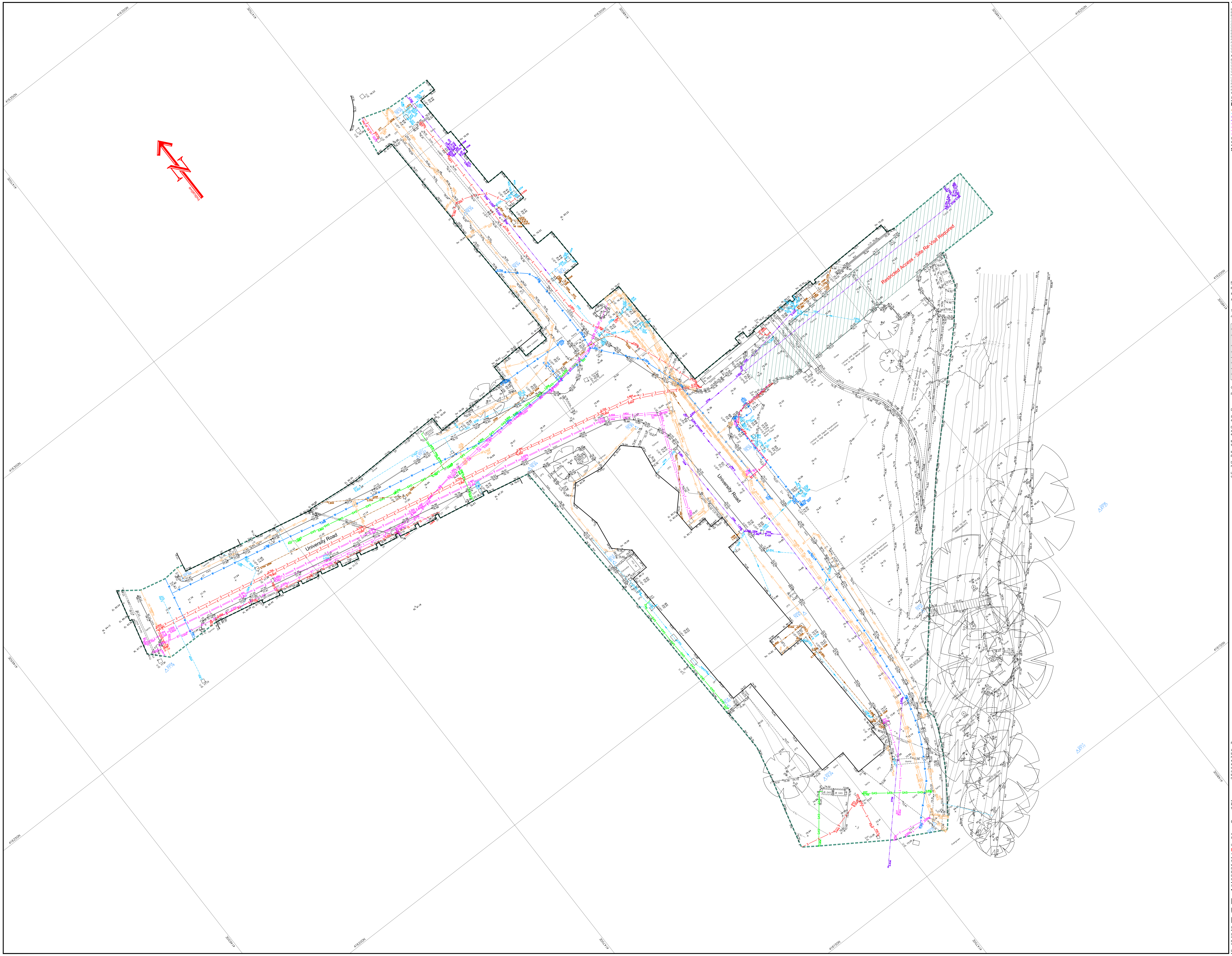
14.8 The drainage system will need regular maintenance in accordance with the schedule provided.

14.9 The schemes are wholly suitable for the flood zone and flood risk is fully mitigated and managed within the sites through SUDS methods.

Sebastian Reid, CEng MICE MCIHT
Associate

On behalf of Dudleys Consulting Engineers

APPENDIX A – EXISTING SITE INFORMATION



Topographical Survey Legend

B	Bollard	h	Height	SP	Soil pipe		Level prefix descriptions
BS	Bus stop	Hyd	Hydrant	ST	Stop tap	AL	Arch level
BT	British telecom ic	IC	Inspection cover	Stay	Cable stay	BL	Bed level
CPS	Concrete paving slabs	JB	Junction box	SV	Stop valve	CL	Cover level
CTV	Cable television cover	KO	Kerb outlet	TCB	Telephone call box	EL	Eaves level
DP	Downpipe	LB	Letter box	TL	Traffic light	FL	Floor level
DR	Drain	LP	Lamp post	TP	Telegraph pole	IL	Invert level
Elec	Electrical ic	Mkr	Utility marker	TPS	Tactile paving slabs	PL	Parapet level
EP	Elec. pole	MP	Mile post	VP	Vent pipe	RL	Roof/ridge level
ER	Earth rod	NP	Name plate	WM	Water meter	SL	Soffit level
FP	Flagpole	P	Post	WO	Water outlet	Spr	Arch springing level
FT	Floodlight	PM	Parking meter	UTL	Unable to lift	TF	Top of fence level
G	Gully	RE	Rodding eye			TW	Top of wall level
GP	Gate post	RS	Road sign			Thr	Threshold level
GV	Gas valve	rwp	Rain water pipe			WL	Water level

Fence annotation

B/W	Barbed wire
C/B	Closed boarded
C/I	Corrugated iron
C/L	Chain link
C/P	Concrete panel
H/R	Hand rail
I/R	Iron railings
O/B	Open boarded
P/C	Post & chain
P/R	Post & rail
P/W	Post & wire
W/M	Wire mesh

C/L Fence
Safety barrier
Gate
Stile
Hedge
Limit of foliage & tree canopy
50.00 Spot level
SSL1 50.00 Survey control station (Coordinated point)
Tree
MT Multi trunk

Levels defining edge of carriageway are observed at channel (bottom of kerb). Unless otherwise stated.

Drainage/Services Legend

Foul
Surface
Combined
Drainage (unspecified)
BT British telecom
T Telecom
FO Fibre optics
CATV CATV
CCTV CCTV
E Electric
SL Street lighting
TM Traffic management
GAS Gas
W Water
F Fuel
UK Unknown / misc
Ducting
ED Empty Duct
d Service depth (m)
ø Pipe diameter (mm)
EOT End of trace
UTT Unable to trace
Utility Survey Boundary

Drainage pipe size data has been determined from the surface, in order to comply with confined spaces health and safety legislation. Please regard this data as approximate.

Survey Station Coordinates

STN	EASTING	NORTHING	LEVEL
D002	414757.92	416240.78	75.83
D003	414771.66	416225.66	75.28
D001	414681.24	416267.81	77.88
D004	414761.07	416198.24	74.63
D005	414777.21	416186.17	74.41
D006	414811.55	416181.23	67.27
D011	414725.49	416259.65	77.03
D012	414739.27	416246.36	76.64
D013	414740.87	416224.94	75.91
D014	414741.17	416193.69	75.92
D015	414746.53	416173.81	74.04
D016	414756.58	416156.36	73.11
D017	414783.38	416151.11	67.18
D021	414757.38	416275.23	76.54
D022	414757.29	416287.40	76.54
D023	414758.24	416307.28	76.49
JL01	414763.64	416270.39	76.47
X004	414669.38	416257.25	77.78
XXXX	414596.87	416275.80	81.36

PAS128 Quality Levels

Please refer to PAS128:2014 Table 1 - "Quality level of survey outputs (normative)" for in anticipated accuracy of quality levels.

All utilities are located to PAS128 QL-B2 unless otherwise stated.

The following table identifies the PAS128 quality level based on the text notes shown on the drawing:

Annotation found on drawing	PAS128 Quality Level
Added from records	PAS128 QL-D
Trench scar, street furniture, visual note/reference to utility	PAS128 QL-C
Assumed route	PAS128 QL-B4
Unable to obtain depth	PAS128 QL-B3
QL-B1	PAS128 QL-B1
QL-B3P	PAS128 QL-B3P
QL-B2P	PAS128 QL-B2P
QL-B1P	PAS128 QL-B1P

Quality levels ending with a "P" refer to a utility that has been located with post processed Ground Penetrating Radar (GPR).

Drawing caveats, please note:

Survey Systems Ltd carry out surveys in accordance with site procedures using approved detectors.

Depth data is limited by the accuracy of the detection equipment. Average accuracy is +/- 10% of depth with GPR and +/- 5% of the depth with electromagnetic technologies.

It is SSL's procedure to use statutory undertakers plans prior to and during the survey as a guide for the survey team.

In accordance with British Telecom's national policy survey companies are not permitted to raise BT inspection chamber covers.

Drainage routes between manholes, if not able to be traced by Locate's survey methodologies, are assumed to be direct lines between manholes.

Locate advise that excavations in the vicinity of services are carried out with due diligence, please refer to HSG47.

Please note:

Any discrepancy found between an Ordnance Survey benchmark and an OSGB15 computed orthometric height is likely to be due to bench mark subsidence or uplift and, assuming precise GPS survey has been carefully carried out, the orthometric height given by OSGB15 should be considered correct in preference to archive benchmark heights. OSGB15 converts GPS ellipsoid heights to orthometric heights above mean sea level.

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Fax 01625 526815
mail@survsys.co.uk
www.survsys.co.uk

Levels are related to **OSGB15**
Value **n/a**

Coordinates are related to **National Grid** (GPS)

Scale **1:200**
0 2 4 6 8 10 12 14 16 18
metres

The accuracy of this survey is commensurate with the drawing scale specified within the title block.

Do not scale from this drawing, work to figured dimensions.
Check all dimensions on-site.
In the event of any discrepancy, please refer query to Survey Systems Ltd.

Title
Topographical & Utility Survey
Rifle Street
University Road
Huddersfield HD1 3DH

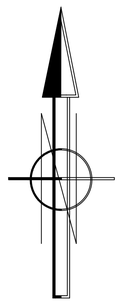
Surveyed	DI JL AT CM	Drawn	GAT AG
Date	January 2020	Checked	AT MT
File name	17036A-TOPO-UTIL	Revision No.	Sheet size A0

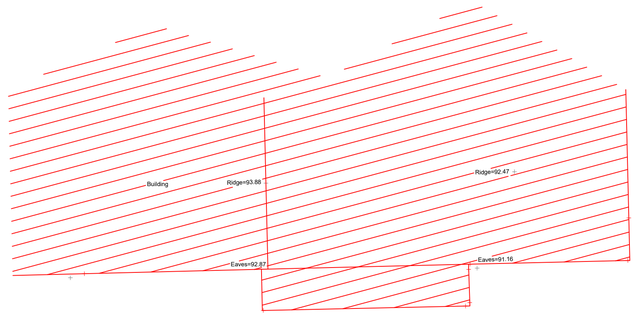
Drawing No. **SSL:17036A:200:1:1**

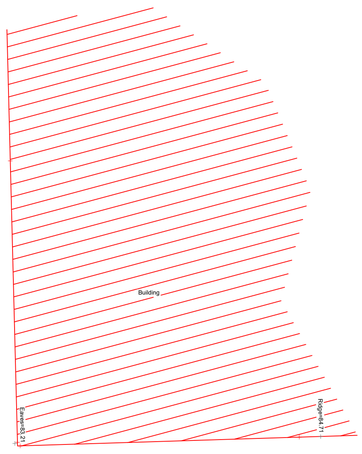
SURVEYsystems

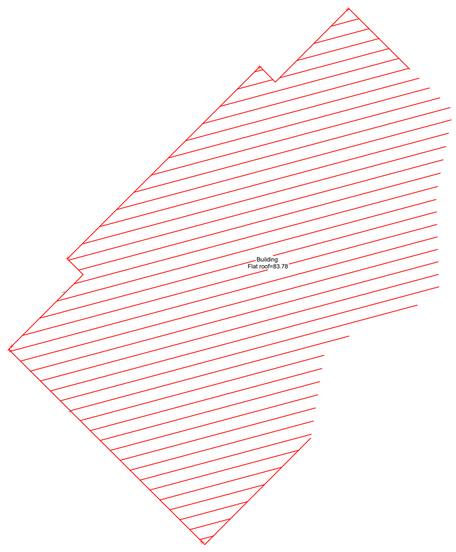
414700.000 414750.000 414800.000

416250.000 416200.000 416150.000 416100.000









TITLE	Topographical Survey University Road University of Huddersfield
CLIENT	GSS Architecture
DATE	Nov 2024
DRAWN BY	ACA
CHKD. BY	SA
DRG NO	14051 - 01
PLOT SCALE	1 : 200 @ A0

REV	AMENDMENT	DATE	BY	CHKD.

CSL SURVEYS
CONSULTING SURVEYORS
LAND-ENGINEERING-BUILDING
751 Scott Hall Road ▪ Moortown ▪ Leeds
Tel 01132 893924 ▪ Tel 07739 753 651
Email info@cslsurveys.co.uk ▪ www.cslsurveys.co.uk

NOTES

This survey has been fitted to Ordnance Survey Grid and Datum using GPS coordinates system OSGB36-15 and has been drawn at a scale factor of 1.0000.

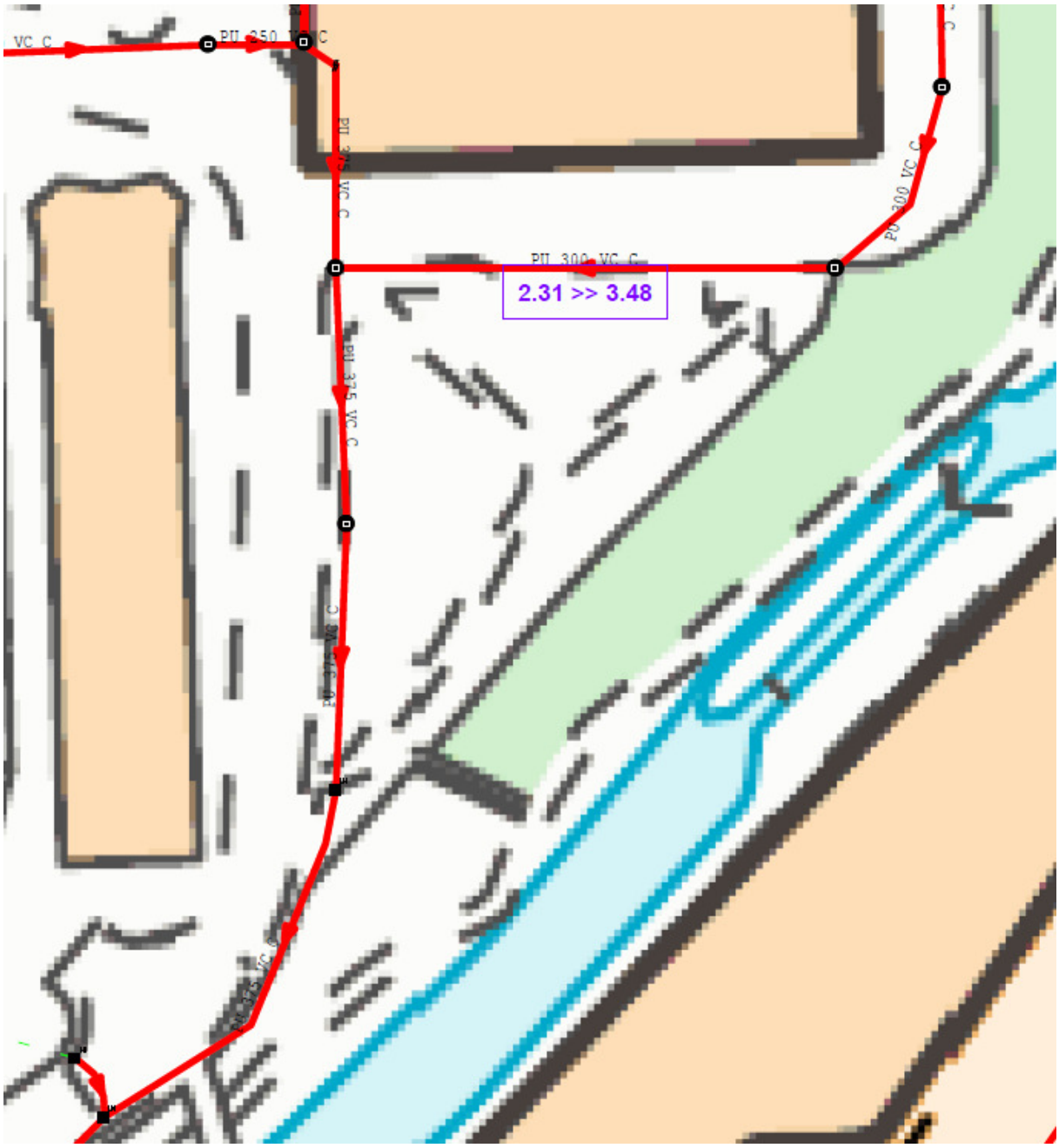
Although this survey is tied to Ordnance Survey, due to the scale factor, any setting out or design works should strictly use the control co-ordinates contained within the table.

Boundaries shown are physical features on site and do not necessarily represent the legal extents of ownership.

KEY

AC	- Air Condition	CB	- Control Box	FE	- Fire Escape	MK	- Marker
ARMC.	- Armco Barrier	CBL	- Cable	FH	- Fire Hydrant	NB	- Notice Board
AV	- Air Valve	CCTV	- CCTV	FHT	- Fence Height	OC	- Overhead Cable
BALC.	- Balcony	COL.	- Column	FL	- Floor Level	PI	- Pipe
BD	- Building	CON.	- Contour	FP	- Flag Pole	PE	- Playground Equipment
BDCAN	- Building Canopy	CP	- Car Parking	FR	- Flat Roof	PRT	- Portacabin
BH	- Borehole	CPY.	- Canopy	G	- Gully	PST	- Post
BL	- Bed Level	CSL	- Survey Station	GARG	- Garage	RD	- Ridge
BOB	- Bottom Of Bank	CTR	- Container	GH	- Greenhouse	RE	- Rodding Eye
BOL	- Bollard	DC	- Drainage Channel	GT	- Gate	RM	- Road Markings
BRDG	- Bridge	DIA	- Diameter	GV	- Gas Valve	RMP	- Ramp
BSHEL	- Bus Shelter	DK	- Drop Kerb	H	- Hedge	RS	- Road Sign
BSTOP	- Bus Stop	EA	- Edge Area	HH	- Hedge Height	SF	- Street Furniture
BT	- British Telecom	EP	- Electric Pole-Pylon	IC	- Inspection Chamber	SHD	- Shed
BUSH	- Bush	ER	- Earth Rod	IL	- Invert Level	ST	- Stone
CARA.	- Caravan	EV	- Eaves	K	- Kerb	STP	- Steps
CATV	- CATV	F	- Fence	LP	- Lamp post	SV	- Stop Valve

TH	- Threshold	TNK	- Tank
TL	- Traffic Light	TOB	- Top Of Bank
UTL	- Unable To Lift	TP	- Telegraph Pole
V	- Vegetation	TPT	- Telegraph Pole Tie
VH	- Vegetation Height	TRH	- Tree Height
VN	- Vent	TT	- Tree Trunk
W	- Wall	UTL	- Unable To Lift
WH	- Wall Height	V	- Vegetation
WL	- Water Level	VH	- Vegetation Height
WM	- Water Meter	VN	- Vent
WO	- Water Orifice	W	- Wall



Extract Of Yorkshire Water Sewer Record

APPENDIX B – PROPOSED SITE INFORMATION

1. Proposed GA Plan (BH)

SCALE - 1 : 100@A1

1:100 Scale 0 1m 2m 5m 10m

Legend

- Site Boundaries
- Existing Tactile Paving
- Existing Grass Areas
- Existing Balustrade
- Existing Buildings
- Existing Canal
- Existing Overhang
- Existing Cobbles
- Existing Ancheson Glover Plaza Paving Block
- Listed Stone Wall
- Existing Seating
- Existing Lighting
- Existing Granite Blockwork
- Retaning Wall Specicication TBC: 2 Options - Granite Blocks or Gabion Baskets.
- Proposed Stainless Steel Tubular Balustrade and Handrail to match Existing
- Proposed Shrub Planting - 58m²
- Proposed Sunny Wildflower Mix - 66m²
- Proposed Semi-Shade Wildflower Mix - 262m²
- Proposed Gravel - 6.3m²
- Proposed Golpa Gravel: to create safe maintenance strip. - 37m²
- Proposed Topography/ Contours
- 5 x Proposed Trees
- Proposed Rocks
- Proposed Levels
- Existing Levels - Not Proposed to Change
- (F) Existing Fire Doors
- Existing Vehical barrior/ Emergency and maintenace vehical gate

Key Plan

Rev	Date	Drn	Chk	Description
P04	06.05.25	AMG	CJPW	Maintance strip key wording updated.
P03	10.02.25	AMG	CJPW	Planning Issue. For Design Team Comments.
P02	27.01.25	AMG	CJPW	Changes made to retaining wall arrangement and proposed levels, to align with product options and maintenance access.
P01	19.12.24	AMG	CJPW	Preliminary Issue. Co-ordination with Planting Strategy

GSSarchitecture
KETTERING | GLOUCESTER | HARROGATE | LEEDS | MILTON KEYNES | NEWCASTLE

Project Title: Campus Landscaping Schemes

Client: University of Huddersfield

Drawing Title: Proposed GA Plan (BH)

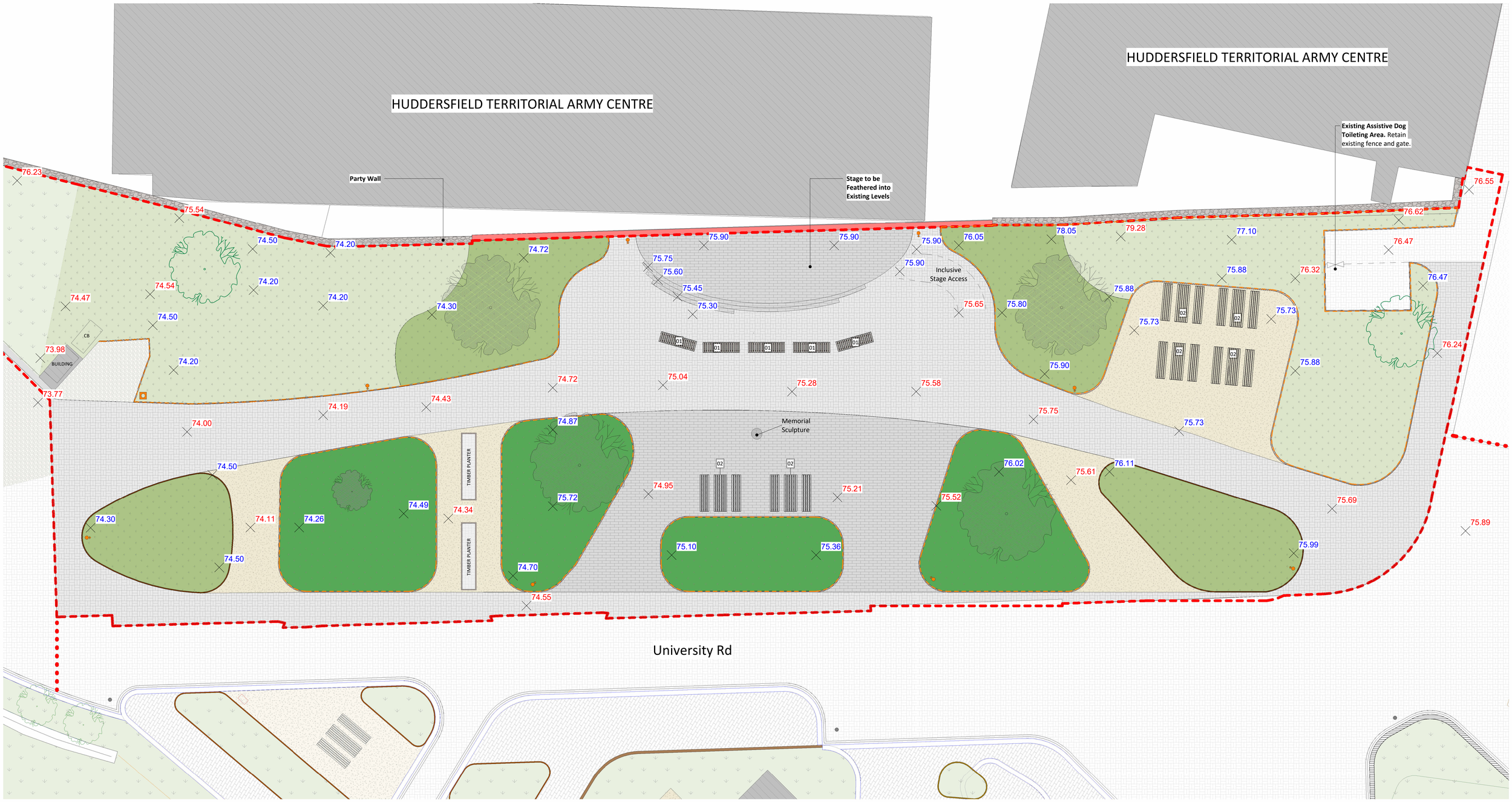
Drawn By:	Checked By:	Scale @A1:	Date:
AMG	CJPW	1 : 100	06/12/2024

Status: Preliminary Issue

File No: UNI049H

Drwg No: (00)100

Rev: P04



1:100 Scale 0 1m 2m 5m 10m

Legend

EXISTING:

- Site Boundaries
- Existing Vehical barrior/ Emergency and maintenace vehical gate
- Existing Buildings
- CB: Existing Control Box
- Existing Planting
- Exiting Tree
- Existing Canal
- Existing Retaining Wall
- Existing Resin Bonded Gravel
- Existing Acheson Glover Plazza Paving Blocks Size: 100 x 200 x 80mm
- Existing Cobbles
- Existing Marshals Modal Paving Slabs, Size: 300/200 x 200 x 80mm
- Existing Marshalls Conservation Kerb - Upstand,Size: 255 x 145 x 915mm, Finish: Silver Grey, Textured
- Existing Set Trim (2 Row) Size: 100 x 200 x 80mm Colour: Mid Grey Granite Bond: Slack Bond
- Existing Stone Wall
- Existing Brick Wall
- Existing Road/Tarmac
- Existing Marshalls Conservation Kerb - Flush,Size: 255 x 145 x 915mm,Finish: Silver Grey, Textured

PROPOSED:

- Proposed Shrub Planting - 196m²
- Proposed Rowlawn Medallion Turf - 208m²
- Proposed Wildflower Turf - Lindum -294m²
- Proposed Prorous Bonded Resin (Colour and aggregate TBC) - 158m²
- Logic Velox Rapid Edge Planter
- Proposed Acheson Glover Plazza Paving Blocks, Size: 100 x 200 x 80mm
- Proposed Marshals Modal Paving Slabs, Size: 300/200 x 200 x 80mm - 58m2
- Concrete Kerb with Bullnose 37m Length of 125mm upstand with transitions Size: 125 x 255 x 915mm
- 8x DW Windsor Sephora Halo Radius with 6m coloumn root mount coloumn. To match Existing around the Campus.
- 1x Altron - AW1545/5/UP 5 Meter high CCTV Column.
- Proposed Tree
- Proposed Levels
- Existing Levels - Not proposed to change

GROUP (Contractual Responsibility) Supply/Install Responsibility:
Group 1: Supplied and fixed by Contractor
Group 2: Supplied by Client, Installed by Contractor
Group 3: Supplied & Installed by Client

Logic Street Furniture Schedule

Type Mark	Furniture Group	Description	Count
01	1	Composite Bench	4
02	1	Composite Picnic Bench	6

Key Plan

Rev	Date	Drn	Chk	Description
P06	06.05.25	AMG	CJPW	Revised to coordinate with planting strategy, Lighting & CCTV plans.
P05	25.04.25	AMG	CJPW	Resin bonded material amendement.
P04	14.04.25	AMG	CJPW	VE amendments made, retained Assistive Dog Toileting area.
P03	10.02.25	AMG	CJPW	Planning Issue. For Design Team Comments.
P02	27.01.25	AMG	CJPW	Red line boundary alteration. Revised Changes to meet manufacturer specifications
P01	19.12.24	AMG	CJPW	Preliminary Issue. Co-ordination with Planting Strategy

GSSarchitecture
KETTERING | GLOUCESTER | HARROGATE | LEEDS | MILTON KEYNES | NEWCASTLE

Project Title: Campus Landscaping Schemes
Client: University of Huddersfield
Drawing Title: Proposed GA Plan (EK)

Drawn By:	Checked By:	Scale @A1:	Date:
AMG	CJPW	1 : 100	05/12/2024

Status: Preliminary Issue
File No: UNI049H
Drwg No: (00)200
Rev: P06

APPENDIX C – FLOOD MAP FOR PLANNING

Environment Agency

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
414694/416124

Scale
1:2,500

Created
11 Jun 2025 11:46

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

0 20 40 60 m

Environment Agency

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
414750/416208

Scale
1:2,500

Created
11 Jun 2025 11:44

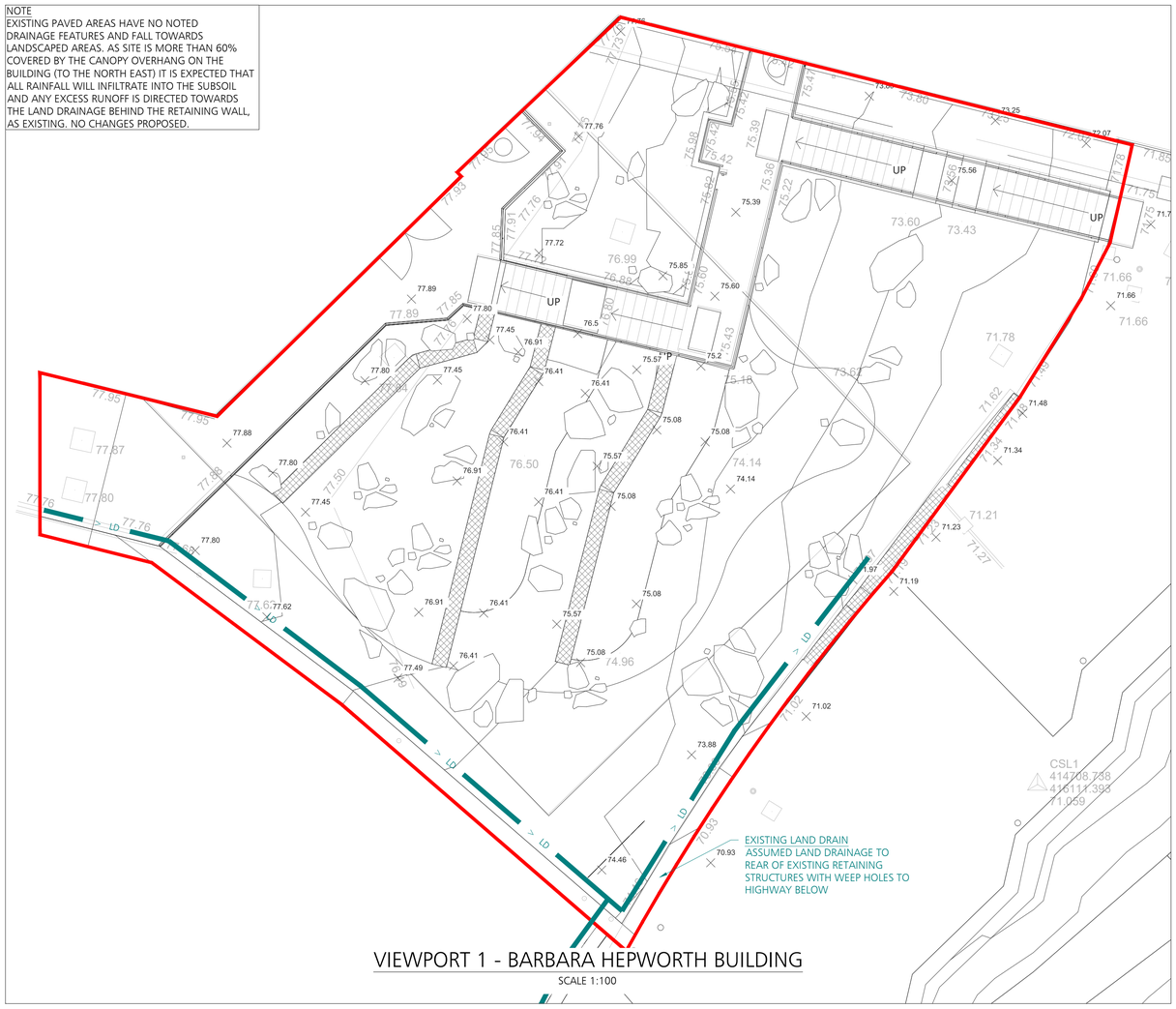
- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60 m

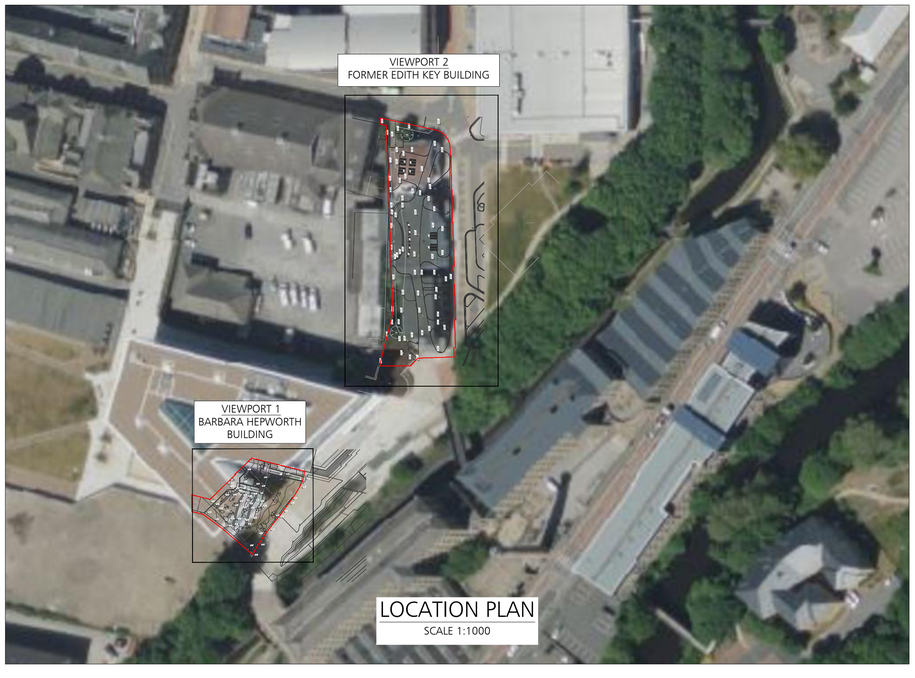
APPENDIX D – FLOOD MODELLING AND DATA

APPENDIX E – DRAINAGE PLANS, MODELLING AND TECHNICAL INFORMATION

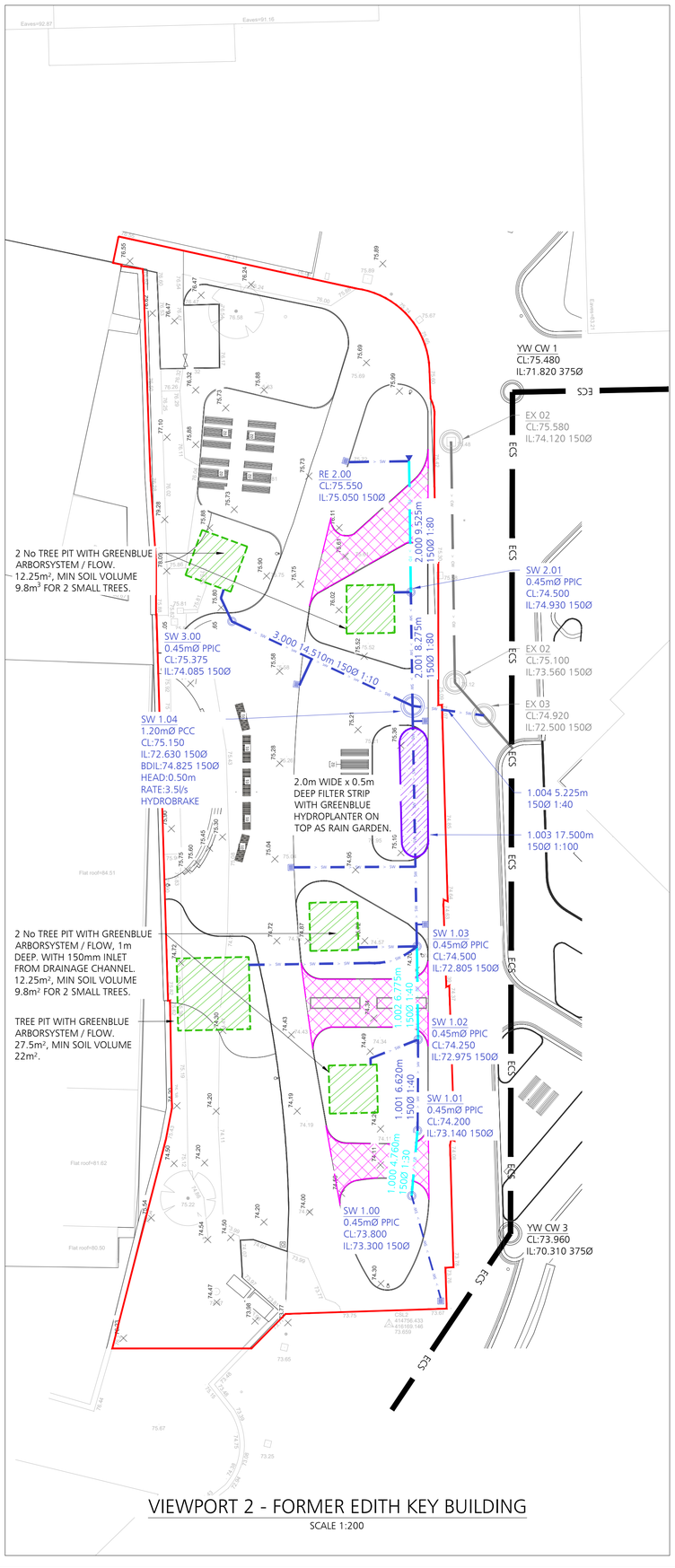
NOTE
EXISTING PAVED AREAS HAVE NO NOTED DRAINAGE FEATURES AND FALL TOWARDS LANDSCAPED AREAS. AS SITE IS MORE THAN 60% COVERED BY THE CANOPY OVERHANG ON THE BUILDING (TO THE NORTH EAST) IT IS EXPECTED THAT ALL RAINFALL WILL INFILTRATE INTO THE SUBSOIL AND ANY EXCESS RUNOFF IS DIRECTED TOWARDS THE LAND DRAINAGE BEHIND THE RETAINING WALL, AS EXISTING. NO CHANGES PROPOSED.



VIEWPORT 1 - BARBARA HEPWORTH BUILDING
SCALE 1:100



LOCATION PLAN
SCALE 1:1000



VIEWPORT 2 - FORMER EDITH KEY BUILDING
SCALE 1:200

NORTH

DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.

ABNORMAL HAZARD REFERENCE

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS TO BE REPRODUCED IN COLOUR.
3. IF ANY DISCREPANCIES ARE FOUND IN THIS DRAWING, PLEASE REPORT TO DUDLEYS CONSULTING ENGINEERS.
4. THIS DRAWING HAS BEEN ORIENTATED TO OS BRITISH NATIONAL GRID (EPSG:27700 OSGB36). EXISTING SURVEY STATIONS ARE SHOWN ON THE TOPOGRAPHICAL SURVEY.
5. THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
   5.1. 14051-01 - TOPOGRAPHICAL SURVEY BY CSL SURVEYS DATED NOVEMBER 2024
   5.2. (00)100 - REV P04 - SITE LAYOUT PLAN BY GSS ARCHITECTURE DATED MAY 2025
   5.3. (00)200 - REV P06 - SITE LAYOUT PLAN BY GSS ARCHITECTURE DATED MAY 2025
6. ALL WORK TO BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS, SEWERAGE SECTOR CODES OF PRACTICE, AND THE RELEVANT LOCAL HIGHWAY AUTHORITY STANDARDS.
7. EXISTING BUILDING HAS BEEN DEMOLISHED AND NO EXISTING ACTIVE DRAINAGE IS PRESENT ON SITE. SITE IS TO BE ASSESSED AS GREENFIELD. GREENFIELD RATE FOR THE 1600m² IS 0.52l/S. MINIMUM PRACTICABLE RATE FOR THE SITE IS 3.5L/S TO ENSURE THAT FLOW RESTRICTIONS CAN BE MAINTAINABLE.
8. NO SI UNDERTAKEN AT THIS STAGE, BUT SITES ARE PREVIOUSLY DEVELOPED AND FULLY CONSTRAINED, INFILTRATION IS NOT LIKELY.
9. SUDS USED TO ALLOW FOR PLANT WATER UPTAKE AND TO ENSURE THAT TREES HAVE ADEQUATE ROOT SPACE FOR GROWTH IN ACCORDANCE WITH BNG ASSESSMENT. ATTENUATION DESIGN AROUND THE ROOT STORAGE SYSTEMS AND RAIN GARDENS TO ENSURE THAT ALL FLOWS UP TO THE 1:100 + 45% STORM EVENT ARE CATERED FOR WITHOUT FLOODING.

KEY

- PROPOSED PRIVATE SURFACE WATER DRAIN
- PROPOSED PRIVATE SURFACE WATER MANHOLE
- PROPOSED PRIVATE SURFACE WATER PPIC
- PROPOSED PRIVATE SURFACE WATER RODDING EYE
- PROPOSED PRIVATE SURFACE WATER YARD GULLY
- EXISTING ADOPTED COMBINED WATER SEWER
- EXISTING ADOPTED COMBINED WATER MANHOLE
- EXISTING PRIVATE COMBINED WATER DRAIN
- EXISTING PRIVATE COMBINED WATER MANHOLE
- TREE PIT
- FILTER DRAIN UNDER RAIN GARDEN
- EXISTING LAND DRAIN
- PROPOSED PRIVATE PERMEABLE PAVEMENT
- PROPOSED PRIVATE FILTER DRAIN
- SITE BOUNDARY

DATE	REVISION DESCRIPTION	BY	CHK.	REV.
12.06.25	TREE PITS REMOVED AND RELOCATED	OB	SDR	P03
11.06.25	SITE LAYOUT REVISED - CHANNEL DRAINS REPLACED WITH GULLIES	OB	SDR	P02
03.01.25	PRELIMINARY ISSUE	SDR	SDR	P01

DUDLEYS CONSULTING ENGINEERS
Tithe House
35 Town Street
Leeds, LS18 5JJ
0113 258 3611
info@dudleys.co.uk

PROJECT
UNIVERSITY OF HUDDERSFIELD BARBARA HEPWORTH AND EDITH KEY PUBLIC OPEN SPACES

TITLE
DRAINAGE STRATEGY

SCALE	PAPER	STAGE	STATUS
AS SHOWN	A1	PRELIMINARY	

DRAWING NO.
24462-DCE-XX-XX-D-C-100

REV.
P03

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE 2.00	0.022	5.00	75.550	270	414757.894	416231.922	0.500
SW 1.04	0.027	5.00	75.150	1200	414758.144	416214.124	2.520
SW 3.00		5.00	75.375		414744.998	416220.268	1.290
EX 03			74.920	1200	414763.321	416213.431	2.419
SW 1.01	0.007	5.00	74.200		414758.508	416183.232	1.070
SW 1.00	0.006	5.00	73.800	270	414758.081	416178.493	0.500
SW 2.01			75.500		414758.023	416222.397	0.570
SW 1.02			74.250		414758.550	416189.854	1.275
SW 1.03			74.500		414758.459	416196.631	1.695

Links (Input)

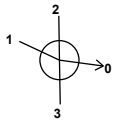
Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	RE 2.00	SW 2.01	9.525	0.600	75.050	74.930	0.120	79.4	150	5.14	48.7
3.000	SW 3.00	SW 1.04	14.511	0.600	74.085	72.630	1.455	10.0	150	5.08	48.9
1.000	SW 1.00	SW 1.01	4.758	0.600	73.300	73.130	0.170	28.0	150	5.04	49.1
1.004	SW 1.04	EX 03	5.223	0.600	72.630	72.501	0.129	40.5	150	5.53	47.3
2.001	SW 2.01	SW 1.04	8.274	0.600	74.930	74.825	0.105	78.8	150	5.26	48.3
1.003	SW 1.03	SW 1.04	17.496	0.600	72.805	72.630	0.175	100.0	150	5.47	47.5
1.001	SW 1.01	SW 1.02	6.622	0.600	73.130	72.975	0.155	42.7	150	5.11	48.8
1.002	SW 1.02	SW 1.03	6.778	0.600	72.975	72.805	0.170	39.9	150	5.18	48.5

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	9.525	79.4	150	Circular	75.550	75.050	0.350	75.500	74.930	0.420
3.000	14.511	10.0	150	Circular	75.375	74.085	1.140	75.150	72.630	2.370
1.000	4.758	28.0	150	Circular	73.800	73.300	0.350	74.200	73.130	0.920
1.004	5.223	40.5	150	Circular	75.150	72.630	2.370	74.920	72.501	2.269
2.001	8.274	78.8	150	Circular	75.500	74.930	0.420	75.150	74.825	0.175
1.003	17.496	100.0	150	Circular	74.500	72.805	1.545	75.150	72.630	2.370
1.001	6.622	42.7	150	Circular	74.200	73.130	0.920	74.250	72.975	1.125
1.002	6.778	39.9	150	Circular	74.250	72.975	1.125	74.500	72.805	1.545

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	RE 2.00	270	Manhole	Adoptable	SW 2.01		Junction	
3.000	SW 3.00		Junction		SW 1.04	1200	Manhole	Adoptable
1.000	SW 1.00	270	Manhole	Adoptable	SW 1.01		Junction	
1.004	SW 1.04	1200	Manhole	Adoptable	EX 03	1200	Manhole	Adoptable
2.001	SW 2.01		Junction		SW 1.04	1200	Manhole	Adoptable
1.003	SW 1.03		Junction		SW 1.04	1200	Manhole	Adoptable
1.001	SW 1.01		Junction		SW 1.02		Junction	
1.002	SW 1.02		Junction		SW 1.03		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE 2.00	414757.894	416231.922	75.550	0.500	270		0	2.000	75.050	150
SW 1.04	414758.144	416214.124	75.150	2.520	1200		1	3.000	72.630	150
							2	2.001	74.825	150
							3	1.003	72.630	150
							0	1.004	72.630	150
SW 3.00	414744.998	416220.268	75.375	1.290			0	3.000	74.085	150
EX 03	414763.321	416213.431	74.920	2.419	1200		1	1.004	72.501	150
SW 1.01	414758.508	416183.232	74.200	1.070			1	1.000	73.130	150
							0	1.001	73.130	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 1.00	414758.081	416178.493	73.800	0.500	270	0			
						0	1.000	73.300	150
SW 2.01	414758.023	416222.397	75.500	0.570		1	2.000	74.930	150
						0	2.001	74.930	150
SW 1.02	414758.550	416189.854	74.250	1.275		1	1.001	72.975	150
						0	1.002	72.975	150
SW 1.03	414758.459	416196.631	74.500	1.695		1	1.002	72.805	150
						0	1.003	72.805	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	20.0		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node SW 1.04 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	72.630	Product Number	CTL-SHE-0096-3500-0500-3500
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Node SW 1.01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	73.130
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.27	Time to half empty (mins)	41

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	27.5	0.0	1.000	27.5	0.0

Node SW 1.02 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	72.975
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.27	Time to half empty (mins)	49

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.3	0.0	1.000	12.3	0.0

Node SW 1.03 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	72.805
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.27	Time to half empty (mins)	45

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.3	0.0	1.000	12.3	0.0

Node SW 1.04 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	72.630	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	107	Diameter (mm)	750

Node SW 2.01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	74.930
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.27	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.3	0.0	1.000	12.3	0.0

Node SW 3.00 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	74.085
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.27	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.3	0.0	1.000	12.3	0.0

Node SW 2.01 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	2.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	74.930	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	2	Diameter (mm)	1000

Node SW 1.03 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	72.805	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	100	Diameter (mm)	1000

Node SW 1.01 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	73.130	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	69	Diameter (mm)	1000

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE 2.00	10	75.094	0.044	3.6	0.0412	0.0000	OK
30 minute summer	SW 1.04	23	72.926	0.296	7.9	1.1326	0.0000	SURCHARGED
15 minute summer	SW 3.00	1	74.085	0.000	0.0	0.0000	0.0000	OK
60 minute winter	EX 03	34	72.537	0.036	3.5	0.0000	0.0000	OK
15 minute summer	SW 1.01	11	73.158	0.028	2.1	0.2114	0.0000	OK
15 minute summer	SW 1.00	10	73.318	0.018	1.0	0.0053	0.0000	OK
15 minute summer	SW 2.01	11	74.973	0.043	3.6	0.1641	0.0000	OK
15 minute summer	SW 1.02	11	73.002	0.027	2.0	0.0890	0.0000	OK
30 minute summer	SW 1.03	23	72.929	0.124	3.0	0.4917	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE 2.00	2.000	SW 2.01	3.6	0.858	0.179	0.0400	
30 minute summer	SW 1.04	1.004	EX 03	3.5	1.039	0.125	0.0176	5.7
15 minute summer	SW 3.00	3.000	SW 1.04	0.0	0.000	0.000	0.1277	
15 minute summer	SW 1.01	1.001	SW 1.02	2.0	0.917	0.073	0.0144	
15 minute summer	SW 1.00	1.000	SW 1.01	1.0	0.690	0.029	0.0079	
15 minute summer	SW 2.01	2.001	SW 1.04	3.5	0.842	0.174	0.0343	
15 minute summer	SW 1.02	1.002	SW 1.03	2.0	1.028	0.069	0.0524	
30 minute summer	SW 1.03	1.003	SW 1.04	1.5	0.121	0.085	0.2901	

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE 2.00	10	75.124	0.074	9.3	0.0697	0.0000	OK
60 minute summer	SW 1.04	44	73.343	0.713	14.7	3.3260	0.0000	SURCHARGED
15 minute summer	SW 3.00	1	74.085	0.000	0.0	0.0000	0.0000	OK
60 minute summer	EX 03	44	72.539	0.038	4.0	0.0000	0.0000	OK
60 minute summer	SW 1.01	44	73.344	0.214	6.6	1.7809	0.0000	SURCHARGED
60 minute summer	SW 1.00	44	73.344	0.044	1.8	0.0129	0.0000	OK
15 minute summer	SW 2.01	11	75.004	0.074	9.2	0.3020	0.0000	OK
60 minute summer	SW 1.02	45	73.343	0.368	5.8	1.2226	0.0000	SURCHARGED
60 minute summer	SW 1.03	44	73.343	0.538	7.1	2.6727	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE 2.00	2.000	SW 2.01	9.2	1.082	0.463	0.0821	
60 minute summer	SW 1.04	1.004	EX 03	4.0	1.077	0.143	0.0195	19.6
15 minute summer	SW 3.00	3.000	SW 1.04	0.0	0.000	0.000	0.1277	
60 minute summer	SW 1.01	1.001	SW 1.02	3.9	1.034	0.141	0.1166	
60 minute summer	SW 1.00	1.000	SW 1.01	1.8	0.700	0.053	0.0520	
15 minute summer	SW 2.01	2.001	SW 1.04	9.1	1.084	0.454	0.0694	
60 minute summer	SW 1.02	1.002	SW 1.03	-4.8	0.713	-0.171	0.1193	
60 minute summer	SW 1.03	1.003	SW 1.04	-7.1	-0.404	-0.401	0.3080	

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE 2.00	10	75.136	0.086	11.8	0.0809	0.0000	OK
60 minute winter	SW 1.04	48	73.509	0.879	13.8	4.2045	0.0000	SURCHARGED
15 minute summer	SW 3.00	1	74.085	0.000	0.0	0.0000	0.0000	OK
60 minute winter	EX 03	48	72.541	0.040	4.4	0.0000	0.0000	OK
60 minute winter	SW 1.01	48	73.510	0.380	5.4	3.2694	0.0000	SURCHARGED
60 minute winter	SW 1.00	48	73.510	0.210	1.7	0.0624	0.0000	FLOOD RISK
15 minute summer	SW 2.01	11	75.015	0.085	11.7	0.3601	0.0000	OK
60 minute winter	SW 1.02	48	73.510	0.535	3.8	1.7767	0.0000	SURCHARGED
60 minute winter	SW 1.03	48	73.510	0.705	6.9	3.5649	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE 2.00	2.000	SW 2.01	11.7	1.142	0.588	0.0988	
60 minute winter	SW 1.04	1.004	EX 03	4.4	1.105	0.158	0.0210	25.5
15 minute summer	SW 3.00	3.000	SW 1.04	0.0	0.000	0.000	0.1277	
60 minute winter	SW 1.01	1.001	SW 1.02	3.3	0.974	0.122	0.1166	
60 minute winter	SW 1.00	1.000	SW 1.01	1.7	0.673	0.050	0.0838	
15 minute summer	SW 2.01	2.001	SW 1.04	11.5	1.146	0.576	0.0833	
60 minute winter	SW 1.02	1.002	SW 1.03	-3.8	0.806	-0.136	0.1193	
60 minute winter	SW 1.03	1.003	SW 1.04	-6.9	-0.394	-0.391	0.3080	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE 2.00	10	75.163	0.113	17.2	0.1062	0.0000	OK
60 minute summer	SW 1.04	41	73.827	1.197	27.5	5.8873	0.0000	SURCHARGED
15 minute summer	SW 3.00	1	74.085	0.000	0.0	0.0000	0.0000	OK
60 minute summer	EX 03	41	72.545	0.044	5.1	0.0000	0.0000	OK
60 minute winter	SW 1.01	44	73.806	0.676	8.3	5.9278	0.0000	SURCHARGED
60 minute winter	SW 1.00	42	73.800	0.500	6.5	0.1485	1.8699	FLOOD
15 minute summer	SW 2.01	11	75.041	0.111	17.1	0.4984	0.0000	OK
60 minute summer	SW 1.02	41	73.811	0.836	8.7	2.7764	0.0000	SURCHARGED
60 minute summer	SW 1.03	41	73.816	1.011	15.0	5.2022	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE 2.00	2.000	SW 2.01	17.1	1.233	0.855	0.1336	
60 minute summer	SW 1.04	1.004	EX 03	5.1	1.149	0.183	0.0234	35.1
15 minute summer	SW 3.00	3.000	SW 1.04	0.0	0.000	0.000	0.1277	
60 minute winter	SW 1.01	1.001	SW 1.02	-4.3	0.986	-0.158	0.1166	
60 minute winter	SW 1.00	1.000	SW 1.01	-5.5	0.693	-0.164	0.0838	
15 minute summer	SW 2.01	2.001	SW 1.04	16.7	1.234	0.836	0.1122	
60 minute summer	SW 1.02	1.002	SW 1.03	-8.7	0.846	-0.308	0.1193	
60 minute summer	SW 1.03	1.003	SW 1.04	-15.0	-0.855	-0.847	0.3080	

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

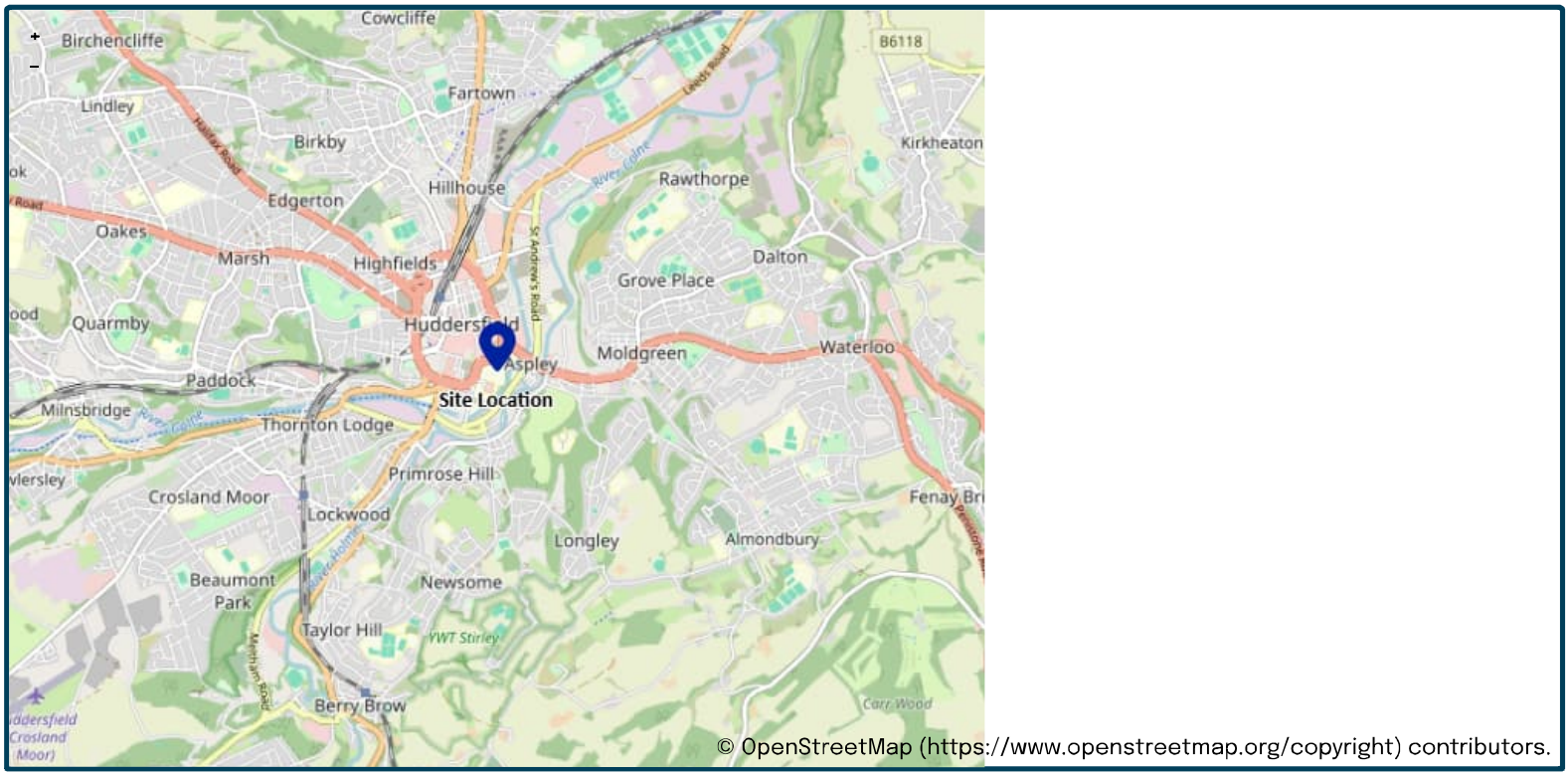
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	29/05/2025
Calculated by	
Reference	
Model version	2.0.1

Location

Site name	UoH Key Public Open Spaces
Site location	Huddersfield



Site easting	414762
Site northing	416167

Site details

Total site area (ha)	0.16 ha

Greenfield runoff

Method

Method	FEH statistical

FEH statistical

	My value		Map value
SAAR (mm)	883 mm		891
BFIHOST	0.809		
QMed-QBar conversion	1.064		1.064
QMed (l/s)	0.235 l/s		
QBar (FEH statistical) (l/s)	0.25 l/s		

Growth curve factors

	My value		Map value
Hydrological region	3		3
1 year growth factor	0.86		
2 year growth factor	0.94		
10 year growth factor	1.45		
30 year growth factor	1.75		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

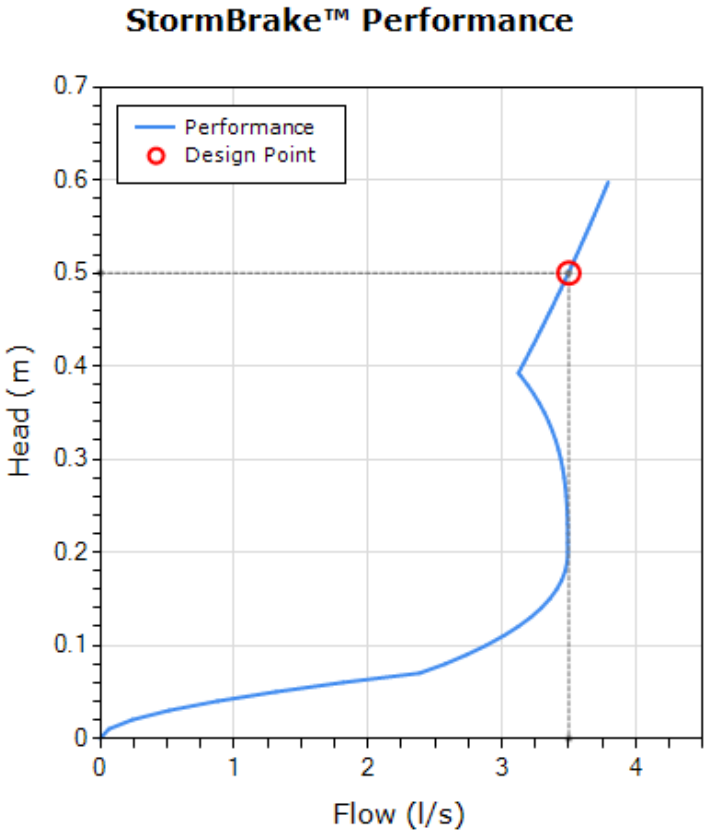
Method	FEH statistical
Flow rate 1 year (l/s)	0.22 l/s
Flow rate 2 year (l/s)	0.24 l/s
Flow rate 10 years (l/s)	0.36 l/s
Flow rate 30 years (l/s)	0.44 l/s
Flow rate 100 years (l/s)	0.52 l/s
Flow rate 200 years (l/s)	0.59 l/s

Disclaimer

StormBrake™ Performance Report

WRC approved PT/398/0217

Contractor:	Dudleys	Head(m):	0.5
Site:	University of Huddersfield	Flow(l/s):	3.5
Date:	11/06/2025	Chamber Ref:	SW 1.04
Created By:	Oli Bastain	Mounting Style:	LUGS (Default)
Device Ref:	FPM-SB1-00500-00350-0100		



	Head (m)	Flow (l/s)
Design Point	0.50	3.50
Flush Flow	0.20	3.49
Kick Back	0.39	3.12

	Dims (mm)
Min. Chamber Diameter	1200
Min. Outlet Pipe Diameter	150
Min. Sump Depth	220

Head (m)	Flow (l/s)
0	0.00
0.02	0.26
0.04	0.93
0.06	1.92
0.08	2.62
0.1	2.92
0.12	3.15
0.14	3.32
0.16	3.43
0.19	3.48
0.21	3.49
0.23	3.49
0.25	3.49
0.27	3.48
0.29	3.46
0.31	3.42
0.33	3.38
0.35	3.32
0.37	3.23
0.39	3.13
0.41	3.20
0.43	3.27
0.45	3.34
0.47	3.41
0.49	3.48
0.52	3.54
0.54	3.61
0.56	3.67
0.58	3.73
0.6	3.79

The unique performance characteristics of this StormBrake™ are derived from extensive dynamic modelling using parametric experimental testing and computational fluid dynamics.

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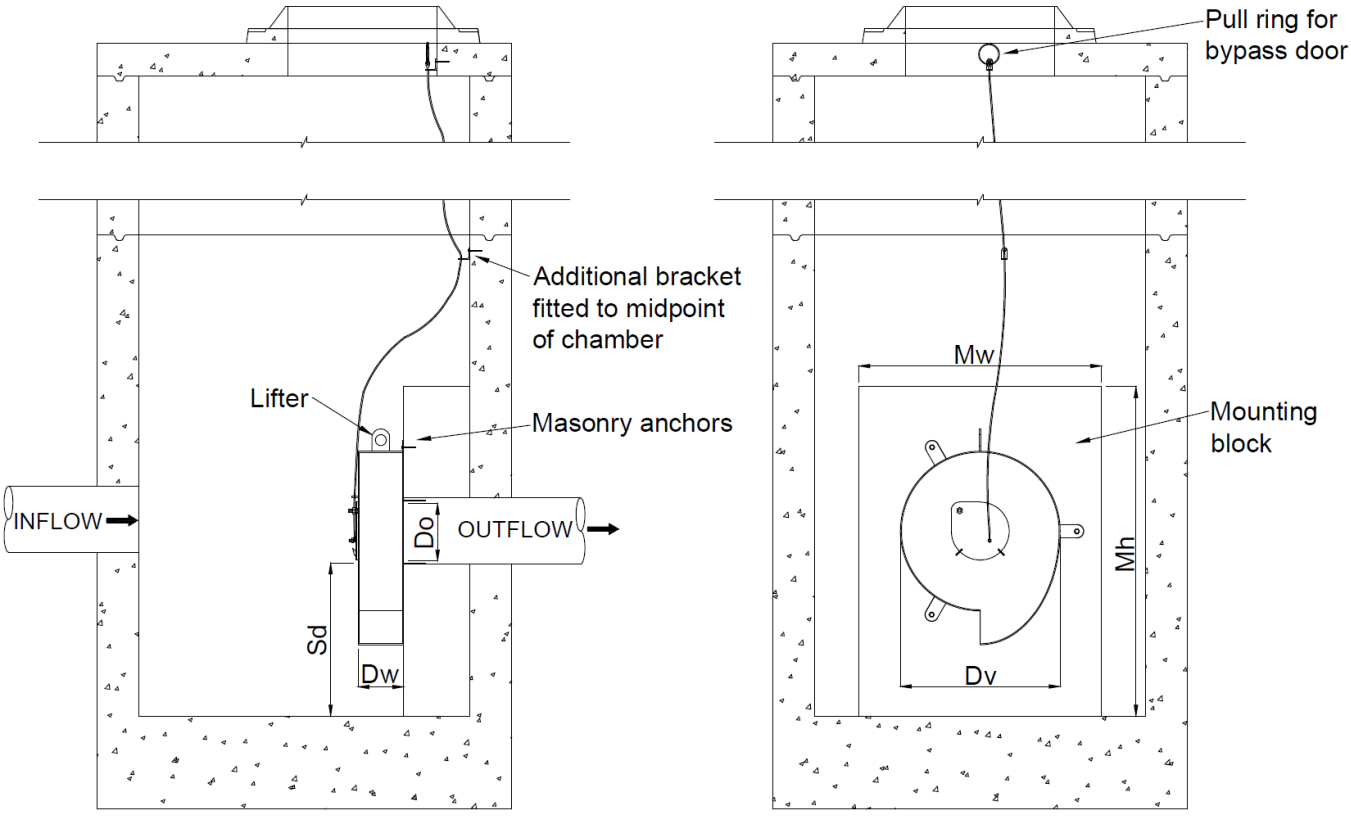
StormBrake™ Performance Report

wrc approved PT/398/0217

INSTALLATION INSTRUCTIONS

1. Position the StormBrake™ so that the inlet is at the bottom and the device outlet is in line with the chamber outlet pipe.
2. Mark the locations of the mounting points on the chamber/mounting wall.
3. Using the marked locations, drill holes to the required thickness and depth for the supplied masonry anchors (M10 throughbolts require 11 mm holes). Fit the bolts to the holes.
4. Attach the StormBrake™ to the anchor points, ensuring the neoprene gasket is flush with the chamber wall, and fasten the device by tightening the bolts. This will compress the neoprene gasket to provide a watertight seal between the StormBrake™ and the wall.
5. Fix the stainless steel wire cable from the front bypass door to the underside of the manhole cover, vertically above the device. A secondary bracket is supplied and should be fitted halfway up the chamber to guide the bypass door cable to the top.
6. Adjust the length of the bypass door cable accordingly, so that it reaches the ground level whilst ensuring the bypass door can open if required. Ensure the bypass door is closed for normal operating conditions.



Geometry	Annotation	(mm)
Device Vortex Diameter	Dv	308
Device Width	Dw	93
Device Orifice	Do	94
Sump Depth (outlet Ø150mm)	Sd	220
Mounting Block Width	Mw	550
Mounting Block Height	Mh	620

Dimensions quoted are minimum values based on the geometry of this unique StormBrake™ unit. These ensure the device can be fitted to the flow control chamber without restriction and meet the performance specification.