Report on Drainage Strategy to Accompany Planning Application for Hogshaw Farm, off Fairfield Road, Buxton

by

Barratt Manchester

Revision	Date	Prepared By	Revision Notes
-	23.02.24	CD	
A	08.07.24	CD	Updated to suit latest planning layout

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B. Ground Investigation Report – Soiltechnics; STQ4642M-G01 Rev 03; April 2023

1. Introduction

The following document has been prepared to assist the designer's preparation and the readers understanding of the drainage theory in one reference document.

2. Site Details

Development Name	Hogshaw Farm, Buxton
Site Address	Fairfield, Buxton, SK17 7HN
Longitude, Latitude (or OS Grid Ref)	406582; 374317
Site Description	3 No. open grassed fields separated by an existing dry stone walls footpath and hedgerow. Currently pasture lane.
Site Area (Ha)	4.20 Ha
Site Area used for calculating Greenfield Run-Off Rates (Ha)	3.72 Ha
Existing Impermeable Area (Ha)	0Ha
Is the Site Steeply Sloping (Y/N), If "Yes" Typical Gradient.	Yes, average gradient 1 in 8

Table 1

3. Pre-Development Greenfield Runoff Rates

Return Period	**Greenfield Rate (L/s)**
1 in 1 Year	37.5
Qbar	45.2
1 in 30 Year	88.6
1 in 100 Year	116.2

Table 2

4. Soakaway Testing

A site specific site investigation was carried out by Soilltechnics dated April 2023. A copy of the site investigation is presented in Appendix B.

Ground conditions are typically 0.30m of topsoil overlaying weathered Limestone and Shale bedrock.

Hydraulic conductivity tests were performed within selected boreholes as part of the ground investigation report undertaken by Soiltechnics. The infiltration testing has provided good permeability between 2.94 x 10^{-6} m/s to 3.12 x 10^{-6} m/s. However, due to the following reasons, infiltration disposal may not be the best option:

- Existing air voids within the strata could collapse with increased water causing compaction and depressions
- Steep slopes could become unstable with increased water
- Variations in strata across the site will affect the infiltration capacity across the development
- The lowest area of the development is located within made ground and therefore soakaways wouldn't be acceptable

For these reasons, it is decided that surface water will discharge to the existing Nun Brook watercourse on the western boundary.

5. Post-Development Surface Water Allowable Discharge Rates

Discharge rates have been limited to existing greenfield runoff rates of Qbar for all storm return periods. Refer to the Phase specific FRA, and Table 2 above for details of the pre-development greenfield runoff rates.

	1 in 1 Year	**1 in 30 Year**	**1 in 100 Year**
Developable Area (Ha)	**Allowable Discharge Rate L/s**	**Allowable Discharge Rate L/s**	**Allowable Discharge Rate L/s**
3.72	37.5	45.2	45.2

Table 3

6. Design Parameters

Preliminary Drainage Layout Drg No	H8797-BAH-XX-XX-DR-CE-300001 P07
Lowest FFL	302.325
Maximum TWL for Design	300.50 – Flow control manhole cover level
Climate Change Allowance	40%
Discharge Location Minimum Level	294.26
Point of Connection	Existing watercourse north west of site
Point of Connection Approved By DCC (Y/N)	No – Submission not made yet

Table 4

7. Summary of Preliminary Drainage

The drainage will be designed in accordance with the site specific FRA

The drainage will be designed to comply with DEFRA's non-statutory technical standards for sustainable drainage systems dated March 2015. Compliance to such is demonstrated within Section 15.

The surface water network is to drain into the existing watercourse situated west of the site boundary, running north to south. Discharge rates will be limited to existing greenfield runoff rates, all storm events have been restricted to Qbar.

Attenuation storage is provided in the form of SuDS in public open spaces. The attenuation storage is sized to provide attenuation for all flows up to an including the 1 in 100 year storm event plus a 40% allowance for climate change.

8. Urban Creep

An additional 10% will be added to the residential areas within the Surface Water Network design to represent Urban Creep.

9. Design for Exceedance

All surface water drainage models will be modelled for storm events greater than the 1 in 100 year event to determine the impact of flooding. Any exceedance flooding will be designed to be managed within the site where reasonably practicable.

The surface water drainage will be design so that all properties are unlikely to flood during these flood events.

10. Maintenance

All surface water (coloured blue) and the detention basin on the attached plan, H8797-BAH-XX-XX-DR-CE-300001, will be put forward for adoption under a Section 104 Agreement. Prior to issue of the Vesting Declaration, the drainage shown on the included plan will be maintainable by Barratt Manchester at the expense of Barratt Manchester.

All areas of public open space will be transferred to the management company for adoption and maintenance, excluding the detention basin. The management and maintenance will be funded by the purchasers/owners of the development by way of an annual fee levied on the owner. In order to ensure the long term operation, the maintenance contract will stipulate regular maintenance in accordance with the management plan.

All highways gullies, and highway drains on the attached plan will be put forward for adoption under a Section 38 Agreement with Derbyshire County Council. After issue of the highway final certificate, the highways and highway drains, gullies and gully pipes on the attached plan H8797-BAH-XX-XX-DR-CE-300001, will be maintainable by the Local Highway Authority at public expense. Prior to the issue of the final certificate by DCC, the roads and drainage will be maintainable by Barratt Manchester at the expense of Barratt Manchester.

All foul drainage on the attached plan H8797-BAH-XX-XX-DR-CE-300001 (coloured brown) will be put forward for adoption under a S104 agreement. Prior to issue of the Vesting Declaration, the drainage shown on the included plan will be maintainable by Barratt Manchester and at the expense of Barratt Manchester.

A draft inspection & maintenance schedule for elements of the SuDS/drainage infrastructure is shown in Table 5.

Drainage Element	**Maintenance Requirement**	**Frequency**
Surface Water Pipes and Manholes (prior to adoption)	Inspect. Remove excess silt & debris, Clear Blockage	Inspect Annually. CCTV if required. Silt & debris removed as necessary.
Catchpits	Inspect. Remove excess silt & debris, Clear Blockage	Inspected every 3 months. Silt & debris removed as necessary.
Ditches/Swales	Inspect. Remove excess vegetation. Clear blockages, silt & debris.	Inspected every 1 Month. Blockages, silt & debris removed as necessary.
Flow Controls	Inspect. Remove excess silt & debris, clear blockage. Test functionality of Bypass doors.	Inspect Annually Silt & debris removed as necessary. Flow control repaired, maintained as necessary.
Overflow Ponds (and POS)	Inspect. Remove excess vegetation. Clear blockages, silt & debris.	Inspected monthly, or after significant storm events. Blockages, silt & debris removed as necessary.

Table 5

11. Defect Reporting

Prior to adoption of the highway drains, foul drains, surface water drains, SuDS and culverts, defects may be reported to Barratt Manchester by the local authority, local residents or members of the public.

All defects can be reported to Barratt Manchester Customer Care line using the following details:

Email: manchester@newhomecare.co.uk

Phone: 0161 872 0161 Option 3

Phone (Out-of-Hours): 0345 601 6084

The customer care line's normal working hours are Monday to Friday 9:00 to 17:30, excluding bank holidays. The out-of-hours line is a 24-hour call service.

After adoption, the following numbers may be useful:

Derbyshire County Council Highways
https://www.derbyshire.gov.uk/transport-roads/roads-traffic/report-a-road-fault/report-a-road-fault.aspx
Tel: 01629 533190 (Mon-Fri 8:00 to 18:00, Sat 09:30 to 16:00 exc. Bank Holidays)

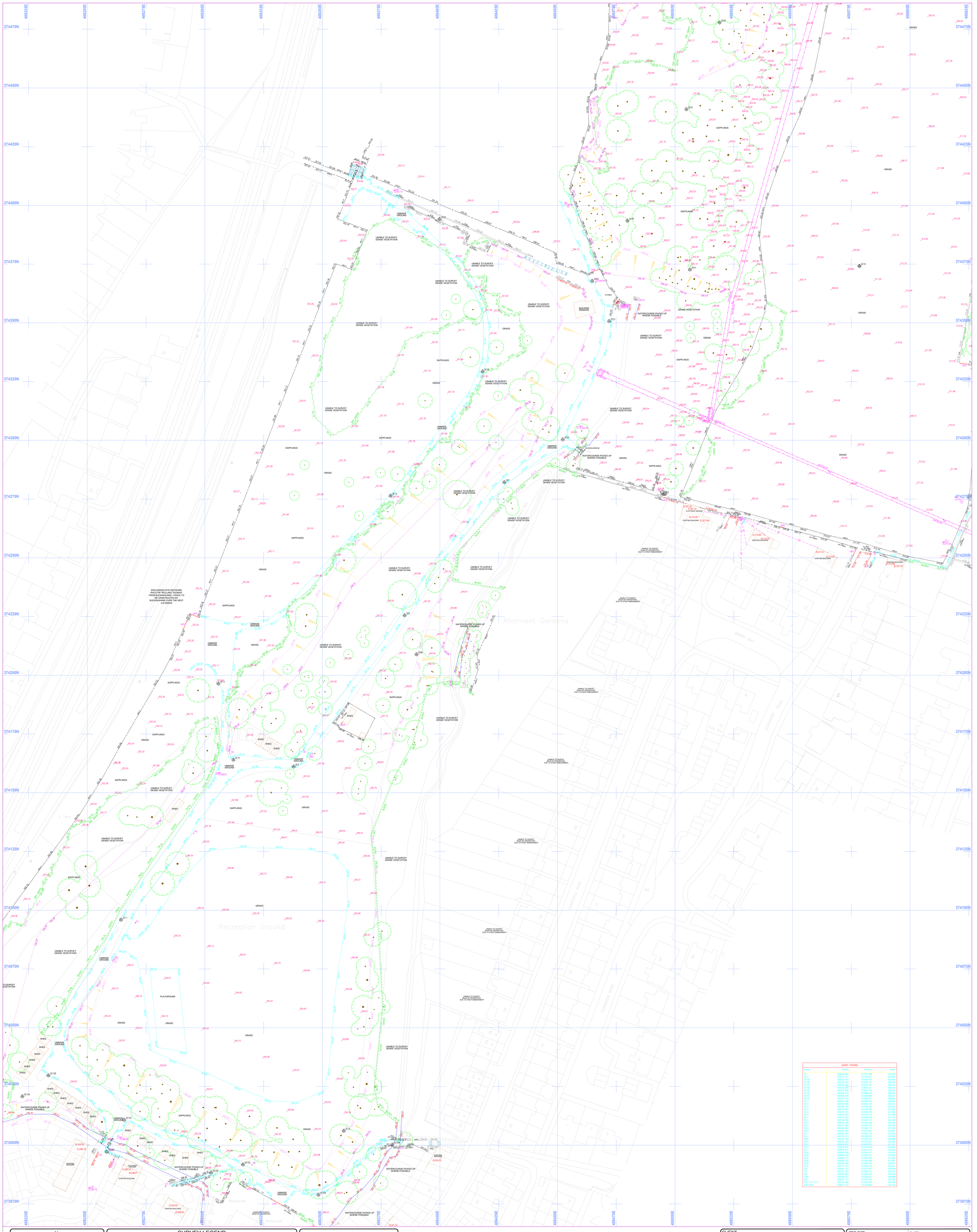
Environment Agency
Tel: 0800 80 70 60 (24 Hours)

12. Response Times

All non-urgent defects will be repaired within 10 weeks of being reported.

All urgent defects will be made safe within 48 hours, or sooner if practicable. Any works to 'Make Safe' may be a temporary measure in order to protect the public, and allow sufficient time to procure the permanent remedial works. This may include temporary 'fencing off' of the hazard until permanent remedial works can be completed.

Drawings
Topographical Survey



SURVEY STATIONS			
Name	Easting	Northing	Height
SE1	406859.665	374327.588	322.569
SE1A	406512.151	374164.057	297.944
SE1B	406222.352	374020.795	290.945
SE1BB	406313.430	374029.703	290.490
SE1BC	406295.662	374010.787	289.372
SE1BD	406316.350	373997.257	289.501
SE1BE	406316.206	373991.782	290.400
SE1BF	406307.613	373988.525	289.555
SE1BG	406348.304	373978.868	289.203
SE1BH	406379.753	374000.011	289.992
SE1C	406264.306	374066.952	296.505
SE1D	406359.098	374056.134	293.215
SE1E	406305.728	374196.456	302.202
SE1F	406378.981	374216.405	301.622
SE1G	406418.181	374129.336	301.626
SE1H	406578.433	374174.216	311.508
SE1I	406721.619	374566.998	321.153
SE2	406749.395	374561.510	321.558
SE20	406452.238	374300.398	293.464
SE21	406471.982	374292.734	294.365
SE22	406389.840	374194.173	301.364
SE23	406464.760	374367.855	294.827
SE3	406825.541	374222.136	323.056
SE4	406752.641	374308.805	313.544
SE40	406479.784	374193.502	300.805
SE41	406508.328	374172.667	300.000
SE42	406504.852	374440.935	301.581
SE43	406513.970	374477.839	302.823
SE5	406679.351	374311.710	318.343
SE5A	406679.048	374259.673	316.318
SE5B	406680.559	374329.391	319.455
SE5C	406823.177	374367.466	317.564
SE5D	406689.322	374346.548	321.991
SE5E	406726.494	374358.144	322.477
SE5F	406717.370	374370.470	322.591
SE6	406495.120	374277.097	300.548
SE7	406427.355	374283.179	295.072
SE8	406384.952	374215.520	297.580
SE9A	406390.027	374208.921	296.989
SE9	406331.771	374161.165	297.553
STN_11111111	406760.398	374355.833	323.306
STN_5002	406871.735	374144.880	324.769

N
W E
S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY NOTES

ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15) ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

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SURVEY LEGEND

FEATURES	BOUNDARY ANNOTATIONS			
TOP OF BANK	BARB WIRE FENCE	BW.F	SECURITY FENCE	SEC.F
BOTTOM OF BANK	CHAIN LINK FENCE	CL.F	TIMBER FENCE	T.F
SURVEY STATION	CONC POST AND PANEL	CP&P.F	BRICK WALL	B.W
TREE	CONC POST TIMB PANEL	CP&TP.F	BLOCK WALL	BL.W
HEDGE	ELECTRIC FENCE	EL.F	CONCRETE WALL	C.W
TREE CANOPY	HERAS FENCE	HER.F	GABIEN WALL	G.W
BUSHES	IRON RAIL FENCE	IR.F	MISCELLANEOUS WALL	MISC.W
VEGETATION	KNEE RAIL FENCE	KR.F	RETAINING WALL	R.W
	MISCELLANEOUS FENCE	MISC.F	RETAINING LOG WALL	RL.W
	POST AND WIRE FENCE	PAW.F	STONE WALL	S.W
	RANCH STYLE FENCE	RS.F		

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL	IL	INVERT LEVEL		
BL	BED LEVEL	PL	PARAPET LEVEL	TRH	TREE HEIGHT
BD	BACK DROP	RL	ROOF/RIDGE LEVEL	THR	THRESHOLD LEVEL
CL	COVER LEVEL	SL	SOFFIT LEVEL	WL	WATER LEVEL
DH	TOP OF DOOR	TOF	TOP OF FENCE	WS	WINDOW SILL
DTC	DEPTH TO CROWN	TOP	TOP OF PIPE	WSF	WINDOW SOFFIT
FFL	FINISHED FLOOR LEVEL	TOW	TOP OF WALL		

GEOTECHNICAL INFORMATION

TRIAL HOLE / PIT	TH
BORE HOLE	BH
WINDOW SAMPLE	WS
MONITORING POINT	MP

SURVEY ANNOTATIONS

AV	AIR VALVE	OHC	OVERHEAD CABLES
B	BOLLARD	PB	POST BOX
BS	BUS STOP	PM	PARKING METER
BT	BRITISH TELECOM IC	PS	POST
CPS	CONCRETE PAVING SLABS	PYL	ELECTRICITY PYLON
CP	CATCH PIT	RE	RODDING EYE
DR	DRAIN	RS	ROAD SIGN
EB	ELECTRIC CONTROL BOX	RWP	RAIN WATER PIPE
EL	ELECTRICAL IC	ST	STOP TAP
EP	ELECTRICITY POLE	SM	SERVICE MARKER
ER	EARTH ROD	SP	SIGN POST
FH	FIRE HYDRANT	SV	STOP VALVE / SLUICE VALVE
FP	FLAG POLE	SVP	SOIL VENT PIPE
G	GULLY	TB	TELEPHONE BOX
GH	GREENHOUSE	TL	TRAFFIC LIGHTS
GP	GATE POST	TM	TELEPHONE MAST
GV	GAS VALVE	TP	TELEGRAPH POLE
IC	INSPECTION COVER	TPS	TACTILE PAVING SLABS
JB	JUNCTION BOX	VP	VENT PIPE
JKW	JAPANESE KNOT WEED	WM	WATER METER
KO	KERB OUTLET	WO	WASH OUT
LH	LAMP HOLE	UTL	UNABLE TO LIFT
LP	LAMP POST/LIGHT COLUMN	UTS	UNABLE TO SURVEY
MH	MANHOLE		
MP	MONITOR POINT		
NP	NAME PLATE		

CLIENT
BARRATT HOMES

PROJECT ENGINEER AS | DATE 10.12.2018
DRAWN BM | SCALE 1:500@A0

PROJECT TITLE
BUXTON, FAIRFIELD

DESCRIPTION	REV	DATE	DRWN	APPR
TOPO SURVEY UPDATED	C	26.03.21	BM	-
SURVEY ADDED FROM 3RD PARTY	B	28-03-19	BM	-
ADDITIONAL TOPO SURVEY ADDED	A	11.03.19	BM	-

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 1 OF 2

DRAWING NUMBER BH.TS.12 | REVISION C

SurveyEng Ltd
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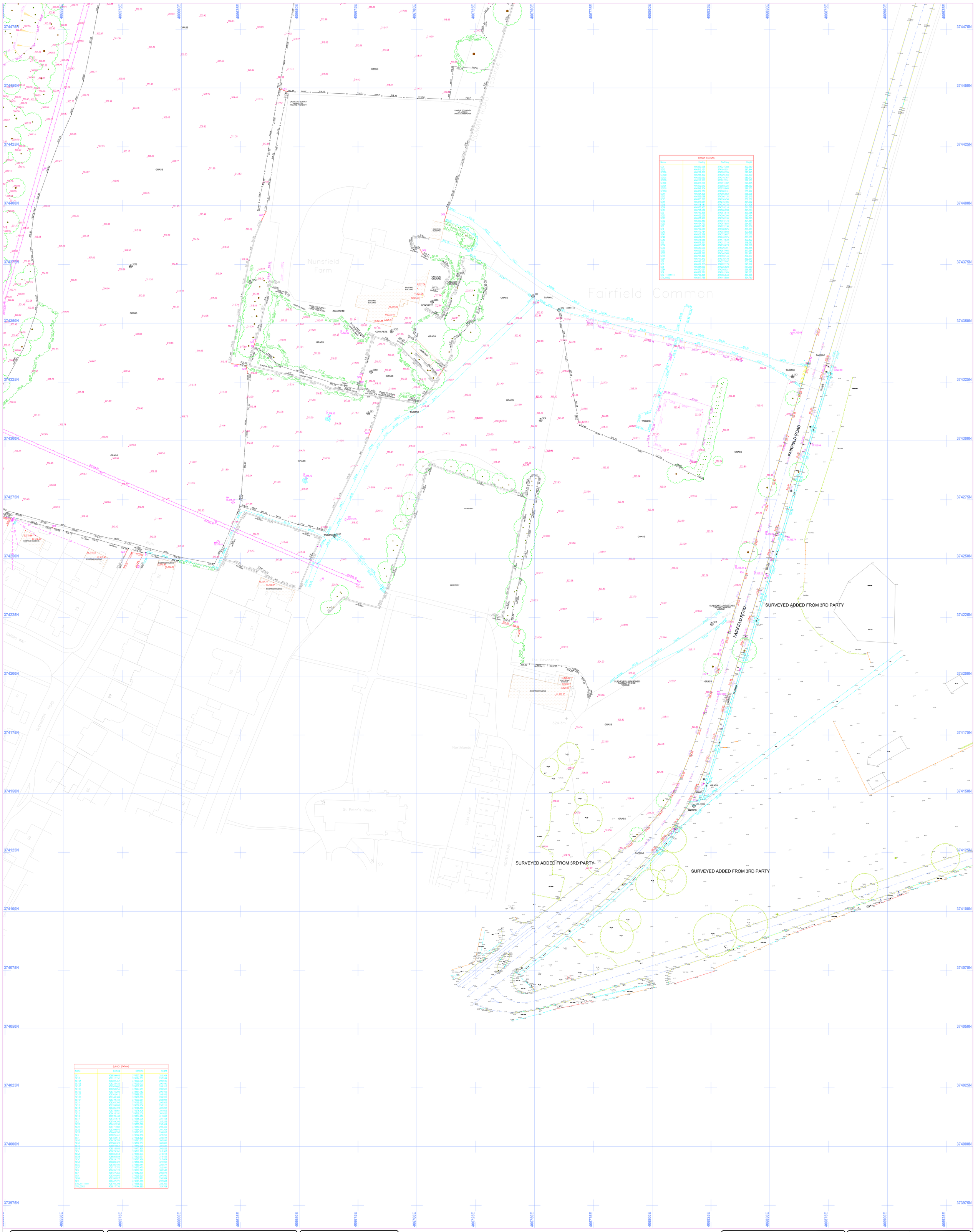

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SURVEY LEGEND

FEATURES

TOP OF BANK
BOTTOM OF BANK
SURVEY STATION
TREE
HEDGE
TREE CANOPY
BUSHES
VEGETATION

BOUNDARY ANNOTATIONS

BARB WIRE FENCE — BW.F
CHAIN LINK FENCE — CL.F
CONC POST AND PANEL — CP&P.F
CONC POST TIMB PANEL — CP&TP.F
ELECTRIC FENCE — EL.F
HERAS FENCE — HER.F
IRON RAIL FENCE — IR.F
KNEE RAIL FENCE — KR.F
MISCELLANEOUS FENCE — MISC.F
POST AND WIRE FENCE — P&W.F
RANCH STYLE FENCE — RS.F
SECURITY FENCE — SEC.F
TIMBER FENCE — T.F
BRICK WALL — B.W
BLOCK WALL — BL.W
CONCRETE WALL — C.W
GABIEN WALL — G.W
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STONE WALL — S.W

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WINDOW SAMPLE — WS
MONITORING POINT — MP

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GP	GATE POST	TM	TELEPHONE MAST
GV	GAS VALVE	TP	TELEGRAPH POLE
IC	INSPECTION COVER	TPS	TACTILE PAVING SLABS
JB	JUNCTION BOX	VP	VENT PIPE
JKW	JAPANESE KNOT WEED	WM	WATER METER
KO	KERB OUTLET	WO	WASH OUT
LH	LAMP HOLE	UTL	UNABLE TO LIFT
LP	LAMP POST/LIGHT COLUMN	UTS	UNABLE TO SURVEY
MH	MANHOLE		
MP	MONITOR POINT		
NP	NAME PLATE		

CLIENT
BARRATT HOMES

PROJECT ENGINEER: AS
DRAWN: BM
DATE: 10.12.2018
SCALE: 1:500@A0

PROJECT TITLE
BUXTON, FAIRFIELD

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY
SHEET 2 OF 2

DRAWING NUMBER: BH.TS.12
REVISION: C

DESCRIPTION	REV	DATE	DRWN	APPR
TOPO SURVEY UPDATED	C	26.03.21	BM	-
SURVEY ADDED FROM 3RD PARTY	B	28-03-19	BM	-
ADDITIONAL TOPO SURVEY ADDED	A	11.03.19	BM	-

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Drawings
Preliminary Drainage Layout

Warning to House Purchasers

Buyers are warned that this is a working drawing and the contents of this drawing may be subject to change during the build process. The layout, form, content, and dimensions specified are included for general guidance only. Finishes or features shown may alter in respect of individual properties. Whilst we make every effort to ensure our drawings are up to date there may from time to time be an unavoidable delay in updating these due to changes in regulations and/or site conditions. Prospective purchasers should not rely on these drawings without first confirming their accuracy with us. The contents of this drawing do not constitute a contract, part of any contract or warranty unless specifically incorporated into the contract. They should not be relied upon for the purposes of entering into a contract to purchase any property.

ENGINEERING LAYOUT NOTES

1. All adoptable drainage works have been designed and are to be constructed in accordance with "Sewerage Sector Guidance Appendix C – Design and Construction Guide (C.T. and United Utilities Guidelines. Where specification conflicts, UU guidelines shall take precedence.
2. All clay pipe work shall be extra strength clayware to BS 295 and BSEN 295 (SW only).
3. All precast concrete pipework shall be to Class 120 in accordance with BS08911–Part 1, BS EN 1916 and bear the BS Kitemark.
4. All adoptable drainage to be bedded in Class S granular surround unless otherwise stated on the longsections.
5. All concrete manhole and soakaways rings, and concrete cover slabs to be manufactured to BS EN 1917 and BS08111-Part 3.
6. Rising mains to be black polyethylene pipes complying to BS EN 13244-2. Polyethylene fittings, including fusion joints, and electro-fusion fittings shall comply with BS EN 13244-2.
7. All levels relate to Ordnance Datum. Contractor to ensure that this drawing is read in conjunction with the site specific topographical survey provided by Barratt Manchester and the benchmark information provided.
8. This drawing is to be read in accordance with all other relevant drawings.
9. The contractor shall be responsible for ensuring that any existing invert levels indicated on the drawings are correct before work commences.
10. All proposed connections to the sewer shall be 150ø unless stated otherwise.
11. All private house drainage shall be 100ø and all drag-out connections shall be 150ø at a minimum gradient of 1:80 unless otherwise stated, and laid in accordance with Part H of the Building Regulations.
12. Runoff from private surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.
13. Pram crossings shall be provided at the inner tangent points of all junctions.
14. Pipes shall be protected from concentrated loading by construction traffic during the construction period when insufficient cover to the pipe may make them vulnerable to damage.
15. Insitu CBR tests of the road formation levels are to be carried out to determine the depth of pavement construction required. This is to be approved by Derbyshire County Council prior to construction of the road pavements.
16. Groundworker to ensure that plot drainage be within the curtilage of the plot they serve where possible and inspection covers kept within hardstanding where possible.
17. Contractor to provide Severn Trent Water with sufficient notice prior to commencement of sewer works on their inspections telephone number.
18. Contractor to obtain all necessary highway opening notices from Derbyshire County Council, obtain approval to work on United Utilities Sewerage System, obtain approval to method statement from the Environment Agency and/or the Local Lead Flood Authority for any works affecting a watercourse.

ENGINEERING KEY

- S104 Adoptable Surface Water Sewer & Manhole
- Private Surface Water Drag-Out and Invert (10.25)
- S38 Adoptable Surface Water Sewer & Manhole
- S38 Adoptable Road Gully
- S104 Adoptable Foul Water Sewer & Manhole
- Private Foul Drag-Out and Invert 10.25
- Proposed Adoptable Foul Water Rising Main
- Proposed S104 Sewer Easement
- Proposed Adoptable Foul Water Pumpstation

Revision	Description	Date	Design By
P07	Updated design to suit planning layout revision Rev. 3	01.07.24	CD
P06	Updated design to suit planning layout revision Rev. 2	27.06.24	CD
P05	Reverted to pumped solution for the whole site.	14.02.24	BJM
P04	Updated design to suit planning layout revision N.	09.02.24	BJM

Project: Hogshaw Farm, Buxton
Description: Preliminary Drainage Layout

Design By	Date	Scale at A0	Revision
CD	Feb 2024	1:500	P07

Project	Originator	Functional	Spatial Form	Discipline	Number
H8797 - BAH -		XX	- XX - DR -	CE -	300001

BARRATT HOMES

Do not scale from this drawing. Work to given dimensions only. Any discrepancies are to be reported to Originator.
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Detention Basin
Low Flow Bed Level: 298.8m
Main Channel Level: 299.2m
Top Water Level: 300.45m
Top of Bank: 300.55m
Storage Volume: 1300m3

S44 – Flow Control
Head=1.95m; Flow=45.2l/s
Emergency drain down penstock included in manhole

Road 1
Road 2a
Road 2b
Road 3
Road 4
Road 5
Road 6

GOLF COURSE
ROMAN ROAD (course of)
Nunsfield Farm
Fairfield Common
Allotment Gardens
NunBrook
BARMS WAY
Potential Future Link Road
PLAY AREA (LAP) Refer to drawing 2402.41929
ARM 1
ARM 2
ARM 4
AS ABOVE HOLES
TENT OF WORKS

Appendix A
Flood Risk Assessment

- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

jpp

Proposed Residential Development
Hogshaw Farm
Buxton
Derbyshire

Flood Risk Assessment and Drainage Strategy

Revision F: July 2024
R-FRA-11024R-01-F

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Proposed Residential Development
Hogshaw Farm
Buxton
Derbyshire

Flood Risk Assessment and Drainage Strategy

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Report Reference	R-FRA-11024R-01-F
Date	Revision F: July 2024

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Revision	Date	Description	Prepared	Reviewed
0	23rd January 2019	Initial Report	Ram Sarpal	Warren Allsopp
A	31st March 2023	DRAFT – revised to suit latest development proposals.	Izzy How	Katherine Rose
A	26th April 2023	Revised to suit latest development proposals.	Katherine Rose	Katherine Rose
B	24th May 2023	Revised following client comments	Katherine Rose	Katherine Rose
C	6th June 2023	Appendices updated	Katherine Rose	Katherine Rose
D	16th February 2024	Revised following consultation comments, and to include latest drainage strategy information and JBA modelling data.	Josh Beverly	Katherine Rose
E	23rd February 2024	Revised following client comments.	Josh Beverly	Katherine Rose
F	12th July 2024	Revised to suit latest site layout.	Josh Beverly	Katherine Rose

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1.0 Introduction

1.1 Background

1.1.1 This report is a Flood Risk Assessment and Drainage Strategy which has been prepared by JPP Consulting Limited on behalf of Barratt Homes for a proposed residential development. The benefit of this report is to our instructing Client.

1.1.2 The proposed Residential development is located at Hogshaw Farm off Nunsfield Road, Buxton, as shown in Figure 1.1 below. Buxton is located to the south-west of Sheffield and east of Macclesfield. The National Grid Reference for the site is E406520 N374340. The proposed development has a total development area of 5.605ha (56,050m^2).

Figure 1.1 Site Location Plan
Source: Open Street Maps, obtained 29th March 2023

1.2 Objectives

1.2.1 The objective of this report is to advise interested parties regarding the potential risk of flooding and the management of surface water run-off arising from the proposals.

1.2.2 This report has been prepared to support a reserved matters planning application.

1.3 Reference documents

1.3.1 This report has been prepared with reference to the following publications:-

- Ministry of Housing, Communities and Local Government (March 2012, updated December 2023), National Planning Policy Framework
- Ministry of Housing, Communities and Local Government (March 2014, updated August 2022), Planning Practice Guidance 'Flood Risk and Coastal Change'
- Department for Environment, Food and Rural Affairs (March 2015), Non-statutory technical standards for sustainable drainage systems
- Environment Agency (September 2013), Climate Change Allowances for Planners: Guidance to support the National Planning Policy Framework
- Environment Agency (October 2013), Delivering benefits through evidence: Rainfall runoff management for developments
- HM Government (2010), The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, The NBS, Newcastle Upon Tyne
- Wilson, Bray, Cooper (2004), Sustainable drainage systems: Hydraulic, structural and water quality advise, C609, CIRIA, London
- Woods-Ballard et al (2015), The SUDS Manual, C753, CIRIA, London
- CIRIA Report C624 Development and flood risk
- National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage Systems,
- Institute of Hydrology (1999), Flood Estimation Handbook, Institute of Hydrology, Wallingford
- BS EN 752:2008 Drain and sewer systems outside buildings. Hydraulic design and environmental considerations
- BS 8533:2011 Assessing and managing flood risk in development – Code of Practice
- CIRIA Report C635 Designing for exceedance in urban drainage – good practice
- Derbyshire County Council & Derby City Council Strategic Flood Risk Assessment Level 1: For Minerals and Waste Local Development Framework (August 2012)

1.4 Report history

1.4.1 This report had previously been revised (Revision E) further to the receipt of further client comments based on prior drainage strategy proposals as provided by Barratt Homes, and the inclusion of details of the fluvial hydraulic modelling study undertaken by JBA Consulting Ltd.

1.4.2 This report has been revised (Revision F) following the receipt of a new site layout and drainage strategy as provided by Barratt Homes.

1.4.3 Changes to the report associated with Revision F are marked by a vertical line in the right-hand column.

2.0 Description and history of the site and development proposals

2.1 Location and description of the site

2.1.1 The proposed residential development is located at Hogshaw Farm, off Nunsfield Road, Buxton, as shown in Figure 1.1 above. The site is bound by agricultural land to the north, a golf course and the A6 to the east, dwellings to the south, and woodland, Nun Brook and a railway line to the west.

2.2 History of the site

2.2.1 The site currently comprises an area of open land associated with Hogshaw Farm, as shown on the topographical survey enclosed in **Appendix B**. There is an area of woodland along the site's western boundary.

2.2.2 Aerial imagery dating back to 1999 shows that the site was comparable to the present day during this time, see Figure 2.1 below.

Figure 2.1 Aerial imagery dated 1999
Obtained: Google Earth Pro 29th March 2023

2.3 Proposed development

2.3.1 The proposed development will comprise 99 residential dwellings. The proposed development layout is shown on the plan enclosed in **Appendix A.**

2.4 Site topography

2.4.1 The topographical survey indicates that site levels fall from east (at approximately 323.0m) towards west (lowest point of approximately 296.0m). The topographical survey is shown on the plan enclosed in **Appendix B**.

2.5 Existing drainage infrastructure

2.5.1 Severn Trent Water's asset plan is enclosed in **Appendix C.** The asset plan identifies a surface water sewer and a foul water sewer, both located in Barms Way to the south. Both sewers then flow south along Nunsfield Road, with the foul sewer transitioning to a combined water sewer. The surface water and foul water sewers are both 150mm diameter, and the combined water sewer is a 225mm diameter pipe.

2.5.2 The topographical survey, as enclosed in **Appendix B**, identifies a number of inspection covers within the southern part of the site.

2.5.3 Nun Brook is located to the west of the site. As shown on the dataset provided by the Environment Agency (see **Appendix D**), a section of this watercourse is culverted.

2.6 Geology of the site and ground investigation data

2.6.1 Inspection of the geological maps show that there are no records of superficial deposits at the site. A narrow band on Alluvium (comprising clay, silt, sand and gravel) is shown along Nun Brook to the west of the site.

2.6.2 The bedrock geology which underlies the majority of the site is Eyam Limestone Formation. A small area along the western part of the site is underlain by Bowland Shale Formation, comprising Mudstone, Siltstone and Sandstone.

2.6.3 A Ground Investigation has been undertaken by Soiltechnics, see report extract enclosed in **Appendix E**. The GI included site visits in January and February 2019, which included:

- Twenty exploratory trials pits (TP01-TP20)
- Twenty-eight exploratory boreholes (DTS01-DTS13 and DTS15-DTS29)
- Infiltration testing in three borehole locations (DTS06, 13 and 19)

2.6.4 The proposed residential development is covered by Zone 3 of the GI, whilst the proposed access route falls within Zone 4 and the open space in the north-western corner within Zone 1. Zone 2 of the GI falls beyond the current site boundary. The encountered ground conditions are briefly summarised as follows:

- Topsoil: Zones 3 and 4
- Made Ground: Zone 1, 2 and 4
- Weathered Bee Low Limestone Formation: Zone 4
- Weathered Eyam Limestone Formation: Zone 3
- Weathered Bowland Shale Formation: Zone 2 and 3
- Bowland Shale Formation Bedrock: Zone 3

2.6.5 Groundwater inflows were encountered in many of the exploratory excavations, as set out in Table 6.4.1 of the Ground Investigation report (see extract in **Appendix E**). In short, groundwater was encountered at depths between 1.3m and 4.2m bgl.

2.6.6 Infiltration test results are summarised as follows:

- Weathered Bee Low Limestone (DTS06, Zone 4, access): 3.81 x 10^{-6} m/s
- Weathered Eyam Limestone (DTS13, Zone 3, residential): between 2.67 x 10^{-4} and 4.72 x 10^{-5} m/s
- Weathered Bowland Shale (DTS19, Zone 3, residential): between 2.94 x 10^{-6} and 3.12 x 10^{-6} m/s

2.6.7 The GI report states:

> *"Testing completed to date should be considered preliminary only and we recommend further, more intensive, on site testing is carried out targeting the part of the investigation allowing detailed design of infiltration systems to be progressed if such systems are to be adopted".*

2.6.8 Additional investigations are being undertaken in the north-western area of the site, to allow an assessment of risks associated with ground conditions.

2.7 Development proposals and flood risk vulnerability

2.7.1 With reference to Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) to the National Planning Policy Framework (NPPF), the proposed residential development would be classed as More Vulnerable development.

2.7.2 An extract from Table 2 of the PPG for Flood Risk and Coastal Change is replicated below in Table 2.1 with the proposed development type highlighted.

Flood Risk Vulnerability Classification	
Vulnerability	**Development Types**
More Vulnerable	Hospitals.
	Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
	Buildings used for **dwelling houses**, student halls of residence, drinking establishments, nightclubs and hotels.
	Non-residential uses for health services, nurseries and educational establishments.
	Landfill and site used for waste management facilities for hazardous waste.
	Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Source: Planning Practice Guidance - 2014	

Table 2.1 Flood Risk Vulnerability Classification

3.0 Flood risk

3.1 Fluvial / Tidal flooding

3.1.1 An extract of the Environment Agency's Flood Map for Planning (Rivers and Sea) is provided below in Figure 3.1. The flood map was extracted from the GOV.UK website on 29th March 2023. The approximate application site boundary is shown in red. The map indicates that the majority of the development site is located within Flood Zone 1 (Low Probability).

Figure 3.1 Flood Map for Planning (Rivers and Sea)
Source: GOV.UK website – March 2023

3.1.2 We note that there are areas of Flood Zone 2 (Medium Probability) and Flood Zone 3 (High Probability) to the north-west and south-west of the site. These areas encroach into the site boundary in the north-western corner of the site. These areas are associated with Nun Brook. The topographical survey confirms that ground levels in this area are lower than those of the developable area of the site.

3.1.3 Product 4 flood level data has been obtained from the Environment Agency, as enclosed in **Appendix D**. This identified that the site is located within Flood Zone 1 and at a low risk of fluvial flooding.

3.1.4 Additional flood risk information is set out in Chapter 4.0, following a fluvial hydraulic modelling study undertaken by JBA Consulting Ltd.

3.1.5 Table 3.1 below is a copy of Table 1 from Planning Practice Guidance for *'Flood Risk and Coastal Change'* to the National Planning Policy Framework which defines Flood Zones. The proposed development, which is located within Flood Zone 1, is defined as having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Flood Zone Definitions	
Flood Zone	**Definition**
Zone 1: Low Probability	**Land having a less than 1 in 1,000 annual probability of river or sea flooding.**
Zone 2: Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a: High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b: The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.
Source: Planning Practice Guidance - 2014	

Table 3.1 Flood Zone Definitions

3.2 Flooding from surface water

3.2.1 An extract of the Environment Agency map 'Risk of Flooding from Surface Water' is provided below in Figure 3.2. The approximate application site boundary is shown in red. The site is shown to be located in an area of very low (less than 1 in 1000) risk of surface water flooding in a given year.

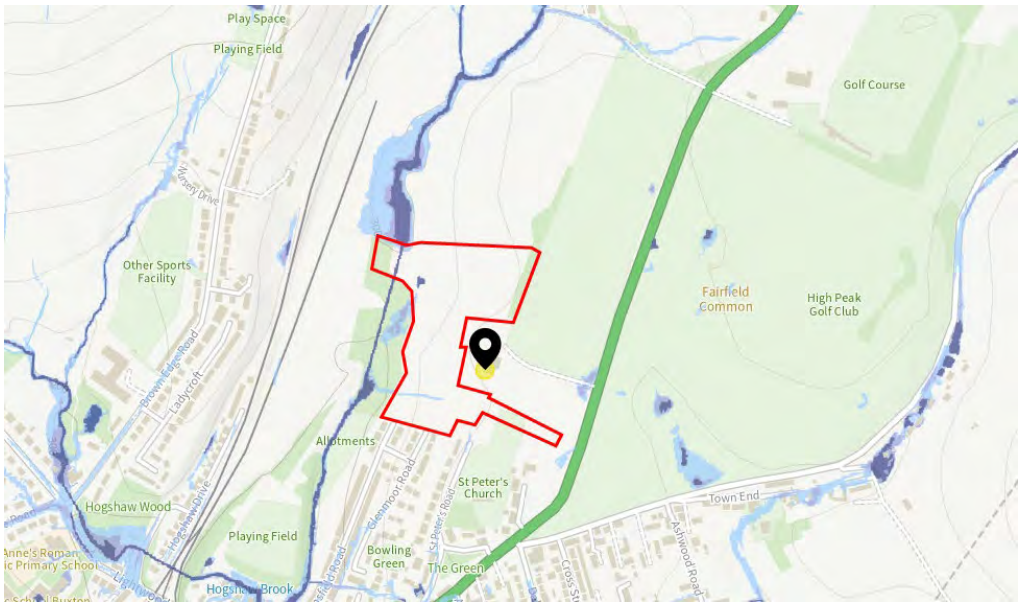

Figure 3.2 Risk of Flooding from Surface Water
Source: GOV.UK website – March 2023

3.2.2 We note that there are areas of medium and high surface water flood risk to the west of the site, associated with Nun Brook. The topographical survey confirms that ground levels in this area are lower than those of the developable area of the site.

3.2.3 It should be noted that this map is generated using a broad methodology applied at the national scale. The model utilises generalised information on infiltration, sewerage infrastructure, rainfall events and catchment topography to route rainfall over a ground surface model. As such, the analysis does not take account of site-scale factors / characteristics that may exert an influence upon surface water flood depths and extents. The map therefore only provides a guide regarding the areas that may be vulnerable to this source of flooding.

3.3 Flooding from groundwater

3.3.1 Information from the Derbyshire County Council (DCC) Level 1 Strategic Flood Risk Assessment (SFRA) has been reviewed with regards to groundwater flooding. The Areas Susceptible to Ground Water Flooding Map for the High Peak Borough is enclosed within **Appendix F**. This is a *"strategic scale map showing groundwater flood areas in a 1 kilometre square grid. It identifies at a broad scale areas susceptible to flooding from groundwater on the basis of geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring and therefore is a hazard not risk based dataset. It does not take account of areas where groundwater is likely to pond or flow, but simply considers where groundwater might emerge".*

3.3.2 The map shows that the 1Km grid square where the site is located is within the '<25%' category.

3.3.3 As part of the Ground Investigation, groundwater inflows were encountered in many of the exploratory excavations, as set out in Table 6.4.1 of the Ground Investigation report (see extract in **Appendix E**). In short, groundwater was encountered at depths between 1.3m and 4.2m bgl.

3.3.4 The information available at the time of preparing this report suggests that groundwater emergence at the surface is unlikely, and therefore the risk of flooding is considered to be low.

3.4 Flooding from sewers

3.4.1 Severn Trent Water's asset plans identify that there are no adopted sewers within the site boundary, as shown on the plan enclosed in **Appendix C.**

3.4.2 The DCC Level 1 SFRA has been reviewed with regards sewer flooding. The Historic Flood Incidence by Source and Floodzones map for the High Peak Borough is enclosed within **Appendix G**. No sewer flooding are incidents are shown within the site boundary. A single sewer flooding incident is identified within Buxton, south-east from the site. The scale of the mapping is not sufficient to refine the location of this incident.

3.4.3 We do not have any records of sewer flooding within the vicinity of the proposed development.

3.4.4 We therefore do not consider the risk of flooding from sewers to be a significant risk to the proposed development.

3.5 Flooding from reservoirs, canals and other artificial sources

3.5.1 We are not aware of any canals or artificial water sources that may result in flooding of this site.

3.5.2 The EA provides maps (https://flood-warning-information.service.gov.uk/long-term-flood-risk/) showing the area that may be affected by flooding as a result of a breach of a large, raised reservoir (i.e. capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land).

3.5.3 An extract of the Environment Agency map 'Risk of Flooding from Reservoirs' is provided below in Figure 3.3. It can be seen that the proposed development site, shown in red, is not at a risk of flooding from reservoirs.

Figure 3.3 Risk of Flooding from Reservoirs
Source: GOV.UK website – 29th March 2023

3.5.4 It can therefore be concluded that the risk of flooding from reservoirs and other artificial sources is low.

3.6 Historic flooding

3.6.1 The DCC Level 1 SFRA has been reviewed with regards to historical flooding. The Historic Flood Incidence by Source and Floodzones map for the High Peak Borough is enclosed within **Appendix G**. This map includes details of historic flooding from the following sources:

- Artificial
- Fluvial
- Groundwater
- Multiple
- Other
- Sewers
- Surface Water
- Unknown

3.6.2 No flood events from the above sources are shown within the site boundary.

3.6.3 The Environment Agency are not aware of any historic flood incidents at the site, as set out within **Appendix D**.

3.7 Flood risk vulnerability and flood zone compatibility

3.7.1 Based on the above assessment of the site being located within Flood Zone 1 and classified as a More Vulnerable development, and with reference to Table 3.2 below (Planning Practice Guidance for 'Flood Risk and Coastal Change' to the National Planning Policy Framework, Table 3), the proposed development of this site would be considered "appropriate". A copy of Table 3 is presented below highlighting the above. Neither a Sequential Test nor an Exception Test will be required.

Table 3 – Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	X	Exception test required	✓
Zone 3b	Exception test required	✓	X	X	X
✓ = Development is appropriate			X = Development should not be permitted		

Source: Planning Practice Guidance - 2014

Table 3.2 Flood Risk Vulnerability and Flood Zone Compatibility

3.8 Flood compensation

3.8.1 Flood compensation measures will not be required for this site as it is located within Flood Zone 1.

3.8.2 The results of the fluvial hydraulic modelling study, discussed further in Chapter 4.0 below, identify the flood extents upstream of the culvert, to the north-west of the site. Based on these results, the proposed detention basin is considered to be outside of the modelled flood extent, such that flood compensation requirements are not triggered as a result of the detention basin location.

3.9 Access and egress

3.9.1 Access and egress to and from this site in the event of flooding will be via the proposed development's access road, which will allow residents of the development to move to higher ground.

4.0 Additional flood modelling

4.1 Introduction

4.1.1 As set out in Section 3.1 above, the flood maps available online identify the site to be located in Flood Zone 1. However, areas of Flood Zone 2 and 3 are identified to the north-west and south-west of the site, associated with the watercourse in this location. As such, a fluvial hydraulic modelling study has been undertaken. This has been undertaken by JBA Consulting, full details of which are set out in their report enclosed in **Appendix N**.

4.2 Baseline modelling

4.2.1 Baseline modelling has been undertaken for the following scenarios:

- 1 in 30 year
- 1 in 100 year
- 1 in 100 year + 29% climate change
- 1 in 1000 year

4.2.2 For the four scenarios set out above, the modelled flood extents are shown in to the north-western area of the site.

4.2.3 The modelled flood depths associated with the baseline 1 in 100 year plus 29% climate change scenario are shown to be deepest immediately upstream of the culverted watercourse. The maximum flood depth is identified to be 4.02m, within the area of low elevation surrounding the channel.

4.2.4 Blockage analysis has been undertaken for a worst-case scenario of a 100% blockage of the culvert during the 1 in 100 year plus 29% climate change event. This blockage results in a 1.88m increase in peak water level to the north-west, and Figure 2-7 of the JBA report identifies the route of water across the site.

4.3 On-site surface water discharge hydraulic modelling

4.3.1 The baseline model was updated to account for the calculated existing greenfield run-off rates from the site, which were then increased by 40% as an allowance for climate change.

4.3.2 The surface water drainage strategy proposes a flow restriction of 45.2 l/s, based on the existing Q_{bar} run-off rate from the site, see additional details in Section 5.7 below. This rate of 45.2 l/s has been used as a static value within the hydraulic modelling, based on the maximum run-off rate from the site. The 45.2 l/s flow restriction offers an overestimation of post-development flows, as smaller storm events will result in lower run-off rates from the site. The modelling results therefore present a worst-case scenario.

4.3.3 The results from the revised baseline modelling and post-development modelling were compared to understand the impact of the proposed development. With the proposed surface water drainage strategy in place, there is a slight reduction identified in the flood extent downstream of the site, in the proximity of the Lightwood Road area. There is also a reduction in flood depth identified here too. This betterment downstream is due to a greater proportion of the flow being held upstream of the 1.22m culvert. As a result, there is an increase in flood depths upstream of the site of up to 0.05m, however, the extent is unchanged.

4.3.4 As noted within the JBA report, *"the majority of the pre-development greenfield surface water discharge would enter Nun Brook downstream of the 1.22m diameter culvert"*. Therefore, the post-development scenario not only reduces greenfield discharge rates from the site, but also moves the surface water discharge point upstream of the culvert. This therefore allows the discharge from the site to be controlled, and, in turn, provides a betterment of alleviating downstream flooding.

4.4 Mitigation

4.4.1 The fluvial hydraulic modelling study undertaken by JBA Consulting Ltd identifies a slight reduction in the existing flood extent identified downstream of the site, and also a reduction in these flood depths. As the proposals are shown to offer flood alleviation downstream of the site, no mitigation strategy is considered to be required.

4.4.2 We would note that the positive results of the proposed drainage strategy are intentional, and developed in order to reduce an existing flooding issue identified within the vicinity of the site.

5.0 Management of surface water

5.1 Current conditions

5.1.1 The site is currently open with no existing development, and is therefore considered a greenfield site with no existing drainage. Therefore, greenfield run-off calculations shall be used to derive the allowable run off rate from the site.

5.2 Surface water drainage outfalls

5.2.1 It is a requirement of The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, to dispose of surface water collected by a development in accordance with the following, listed in order of priority:-

1. Infiltration systems where ground condition permit
2. To watercourses
3. To sewers

5.2.2 Each of these is considered separately below:

5.2.3 Infiltration systems

5.2.3.1 The geology of the site is described in Section 2.6 above. For a worst-case assessment, it is assumed that infiltration techniques are not viable for the management of surface water at the site.

5.2.3.2 We acknowledge the presence of Made Ground at the site, and the risk that infiltration techniques would pose with regards to the mobilisation of leachates. As such, infiltration techniques will not be considered further due to the risk associated with mobilising leachates to the watercourse.

5.2.3.3 On the basis that infiltration techniques are not viable at the site, the proposed detention basin will be designed accordingly, such as with a clay liner.

5.2.4 Watercourses / Main River

5.2.4.1 Nun Brook is located along the site's western boundary. Surface water from the proposed development will drain to this watercourse.

5.2.5 Sewers

5.2.5.1 Draining the site to an existing watercourse is a viable option, therefore the use of surface water sewers will not be considered further.

5.3 Surface water drainage strategy

5.3.1 Surface water discharge rates will be restricted to greenfield equivalent run-off rates to ensure that the rate of surface water run-off from the site does not increase as a result of the proposed development.

5.3.2 The proposed drainage strategy will comprise a piped network with attenuation provided in an online detention basin. Due to the risk of mobilising contaminants to the watercourse, the proposed basin will be lined accordingly, such as with clay.

5.3.3 The location of the proposed detention basin is considered appropriate. It is located in the lowest area of the site and in close proximity to the proposed outfall location upstream of the culvert. With the steeply sloping nature of the site in general, the flatter ground levels in this north-western area help minimise the earthworks required to achieve the detention basin.

5.3.4 The culverted Nun Brook is circa 8m below the ground level to which it runs through. The ground above the Nun Brook culvert is a former landfill site, that is covered by dense bushes and trees. The proposed location of the attenuation basin has been chosen to minimise the impact on existing trees, vegetation and biodiversity. The topographical survey, as enclosed in **Appendix B**, shows that other locations within this land are more severely impacted by trees and vegetation. The proposed location of the basin will offer ease of access and maintenance, as the surrounding dense vegetation will be cleared during the works. This includes the reduction in ground level from circa 8m to circa 6m, and thus improving access for possible future dig-downs.

5.3.5 The proposed flow control, to facilitate surface water being attenuated within the attenuation basin, will be fitted with a bypass. This will therefore allow the basin to be emptied through the bypass and into the adjacent floodplain, should the culvert need a dig-down repair during a storm event. The area of the basin above the culvert will be covered by a management company who will work to keep the area maintained, clear and future proof from self-seeded trees and dense vegetation, therefore maintaining an ease of access.

5.3.6 The basin has been designed such that normal flows up the a 1 in 30 year scenario remain within the lower basin level; the higher basin level is only likely to flood during storm events greater than a 1 in 30 year scenario. A dry weather channel is included to keep the area as dry as possible during common rainfall.

5.3.7 An indicative surface water layout plan is enclosed in **Appendix H.** The drawing shows that surface water attenuation can be accommodated on the site and the method of discharge on the basis that infiltration techniques are not viable. The detailed design parameters of the drainage are described below.

5.4 SUDS assessment

5.4.1 We have considered the suitability of SUDS for use on the development site. The review is set out in below Table 5.1.

SUDS Assessment		
SUDS Technique	**Suitability**	**Justification**
Rain Water Harvesting	Maybe	To be considered at detailed design stage.
Green Roofs	No	Green roofs are generally only viable on flat roofs. The proposed dwellings are to have pitched roofs.
Infiltration	Maybe	Subject to site investigation
Filter Strips / Filter Drains	Maybe	Subject to site investigation
Swales	Maybe	To be considered at detailed design stage, where levels allow.
Bioretention Systems	No	Attenuation will be provided in the form of a detention basin.
Trees	Yes	Most existing trees will remain on the site, plus new trees and landscaping areas will be planted.
Pervious Pavements	No	Treatment of surface water will be achieved by the low-flow channel and micro-pool within the online detention basin.
Attenuation Tanks	No	Surface water will be attenuated above ground within a detention basin.
Detention Basin	Yes	Surface water attenuation to be provided above-ground within an online detention basin, to include micro-pool and low flow channel.
Ponds and Wetlands	No	Attenuation will be provided above-ground using detention basins.
Trapped Drainage	No	Treatment of surface water will be achieved by the low-flow channel and micro-pool within the online detention basin.

Table 5.1 SUDS Assessment

5.4.2 With reference to the Environmental Health consultation response, the inclusion of reed beds has been considered within the wider site. This is not considered viable due to the steeply sloping nature of the site. The proposed detention basin is to be online in nature, with a low flow channel and micro-pool which will offer water quality benefits, as discussed further in Section 5.5 below. The inclusion of planting, such as reeds, will be considered within the design of the detention basin.

5.5 Water quality

5.5.1 Chapter 26 of The SuDS Manual 2015 (CIRIA 753) provides guidance on the methods that should be used to design SuDS to meet the water quality design criteria and good practice design standards. Based on the simple index approach, the pollution hazard indices for different land use classifications are listed in Table 26.2, Chapter 26 of the SuDS Manual. Table 5.2 below summarises the pollution hazard indices that are applicable for residential land use development.

Pollution Hazard Indices for Different Land Use Classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-carbons**
Residential Roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg school, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4
Source: Table 26.2 of The SuDS Manual				

Table 5.2 Pollution Hazard Indices for Different Land Use Classifications

5.5.2 Surface water run-off from the development will pass through an online detention basin. Additional SUDS measures, such as filter drains and swales, will be considered as part of the detailed drainage design.

5.5.3 Table 26.3 of The SuDS Manual shows the mitigation indices for a range of SuDS components for discharges to surface waters. A copy of this is provided in Table 5.3 below.

Indicative SuDS Mitigation Indices for Discharges to Surface Waters			
Type of SuDS Component	**Mitigation Indices**		
	TSS	**Metals**	**Hydro-carbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Source: Table 26.3 of The SuDS Manual			

Table 5.3 Indicative SuDS Mitigation Indices for Discharges to Surface Waters

5.5.4 As set out in The SuDS Manual, where two or more components are utilised, *"a factor of 0.5 is used to account for the reduced performance of the secondary or tertiary components"*. This will therefore need to be considered where multiple SUDS components are proposed.

5.5.5 As the detention basin will be online and include a low flow channel and micropool, it is considered to be a pond for this the purpose of this water quality assessment. Based on the information and assessment set out above, the online detention basin is considered to provide sufficient water treatment for the development proposals.

5.5.6 Additional SuDS features will be considered at detailed design stage, which would offer further water quality benefits.

5.6 Surface water drainage design and management

5.6.1 Proposals are to design the surface water drainage system to accommodate storms up to the 1 in 100 year event plus an allowance of 40% for climate change. The design life of a residential development is considered to be greater than 60 years. Table 5.4 below is a copy of Table 2 from the Environment Agency's guidance 'Flood risk assessments: climate change allowances' to support the National Planning Policy Framework, which defines the climate change allowances. This information is provided for the Derwent Derbyshire Management Catchment in which the proposed development is located within.

Peak Rainfall Intensity Allowance in Small and Urban Catchments			
Allowance	**Epoch**	**Central Allowance**	**Upper End Allowance**
3.3%	2050s	20%	35%
	2070s	25%	35%
1%	2050s	20%	40%
	2070s	30%	40%
Source: https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall			

Table 5.4 Peak Rainfall Allowance: Derwent Derbyshire Management Catchment

5.7 Existing run-off rates

5.7.1 To reflect the changes in the near surface geology across the site the greenfield run-off rates have been calculated. The method used to calculate the greenfield run off rates is the ICP SUDS and the calculations are enclosed in **Appendix I**.

5.7.2 The greenfield run-off rates, for the application site, are:

Greenfield Run-off Rates			
Return Period	**Existing Discharge Rate (l/s)**	**Proposed Discharge Rate (l/s)**	**Betterment**
Qbar Total Site Area	45.2	45.2	0%
1 in 1 Year	37.5	37.5	0%
1 in 30 Year	88.6	45.2	49%
1 in 100 Year	116.2	45.2	61%
1 in 100 Year + Climate Change	-	45.2	

Table 5.5 Greenfield Run-off Rates

5.7.3 Surface water run-off from the proposed development will be limited to the greenfield equivalent rate of 45.2 l/s via a vortex flow control device.

5.7.4 With reference to the results of the fluvial hydraulic modelling study, as discussed in Chapter 4.0, restricting flows to the greenfield equivalent rate of 45.2 l/s is considered to be appropriate.

5.8 Attenuation requirements

5.8.1 Surface water will discharge into the watercourse located to the west of the site and will be attenuated to the greenfield run-off rate of 45.2 l/s. To achieve this, surface water will be attenuated via an online detention basin in the north-west corner of the site to accommodate a 1 in 100 year event plus an allowance of 40% for climate change.

5.8.2 The proposed drained area of the development is 1.883 ha, as shown on the plan enclosed in **Appendix J**. An allowance of 10% has been applied for urban creep. Therefore, the drainage calculation have been prepared based on a total drained area of 1.940 ha.

5.8.3 Based on the proposed drained area and allowable discharge rate of 45.2 l/s, the storage requirement for the 1 in 100 year plus climate change event has been calculated utilising the following parameters. Calculations are enclosed in **Appendix K**.

Rainfall profile	= Flood Estimation Handbook
Return period	= 100 year
Durations	= 60 to 10080 minutes
Climate change	= 40%
Drained area	= 1.940 ha
Limiting flow to watercourse	= 45.2 l/s
Control	= Vortex flow control
Total storage required	= 1,084m^3

5.8.4 The indicative surface water drainage layout incorporating the attenuation is shown on the plan enclosed in **Appendix H.**

5.9 Overland flows

5.9.1 Proposals are to design the surface water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate. Clearly there is a risk of this storm event being exceeded, albeit this risk is considered very low. In such an event the proposed drainage systems will become overwhelmed and overland flows could occur. Overland flows will be directed to follow the path that overland flows currently follow.

5.9.2 Predicted overland flows are shown on the plan enclosed in **Appendix L**.

6.0 Foul water drainage strategy

6.1 Severn Trent Water's asset plan is enclosed in **Appendix C.** The asset plan identifies a foul water sewer located in Barms Way to the south. This is a 150mm diameter sewer, which then flows south along Nunsfield Road, where is transitions to a 225mm diameter combined water sewer.

6.2 The intention is for foul water to discharge to Severn Trent Water's sewer network at manhole 5203, located at the junction of Barms Way and Nunsfield Road. A pre-development enquiry has been undertaken with Severn Trent Water (STW) with regards to this connection, see response enclosed in **Appendix M**. STW have confirmed that a gravity connection to this sewer *"at a new or existing manhole (5203)"* would be acceptable, subject to a formal Section 106 approval.

7.0 Maintenance

7.1 Surface water drainage maintenance

7.1.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption. The various areas will be maintained as set out in Table 7.1 below.

Maintenance Areas – Surface Water	
Aspect	**Maintainer**
Private Drains	Home owner
SUDS – Private	Home owner
SUDS – Communal	Management Company
Adopted Sewers	Severn Trent Water

Table 7.1 Maintenance Areas – Surface Water

7.1.2 Additional maintenance information is set out below for the various components of the surface water drainage strategy.

7.1.3 Hydrobrake

7.1.3.1 A hydrobrake will be utilised to restrict surface water flows.

7.1.3.2 Responsibility for the maintenance of the hydrobrake is with the management company, in line with the manufacturer's specifications.

7.1.4 Detention basins

7.1.4.1 Surface water attenuation will be provided within an online detention basin with low flow channel and micropool. The operation and maintenance requirements for detention basins are outlined in Table 7.2 below.

Operation and Maintenance: Detention Basins		
Maintenance schedule	**Required action**	**Typical Frequency**
Regular maintenance	Remove litter and debris	Monthly
	Cut the grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage reseeding or re-turfing	As required
	Realignment of rip-rap	As required.
	Repair/rehabilitation of inlets, outlets and overflows	As required.
	Relevel uneven surfaces and reinstate design levels	As required
Source: Table 22.1 from Source: The SuDs Manual - 2015		

Table 7.2 Operation and Maintenance: Detention Basins

7.1.4.2 Responsibility for the maintenance of detention basins is as follows:

- Management company – shared detention basins.

7.2 Foul water drainage maintenance

7.2.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption. The various areas will be maintained as set out in Table 7.3 below.

Maintenance Areas – Foul Water	
Aspect	**Maintainer**
Private Drains	Home owner
Adopted Sewers	Severn Trent Water

Table 7.3 Maintenance Areas – Foul Water

8.0 Summary and conclusions

8.1 The proposed Residential development is located at Hogshaw Farm, off Nunsfield Road, Buxton. The site is bound by agricultural land to the north, a golf course and dwellings to the east, Hogshaw Brook and dwellings to the south and a railway line to the west.

8.2 The proposed development will comprise 99 residential dwellings.

8.3 The development is located within Flood Zone 1 and at low risk of flooding from rivers and sea. The site is shown to be at low risk of flooding from surface water, groundwater, sewers and reservoirs.

8.4 A fluvial hydraulic modelling study has been undertaken by JBA Consulting Ltd. The results of which identify a slight reduction in the existing flood extent identified downstream of the site, and also a reduction in these flood depths. The proposals are therefore shown to offer flood alleviation downstream of the site, achieving a betterment on the existing scenario.

8.5 The proposed surface water drainage strategy will comprise a piped network with attenuation provided in an online detention basin, with an outfall to Nun Brook restricted to the greenfield run-off rate of 45.2 l/s. A total volume of 1,084m^3 of attenuation will be provided, sufficient to accommodate storms up to and including the 1 in 100 + 40% climate change event.

8.6 The intention is for foul water to discharge to Severn Trent Water's sewer network at the junction of Barms Way and Nunsfield Road. A pre-development enquiry has been undertaken with Severn Trent Water (STW) with regards to this connection. STW have confirmed that a gravity connection to this sewer *"at a new or existing manhole (5203)"* would be acceptable, subject to a formal Section 106 approval.

8.7 National, Regional and Local planning policy requires that:

- Development is directed to sites at the lowest probability of flooding;
- Development accommodates the potential impacts of climate change;
- Development should not be permitted if it would be at an unacceptable risk of flooding or create an unacceptable risk elsewhere; and
- New development should facilitate safe access and exit during flood conditions.

8.8 The proposals for a residential development at Hogshaw Farm, off Nunsfield Road, Buxton are therefore fully compliant with policy in respect of development and flood risk, such that flood risk considerations do not constitute a barrier to the granting of planning consent.

Appendix A

Planning Layout

Barratt Homes drawing no. H8797-BAH-XX-XX-DR-UD-203001-P03

SCHEDULE OF ACCOMMODATION

Barratt Type	House Type	Sqft	No	Total Sqft
Private Units				
Rowan - End	2 Bed Terraced House	866	10	8660
Rowan - Mid	2 Bed Terraced House	866	1	866
Oakmoor - End	3 Bed Bed Semi / Mews House Duel Aspect End Unit	1049	1	1049
Birchmoor - End	3 Bed Terraced House	1025	3	3075
Rathlin	3 Bed Detached House	990	11	10890
Matlock - End	3 Bed Semi / Mews House	970	23	22310
Hopton	3 Bed Detached / Semi Detached Dual Aspect House	1017	9	9153
Hopton - End	3 Bed Detached / Semi Detached Dual Aspect House	1017	1	1017
Knightwood - End	4 Bed Townhouse	1122	18	20196
Ashtead	4 Bed Dual Aspect Detached House	1265	4	5060
Wallasea	4 Bedroom Int. Garage Detached House	1206	11	13266
Haweswater	4 Bedroom Int. Garage Detached House	1495	7	10465
Total number of units and square footage			**99**	**106007**
Gross Site Area in Acres				**10.39**
Open Space & Undevelopable Area in Acres				**3.18**
Net Site Area in Acres				**7.21**
Density (Units per Acre)				**14**
Density (Units per Hectare)				**34**
Square Foot / Acre				**14,703**

Legend:

- Proposed dwelling and house type code.
- Proposed garage to be built.
- Grass, refer to detailed landscaping plans for details.
- Wall (Refer to BTL01/BTD01&02 for details)
- Timber gates to be erected to rear gardens. (as indicated on site layout).
- Existing trees to be retained & protected during works.
- Trees to be removed, refer to 1795_ARB_AIA & 1795_ARB_AMS for details.
- Root Protection Zone
- Indicates a tree with a TPO.
- Water main easement, 5m wide as confirmed by Ward Hadaway.
- AS OPP — Dwelling handing - as / opposite see the construction dwg.
- Refuse collection area
- EV — Car charging point, refer to EVCP info pack for specs & positioning details.
- PROW.
- GRP Chimney
- Indicative Landscaping, refer to UG_1795_Lan_SI_01-05 for details.

North

AGRICULTURAL LAND

PUMPING STATION

SUDS

LOCAL WILDLIFE AREA

GOLF COURSE

Nunsfield Farm

Fairfield Commc

Potential Future Link Road

ENTRANCE STATEMENT

SUBSTATION

TEMP SALES PARKING

PLAY AREA (LAP) Refer to drawing 2402.4/929

Buxton FP 2

Buxton FP 1

Buxton FP 77

Nestle Water Main 5m

Existing connection to remain open

Existing connection to remain open

BARMS WAY

GLENMOOR ROAD

Sub Sta

The Devonshire Cooch House

324.3m

Northlands

St Peter's Church

Links View

NORTH ROAD

ARM 4

ARM 3

B.O.A.T

Revision	Description	Date	Design By
03	Flipped plot 16, pulled 16&17 south 1m, revised multi use footpath position, various minor tweaks to suit ENG comments	28/06/24	GB
02	Layout updated to various internal comments.	18/06/24	GB

Project: HOGSHAW FARM

Description: PLANNING LAYOUT

Design By:	Date:	Scale at A0:	Revision:
GB	11/06/2024	1:500	3

Project	Originator	Functional	Spatial	Form	Discipline	Number
H8797	- BAH -	XX	- XX -	OR -	UD -	203001

BARRATT HOMES

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HOGSHAW FARM BUXTON

Appendix C
Severn Trent Water Asset Plan

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Scale: 1:1250 | Date: 28/03/23 | Wastewater Plan A2

Data updated: 14/03/23 | Map Centre: 406645,374389 | Our Ref: 1121913 - 1 | Powered by digdat

Public Foul Gravity/Lateral Drain		Highway Drain		Manhole Foul	
Public Combined Gravity/Lateral Drain		Overflow Pipe		Manhole Surface	
Public Surface Water Gravity/Lateral Drain		Disposal Pipe		Abandoned Pipe	
Pressure Foul		Culverted Water Course		Chamber	
Pressure Combined		Pumping Station			
Pressure Surface Water		Fitting			

Section 104 sewers are shown in green

Private sewers are shown in magenta

nathan.reed@jppuk.net

11024 Buxton

SEVERN TRENT

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Appendix D
Environment Agency Product 4 Data

Detailed River Network Map, centred on Nunsfield Farm, Buxton [EMD299476]

Environment Agency

Legend

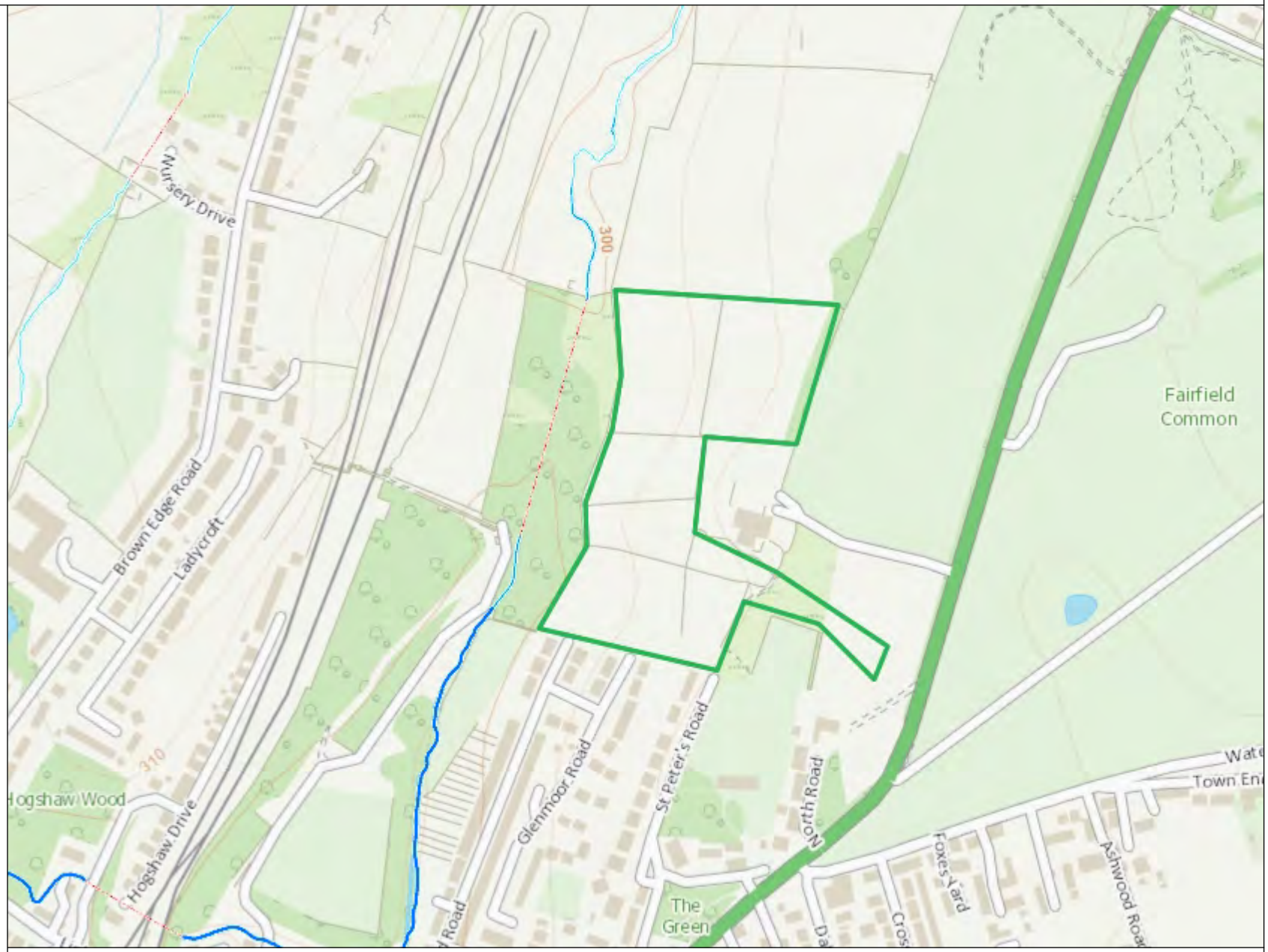
Detailed River Network

- Primary River
- Secondary River
- Tertiary River
- Lake / Reservoir
- Canal
- Canal Tunnel
- Extended Culvert
- Multiple Channel Culvert
- Underground River (potential sewer)
- Underground River (inferred)
- Underground River (local knowledge)
- Undefined

Offline Drainage features

Detailed River Network

- Primary River
- Secondary River
- Tertiary River
- Lake / Reservoir
- Canal
- Canal Tunnel
- Extended Culvert
- Multiple Channel Culvert
- Underground River (potential sewer)
- Underground River (inferred)
- Underground River (local knowledge)
- Undefined



1: 5,000

0 125

Metres

N W E S

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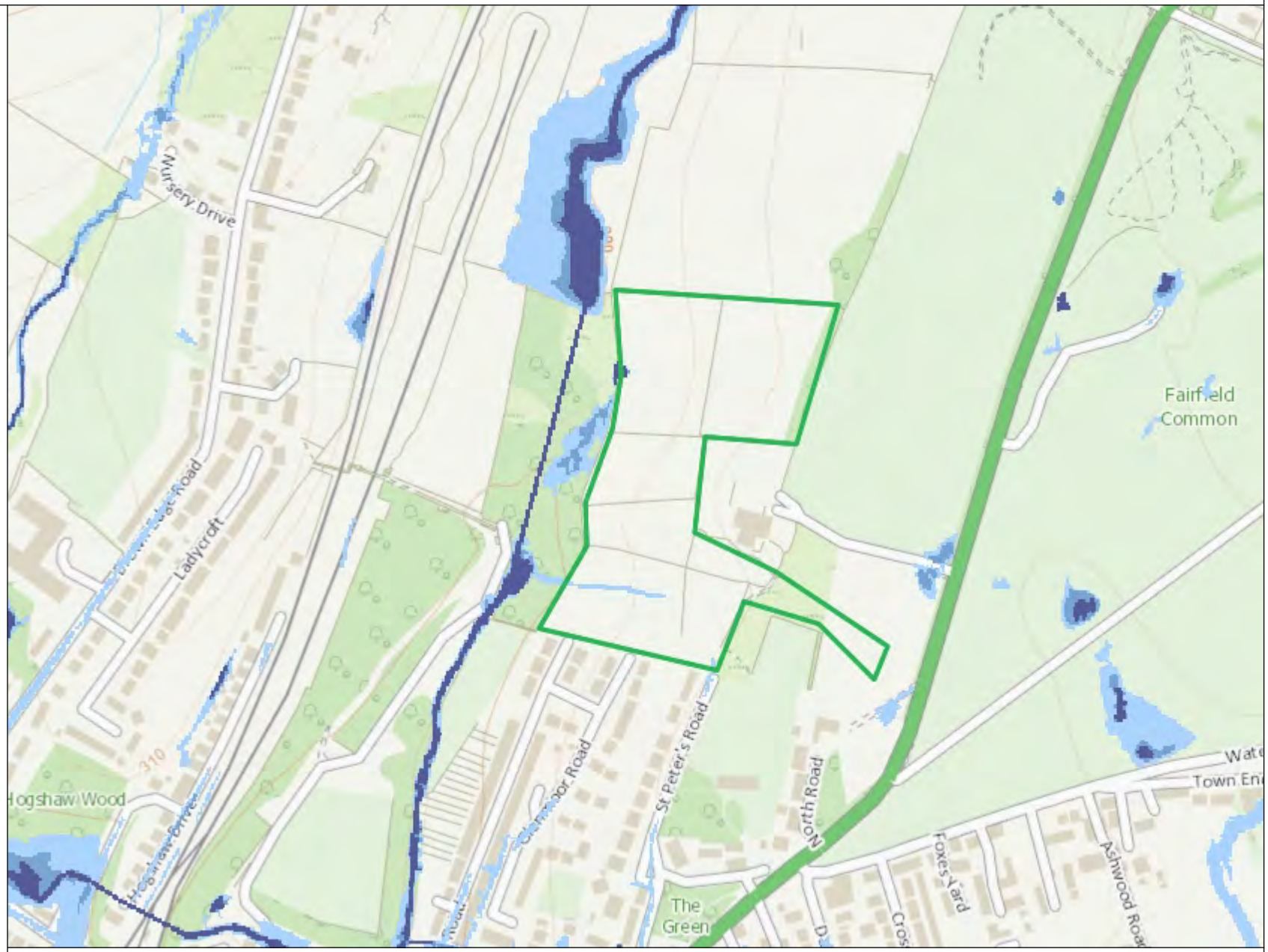
Surface Water Flood Map, centred on Nunsfield Farm, Buxton [EMD299476]

Environment Agency

Legend

- Flood Extent 1 in 30
- Flood Extent 1 in 100
- Flood Extent 1 in 1000



1: 5,000

0 125

Metres

N W E S

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