LAND ADJACENT
480 HALIFAX ROAD
HIGHTOWN
LIVERSEDGE
WF15 8EB

Drainage Strategy

DOCUMENT No:
23042-DSR-001-A

1st AUGUST 2024

Issue Sheet.

Prepared	Date		Checked	Date
MJM	01.08.24		MJM	01.08.24

Revisions	Comment	Date
A	Initial Issue	01.08.24

The report is based on the information that has been acquired and / or made available to Advant Engineers via the various searches and consultations undertaken as part of the Drainage Strategy. In some cases, anecdotal information has been relied upon, where documented evidence has been lacking.

The conclusions drawn in the above report are considered correct although any subsequent additional information may allow refinement of the conclusions.

All work carried out in preparing this report has utilised and is based upon Advant Engineers current professional knowledge and understanding of current UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

This report has been prepared using information contained in maps and documents prepared by others. Advant Engineers can accept no responsibility for the accuracy of such information.

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1. Introduction

1.1. Advant Engineers Ltd has been commissioned by Barnes Homes Ltd, to undertake a Drainage Strategy in connection with the proposed development at the land off Halifax Road, Liversedge. The proposal consists of 3 new build dwellings with associated parking and access road.

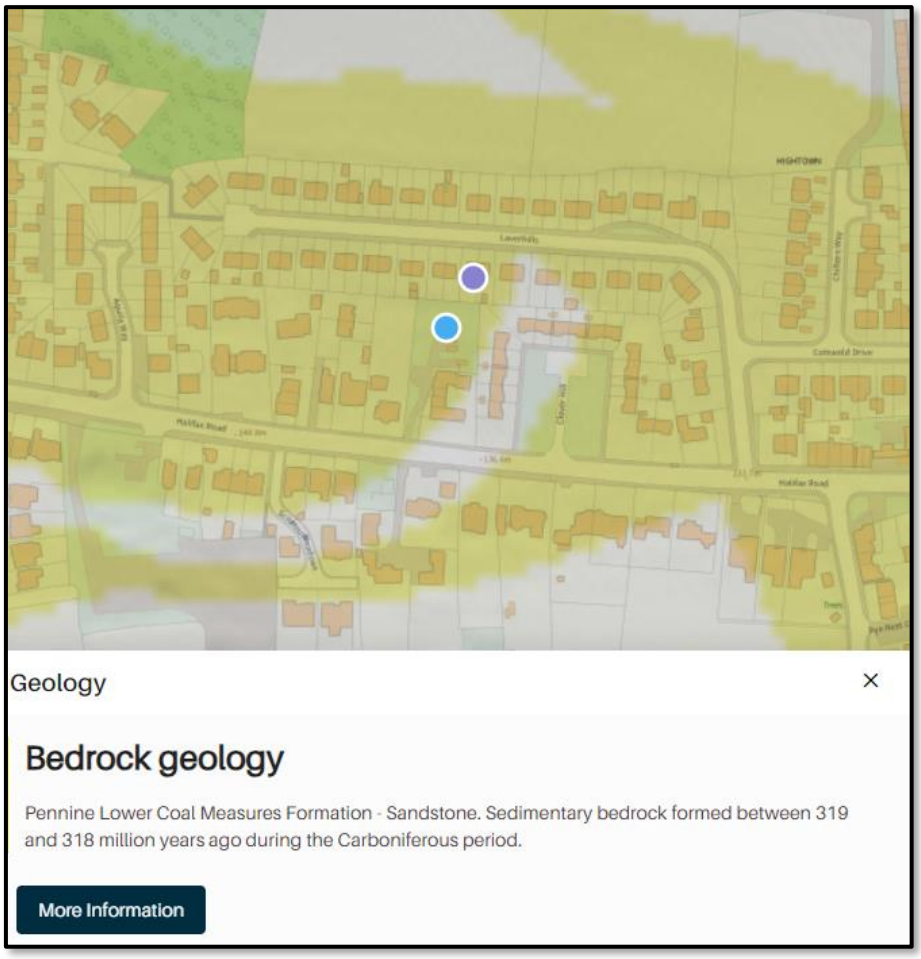
1.2. This report should be read in conjunction with drawing 24066-101 and associated architectural and engineering drawings.

2. Existing Site

2.1. The site currently is a greenfield piece of land with no existing development and located of Halifax Road and access via a stone track, the overall site area is 1,232m² (0.123ha). (See Appendix A for Impermeable area plan).

2.2. This site can be located at the following co-ordinates 418735E, 424056N and the nearest postcode is WF15 8EB and can be seen on the below extract.

2.3. No site investigation has been received at this point, we have therefore referred to the BGS website which describes the site as below.



2.4. There is a public surface water and combined sewers located under the public highway to the south of the site. (See Appendix B for sewer records).

3. Proposed Development

3.1. The proposed development is for 3 new build dwellings with associated parking and a new private driveway into the site. (See Appendix C for layout)

4. Drainage Strategy

4.1. Surface Water

4.2. The surface water drainage should be designed in accordance with the SUD hierarchy providing evidence to each step before moving on to the next one, the SUDS hierarchy is as follows:

SOURCE (INFILTRATION)

WATERCOURSE

SURFACE WATER SEWER

4.3. Based on the BGS website and the constrained nature of the site it is expected that infiltration may not be feasible, therefore we have discounted it at this point.

4.4. The next level on the hierarchy is discharge to a watercourse, as there are no watercourses in the vicinity of the site then this has been discounted as an option.

4.5. Next would be to discharge to a surface water sewer, according to the sewer records there is a public surface water sewer under Halifax Road to the south of the site, it is therefore proposed to discharge to this sewer at a controlled rate.

4.6. As the site is greenfield then greenfield rates should be utilised as the discharge rate back to the public surface water sewer, the greenfield rates for this site are as follows: (See Appendix D for calc).

QBAR = 0.66 l/s
1 in 1 Year = 0.56 l/s
1 in 30 Year = 1.15 l/s
1 in 100 Year = 1.36 l/s

4.7. The above rates would require such a small orifice that it would be at risk of blockages, we are therefore proposing to restrict the discharge to **2.0 l/s** which requires a 28mm orifice and attenuate the **1 in 100 Year + 40%** climate change rainfall event on site in the subbase of the permeable paving. (See Appendix E for Drainage Layout and Appendix F for drainage calcs).

4.8. Foul Drainage

4.9. The foul drainage is proposed to connect into the public foul sewer under Halifax Road to the south of the site.

5. SUDS Elements

5.1. All new surface water drainage systems should implement SUDS features where reasonably possible, these features are incorporated to offer benefits in Water Quality, Water Quantity, Amenity and Biodiversity. Below we have considered each SUDS element and determined it use within this particular development

COMPONENT	SUITABILITY	REASON
Rainwater Harvesting	✓	Potential for a rainwater harvesting unit to be placed in the rear garden of each property.
Green Roof	X	Roof not suitable for a Green Roof.
Blue Roof	X	Roof not suitable for a Blue Roof.
Infiltration Systems	X	Ground conditions not suitable
Proprietary Treatment Systems	✓	Flow control to be installed.
Filter Strips	X	Ground conditions not suitable
Filter Drains	X	Ground conditions not suitable
Swales	X	Ground conditions not suitable
Bioretention Systems	X	Utilising permeable paving in place
Trees	✓	New trees are being proposed as part of the new landscaping
Rain Garden	X	More practical solutions are available.
Pervious Pavements	✓	Permeable paving on driveway and parking bays are being included.
Attenuation Storage Tanks	X	Permeable paving used for storage
Detention Basins	X	Permeable paving used for storage
Ponds and Wetlands	X	Permeable paving used for storage

6. SUDS Maintenance

6.1. Upon selection of the SUDS elements to be incorporated into the surface water drainage scheme then a maintenance plan needs to be adopted along with responsibility of the maintenance.

6.2. The responsibility can general be with 3 different bodies, it could be 'Private' which means the responsibility remains with the homeowner, it could be 'Public" which means it will be adopted and be the responsibility of the local authority or water authority, or it could be 'Management Company' which means a specialist company could be employed or created for the purpose of maintaining those elements, for the management company there would be an annual charge that the home owners would be expected to pay each year.

	PRIVATE	PUBLIC	MANAGEMENT
Rainwater Harvesting	✓		
Flow Control Device	✓		
Pervious Pavements	✓		

6.3. With each element the relevant responsible person(s) / company will need to undertake different tasks on varying frequencies to ensure the peak performance of the SUDS system and remove the risk of flooding or failure, the maintenance regime and regularity for each element are outlined in the tables below.

6.4. Rainwater Harvesting

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

6.5. Flow Control Device

An example of operation and maintenance requirements for a proprietary treatment system		
Maintenance schedule	**Required action**	**Typical frequency**
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

6.6. Pervious Pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	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 manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

7. Flood Exceedance Events

7.1. Although the surface water drainage has been designed to accommodate the 1 in 100 year + 40% climate change rainfall event with no flooding, we have to consider events that exceed this and what happens to any flooding that may occur.

7.2. To illustrate this event, we have produced a Flood Exceedance Layout plan (See Appendix G for layout) and from this we can see that flood would occur at the flow control manhole (S20) and then would follow the road as per the original contours of the site.

8. Conclusion

8.1. Advant Engineers were commissioned by Barnes Homes Ltd to undertake a Drainage Strategy for the proposed residential development at the land off Halifax Road, Liversedge. This report will be provided as supporting documentation as part of a planning application.

8.2. The site is currently greenfield, and it is 1,232m² (0.123ha).

8.3. It is proposed to discharge the surface water to the public surface water sewer under Halifax Road south of the site.

8.4. The surface water will be restricted to 2.0 l/s for the 1 in 100 year + 40% climate change rainfall event with attenuation provided in the subbase of the permeable paving.

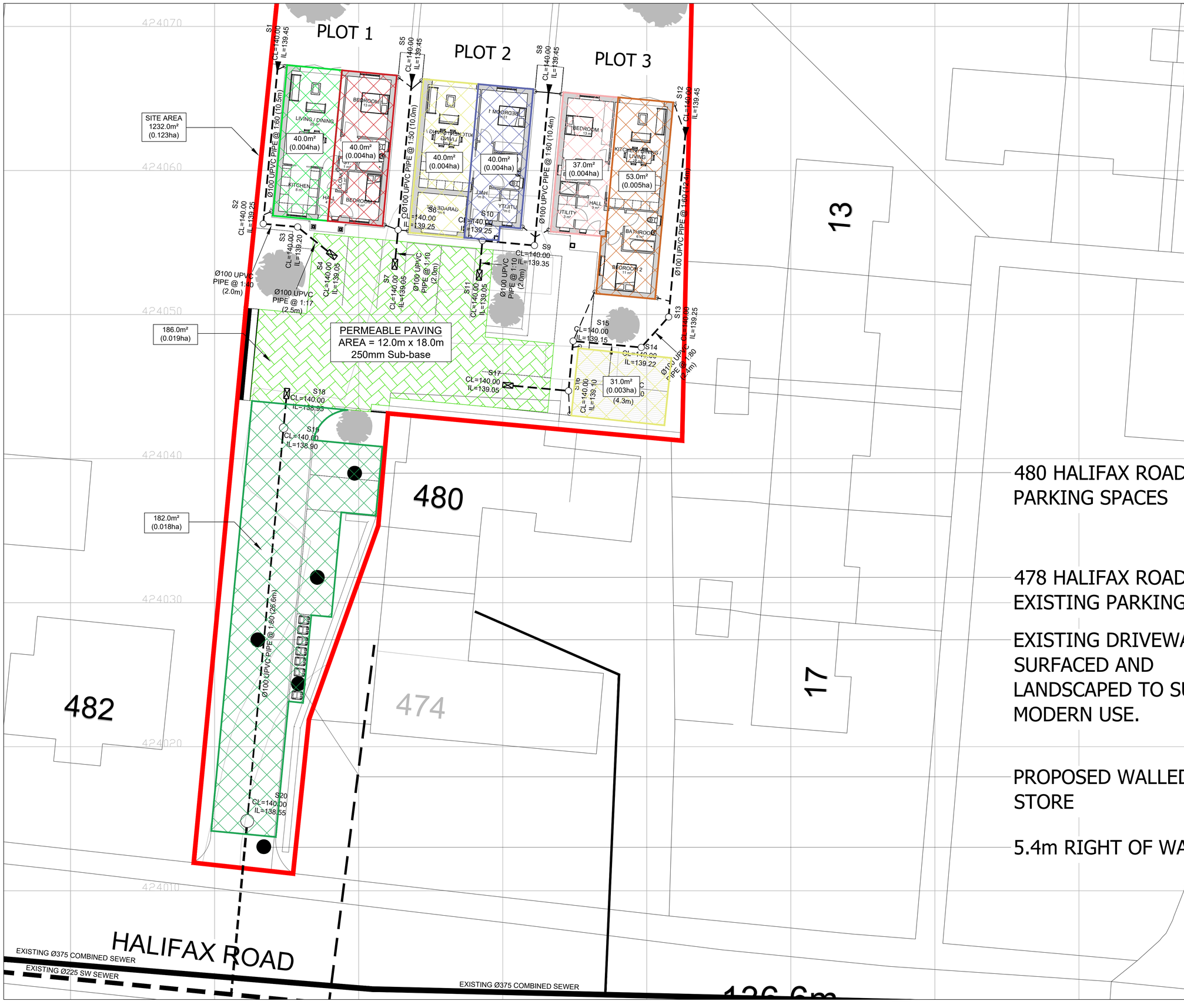
8.5. Foul drainage is to be discharged to the public combined sewer under Halifax Road south of the site.

8.6. The flood exceedance event allows water flows to follow the road and match the existing undeveloped overland flows.

8.7. All public surface water/foul water drainage should be designed in accordance with the Water Authority and Sewers for Adoption.

8.8. All private surface water and surface water/foul water drainage should be designed in accordance with the current Building Regulations Part H.

APPENDIX A
IMPERMEABLE AREA PLAN



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KEY

REV		BY	DATE
A	INITIAL ISSUE	MJM	01.08.24
REV	AMENDMENTS	BY	DATE

PRELIMINARY

STATUS	CHK'D
PRELIMINARY	MJM
FOR COMMENT	
FOR APPROVAL	
FOR CONSTRUCTION	
AS BUILT	

advant ENGINEERS
Building 3 Leeds City West Business Park,
Geldard Road, Leeds, LS12 6LN
0113 873 0607
leeds@advantengineers.co.uk

CLIENT
BARNES HOMES

CONTRACT
LAND ADJ. 480 HALIFAX ROAD
LIVERSEDGE
WF15 8EB

TITLE
PROPOSED IMPERMEABLE AREA PLAN

DRAWN	MJM	CHK'D	MJM
SCALE	1:125 @ A1	DATE	01.08.24

JOB No	DRG No	REV
24066	100	A

APPENDIX B
SEWER RECORDS

YORKSHIRE WATER
PROTECTION OF MAINS AND SERVICES

1. The position of Yorkshire Water Services Ltd (YWS) apparatus shown on the existing mains record drawing(s) indicates the ***general*** position and nature of our apparatus and the accuracy of this information cannot be guaranteed. Any damage to YWS apparatus as a result of your works may have serious consequences and you will be held responsible for all costs incurred. Prior to commencing major works, the exact location of apparatus must be determined on site, if necessary by excavating trial holes. The actual position of such apparatus and that of service pipes which have not been indicated must be established on site by contacting the Customer Helpline on 0845 124 24 24 for both water and sewerage.

2. The public sewer and water network is lawfully retained in its existing position and the sewerage and water undertaker is entitled to have it remain so without any disturbance. The provisions of section 159 of the Water Industry Act 1991 provides that the undertaker may "inspect, maintain, adjust, repair or alter" the network. Those rights are given to enable the undertaker to perform its statutory duties. Any development of the land or any other action that unacceptably hindered the exercise of those rights would be unlawful. The provisions contained in Section 185 of the Water Industry Act 1991 state that where it is reasonable to do so, a person may require the water supply undertaker to alter or remove a pipe where it is necessary to enable that person to carry out a proposed change of use of the land. The provisions contained in Section 185 also require the person making the request to pay the full cost of carrying out the necessary works.

3. Ground levels over existing YWS apparatus are to be maintained. Sewers in highways will ***generally*** be laid to give 1200mm of cover from finished ground level working to kerb races, other permanent identification of the limits of the road or to an agreed line and level. Substantial increases or decreases to this 1200mm depth of cover will result in the sewer being re-laid at your expense. Water mains and services will ***generally*** be laid with a minimum of 750mm depth of cover however some mains and services usually those installed over 50 years ago may have less ground cover.

4. If surface levels are to be decreased / increased significantly the effects on existing water supply apparatus will be carefully considered and if any alterations are necessary, the costs of the alterations will be recharged to you in full. Outlets on fire hydrants must be no more than 300mm below the new levels and all surface boxes must be adjusted as part of the scheme.

5. To enable future repair works to be carried out without hindrance; any pipe, cable, duct, etc. installed parallel to a water main or service pipe should not be installed directly over or within 300mm of a water main or service pipe or 1000mm of a waste water asset. Where a pipe, cable, duct, etc. crosses a main or service it should preferably cross perpendicular or at an angle of no less than 45o and with a minimum clearance of 150mm. These requirements apply to activities within an existing highway and are relevant to the installation of pipes, cables, ducts, etc. up to and including 250mm in diameter *(see illustration below)*. Necessary protection measures for installations greater than 250mm in diameter and/or in private land will need to be agreed on an individual basis. Installations within a new development site must comply with the National Joint Utilities Group publication Volume 2: NJUG Guidelines On The Positioning Of Underground Utilities Apparatus For New Development Sites.

6. All excavation works near to YW apparatus should be by hand digging only.

7. Backfilling with a suitable material to a minimum 300mm above YW apparatus is required.

8. Adequate support must be provided where any works pass under YW apparatus.

9. Jointing chambers, lighting columns and other structures must be installed in such a way that future repair or maintenance works to YW apparatus will not be hindered.

10. Apparatus such as; railings, sign posts, etc. must not be placed in such a way that they prevent access to or full operation of controlling valves, hydrants or similar apparatus. YWS surface boxes must not be covered or buried. Any adjustment, alteration or replacement of manhole covers must be agreed on site prior to the commencement of the works with a YWS Inspector who may be contacted via our Call Centre on 0845 124 24 24.

11. Explosives shall not be used within 100 metres of any Yorkshire Water Services apparatus or installations.

12. Vibrating plant should not be used directly over any apparatus. Movement or operation by vehicles or heavy plant is not to be permitted in the immediate vicinity of YWS plant or apparatus unless there has been prior consultation and, if necessary, adequate protection provided without cost to YWS.

13. ***Under no circumstances*** should thrust boring or similar trenchless techniques commence until the actual position of the Company's mains/services along the proposed route have been confirmed by trial holes.

14. Any alterations to the highway should be notified following the procedures outlined in the New Road and Street Works Act 1991 Code of Practice; Measures Necessary Where Apparatus Is Affected By Major Works (Diversionary Works).

15. You will be held responsible for any damage or loss to YWS apparatus during and after completion of work, caused by yourselves, your servant or agent. Any damage caused or observed to YWS plant or apparatus should be immediately reported to YWS. Should YW incur any costs as a result of non-compliance with the above, all costs will be rechargeable in full.

16. You should ensure that nothing is done on the site to prejudice the safety or operation of YWS employees, plant or apparatus.

17. In accordance with the New Roads and Street Works Act 1991, Chapter 22, Part 3, Section 80. The location of any identified YW asset "*which is not marked, or is wrongly marked, on the records made available*" should be communicated back to Yorkshire Water. The location of the apparatus should be identified on copies of the supplied plans which should be returned to Yorkshire Water (Asset Records Team) with photographic supporting evidence where possible.

18. The Government has decided that responsibility for private sewers serving two or more properties and lateral drains (the section of pipe beyond the boundary of a single property, connecting it to the public sewer) will be transferred to the water companies on Oct 1 2011.

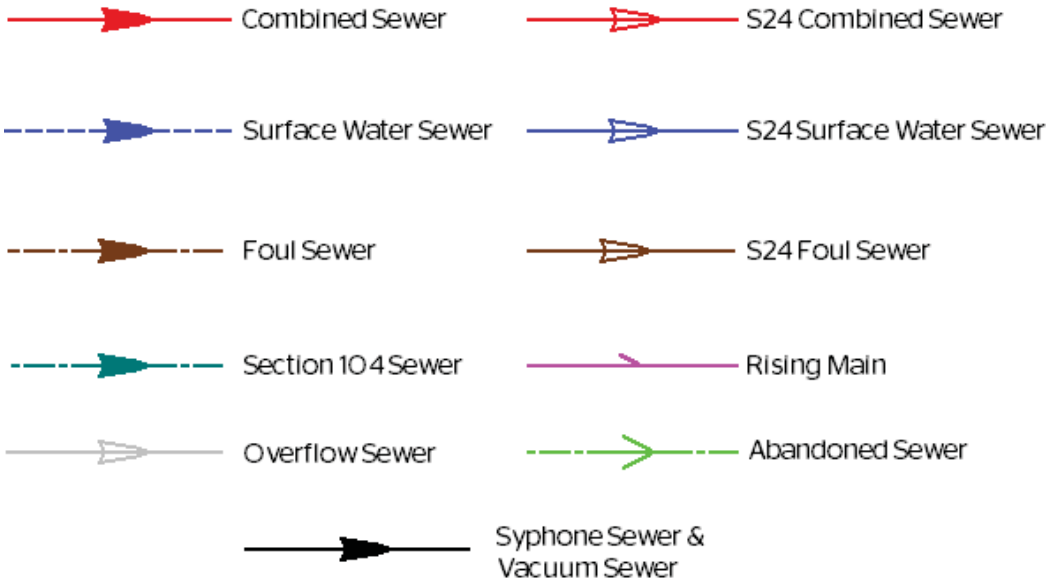
Private pumping stations will also transfer during the period 1 October 2011 – 1 Oct 2016. Records of these assets may not yet be shown on the existing mains record drawing(s). If you encounter any of these assets you must inform Yorkshire Water Services Ltd (YWS).

19. Please note that the information supplied on the enclosed plans is reproduced from Ordnance Survey material with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office, © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number 1000019559.

20. This information is for guidance only and the position and depth of any YW apparatus is approximate only. Likewise, the nature and condition of any YW apparatus cannot be guaranteed. YW has no responsibility for recording the locations of privately owned apparatus. As of 1 October 2011, there may be some lateral drains and/or public sewers which are not documented on YW records but may still be present. For the avoidance of doubt, this information is not a substitute for appropriate professional and/or legal advice. YW accepts no responsibility for any inaccuracy or omissions in this information. The actual position of YW apparatus must be determined on site by excavating trail holes by hand. YW requires a minimum of two working days' written notice of the intention to excavate any trial holes before any excavation can be undertaken. If there are any queries in this respect please contact Yorkshire Water on 0845 124 24 24.

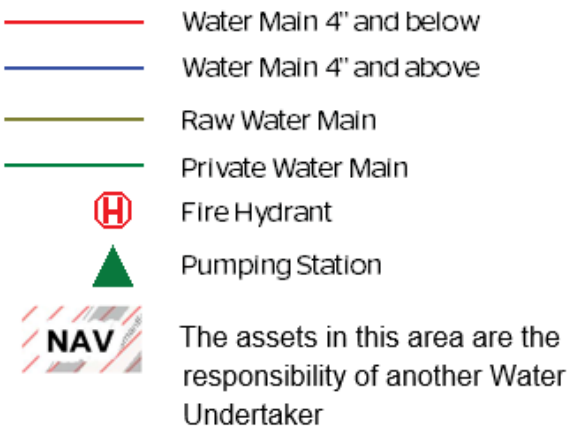
Property Identfier

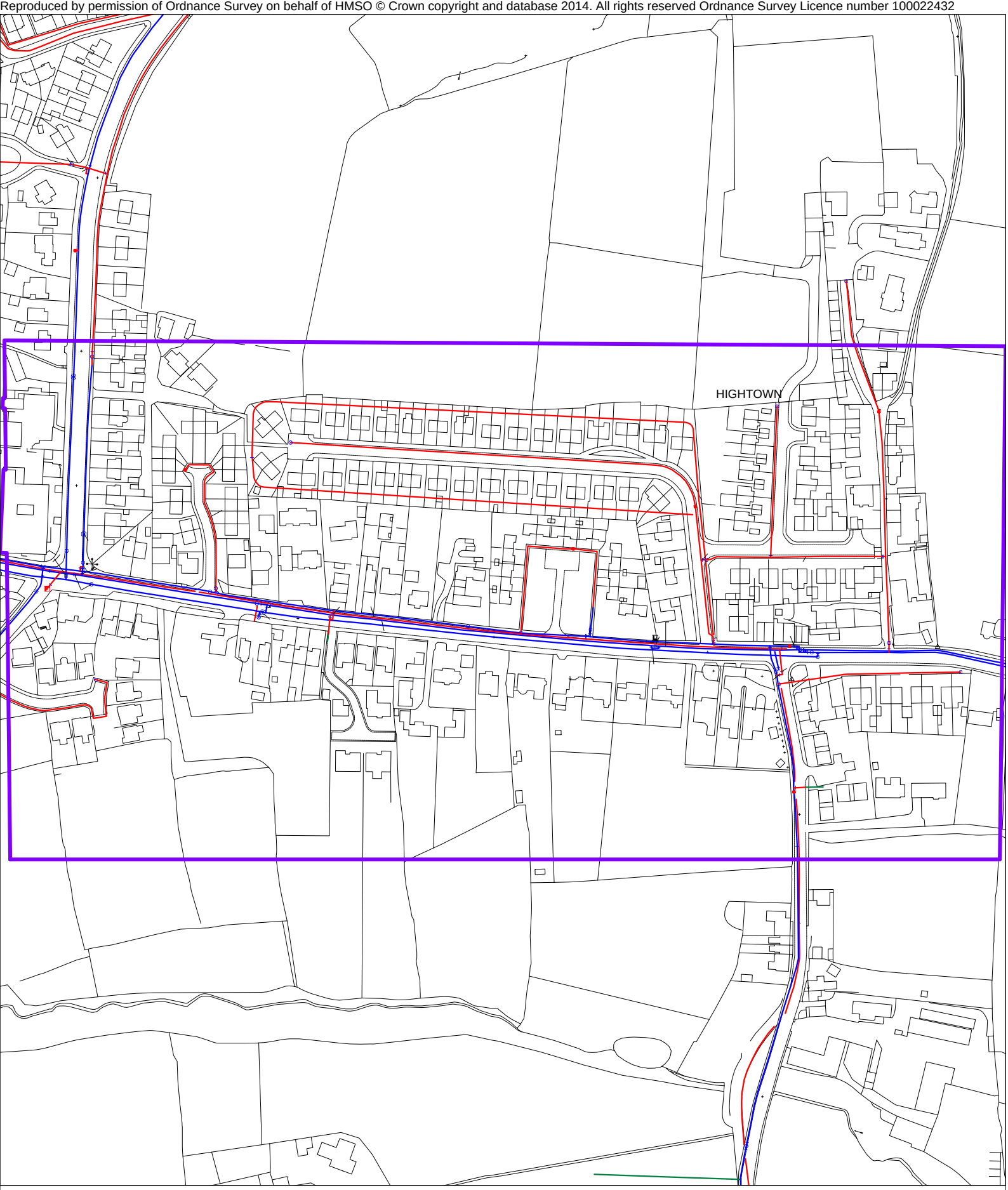
Sewer Legend



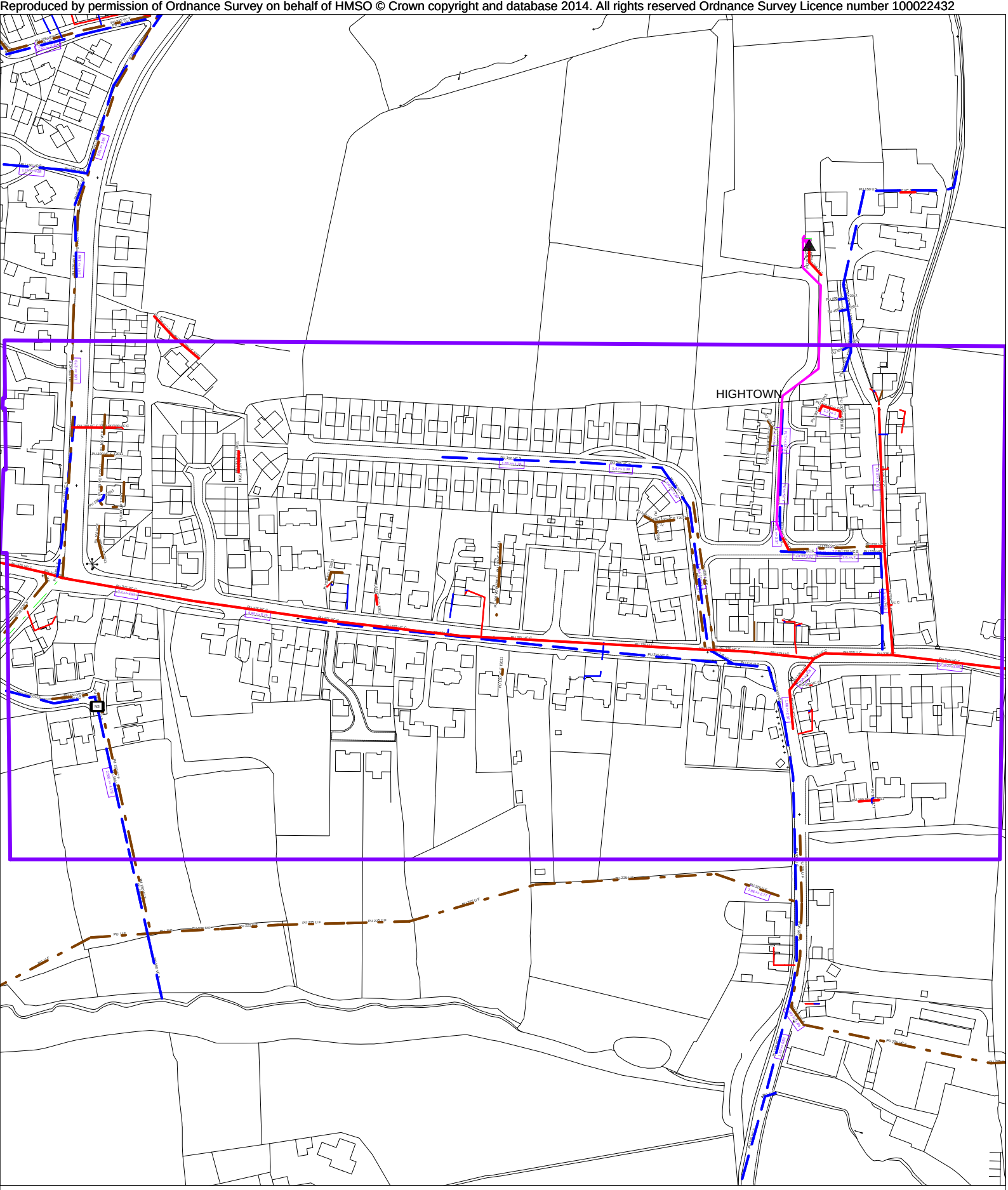
Please note that the direction of flow arrows may not always appear depending on the scale of the map.

Water Legend





Public Clean Water Network 01/08/2024 09:04:50 OS Grid Coordinates: 418482 : 423689 Map Name : SE1823NW svcGISSafeMovePD



Public Waste Water Network 01/08/2024 09:04:54 OS Grid Coordinates: 418482 : 423689 Map Name : SE1823NW svcGISSafeMovePD

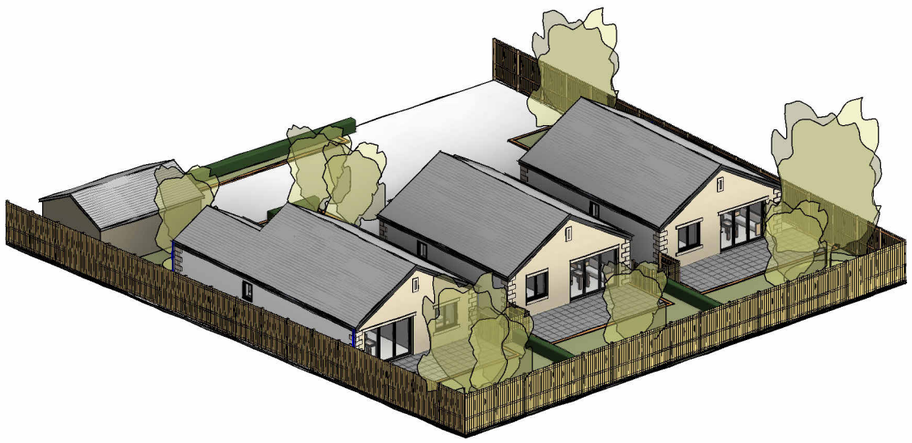
APPENDIX C
PROPOSED SITE LAYOUT

Proposed Site Plan

1 : 500

SCALE 1:500

0 5m 10m 15m 20m 25m



CLIENT

Barnes Homes

PROJECT

Land Adj. to 480 Halifax Road
Hightown
Liversedge
WF15 8DX

DRAWING TITLE

Proposed Site Plan - Bungalows

STATUS

S4 - Planning

Proj Ref	Origin	Zone	Level	Type	Role	Num	Status	Rev
24008	BAS	00	00	DR	A	00100	S4	-

Sheet	Scale	Issue Date	Drwn by	Ckd by
A3	1 : 500	13-03-23	WD	AB

North

W E

S

REV	DESCRIPTION	DATE	ISSED BY

ISSUE/REVISION HISTORY

BARNES ARCHITECTURAL SERVICES

Unit 19, Victoria Spring Business Park
Liversedge, West Yorkshire WF15 6BU

NOTES
Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. Contractor must verify all dimensions on site before commencing any work or shop drawings. Report any discrepancies to the architect before commencing work. If this drawing exceeds the quantities taken in any way the architects are to be informed before the work is initiated. Work within the Construction (Design & Management) Regulations 2015 is not to start until a Health and Safety Plan has been produced. This drawing is copyright and must not be reproduced without consent of BARNES ARCHITECTURAL SERVICES.

DRAWING STATUS/TYPE KEY

S0	Feasibility	S2	Sketch
L	Landscape	D4	Construction
S4	Planning	Z	Marketing
B	Building Survey	B3	As Built
D2	Tender	Z	Tenant
OS	Ordnance Survey		

APPENDIX D
GREENFIELD RUNOFF CALC

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Michael Micklethwaite
Site name:	Halifax Road
Site location:	Liversedge

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

Site Details

Latitude:	53.71237° N
Longitude:	1.71739° W
Reference:	2527641655
Date:	Aug 01 2024 22:40

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.123

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	762	762
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

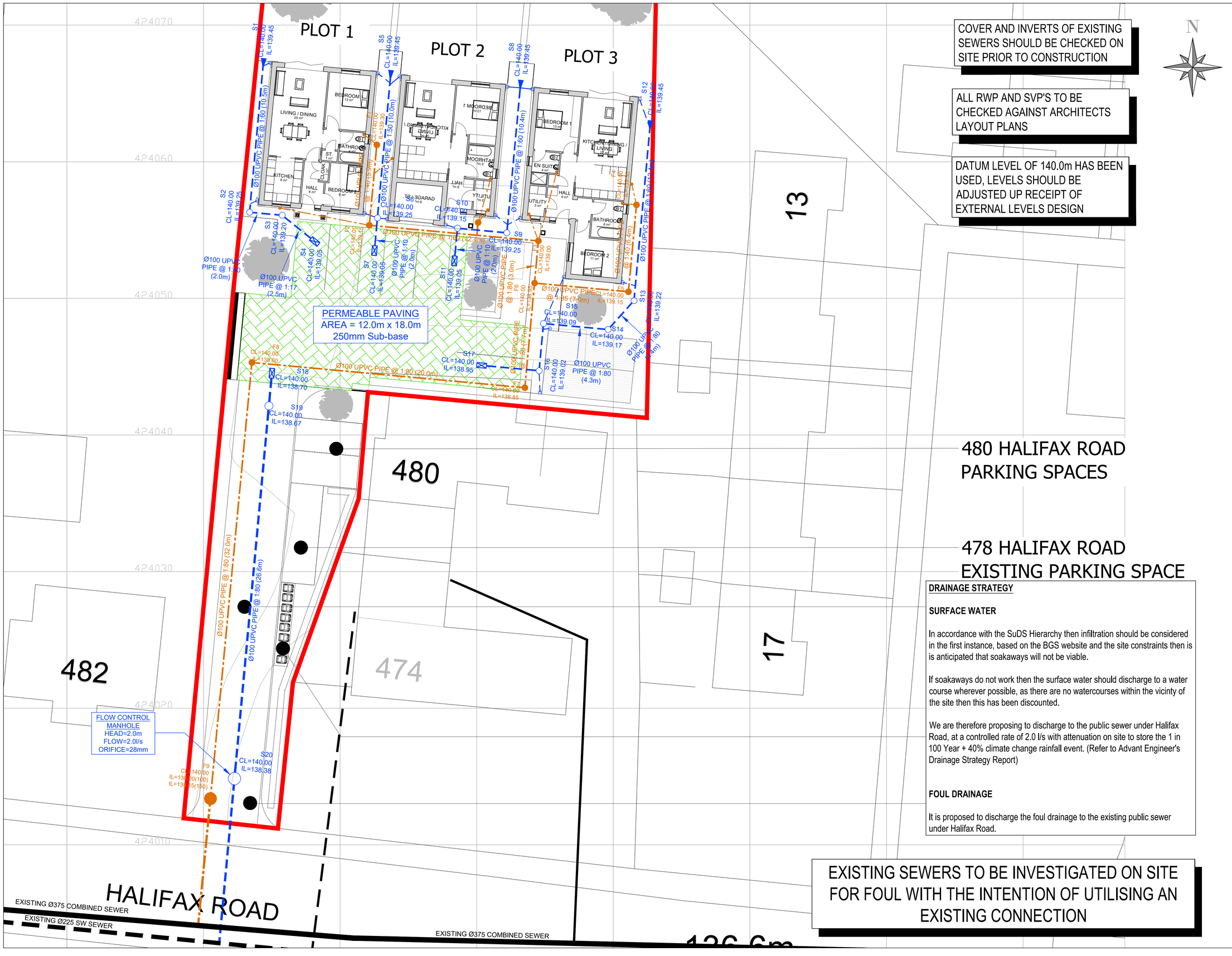
(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.66	0.66
1 in 1 year (l/s):	0.56	0.56
1 in 30 years (l/s):	1.15	1.15
1 in 100 year (l/s):	1.36	1.36
1 in 200 years (l/s):	1.55	1.55

APPENDIX E
DRAINAGE LAYOUT



COVER AND INVERTS OF EXISTING SEWERS SHOULD BE CHECKED ON SITE PRIOR TO CONSTRUCTION

ALL RWP AND SVP'S TO BE CHECKED AGAINST ARCHITECTS LAYOUT PLANS

DATUM LEVEL OF 140.0m HAS BEEN USED, LEVELS SHOULD BE ADJUSTED UP RECEIPT OF EXTERNAL LEVELS DESIGN

480 HALIFAX ROAD
PARKING SPACES

478 HALIFAX ROAD
EXISTING PARKING SPACE

DRAINAGE STRATEGY

SURFACE WATER

In accordance with the SuDS Hierarchy then infiltration should be considered in the first instance, based on the BGS website and the site constraints then is is anticipated that soakaways will not be viable.

If soakaways do not work then the surface water should discharge to a water course wherever possible, as there are no watercourses within the vicinty of the site then this has been discounted.

We are therefore proposing to discharge to the public sewer under Halifax Road, at a controlled rate of 2.0 l/s with attenuation on site to store the 1 in 100 Year + 40% climate change rainfall event. (Refer to Advant Engineer's Drainage Strategy Report)

FOUL DRAINAGE

It is proposed to discharge the foul drainage to the existing public sewer under Halifax Road.

EXISTING SEWERS TO BE INVESTIGATED ON SITE FOR FOUL WITH THE INTENTION OF UTILISING AN EXISTING CONNECTION

N

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KEY

- EXISTING CW SEWER
- EXISTING SW SEWER
- PROPOSED SW SEWER
- PROPOSED FW SEWER
- PERMEABLE PAVING

REV		BY	DATE
A	INITIAL ISSUE	MJM	01.08.24

PRELIMINARY

STATUS	CHK'D
PRELIMINARY	MJM
FOR COMMENT	
FOR APPROVAL	
FOR CONSTRUCTION	
AS BUILT	

advant ENGINEERS
Building 3 Leeds City West Business Park,
Geldard Road, Leeds, LS12 6LN
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CLIENT
BARNES HOMES

CONTRACT
LAND ADJ. 480 HALIFAX ROAD
LIVERSEDGE
WF15 8EB

TITLE
PROPOSED DRAINAGE
LAYOUT PLAN

DRAWN	MJM	CHK'D	MJM
SCALE	1:125 @ A1	DATE	01.08.24

JOB No	DRG No	REV
24066	101	A

APPENDIX F
DRAINAGE CALC

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.004	5.00	140.000	450	418734.415	424067.570	0.550
S2			140.000	450	418733.374	424056.302	0.750
S3			140.000	450	418735.761	424056.082	0.800
S4			140.000	450	418737.864	424054.388	0.950
S5	0.008	5.00	140.000	450	418743.734	424066.701	0.550
S6			140.000	450	418742.735	424055.884	0.750
S7			140.000	450	418742.547	424053.851	0.950
S8	0.008	5.00	140.000	450	418753.239	424065.985	0.550
S9			140.000	450	418752.206	424054.798	0.750
S10			140.000	450	418748.591	424055.132	0.850
S11			140.000	450	418748.403	424053.099	0.950
S12	0.005	5.00	140.000	450	418762.732	424063.020	0.550
S13			140.000	450	418761.514	424049.836	0.780
S14			140.000	450	418759.619	424047.720	0.830
S15	0.003	5.00	140.000	450	418754.889	424048.157	0.910
S16			140.000	450	418754.570	424044.704	0.980
S17			140.000	450	418750.713	424045.061	1.050
S18			140.000	600	418734.975	424044.166	1.300
S19			140.000	600	418734.788	424042.132	1.330
S20	0.018	5.00	140.000	900	418732.267	424014.850	1.620
EXMH			140.000	1200	418731.154	424002.805	1.750
PP	0.019	5.00	140.000	600	418742.439	424048.135	1.200

Links

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)
3.000	S1	S2	11.316	0.600	139.450	139.250	0.200	56.6	100	5.18	50.0
3.001	S2	S3	2.397	0.600	139.250	139.200	0.050	47.9	100	5.22	50.0
3.002	S3	S4	2.700	0.600	139.200	139.050	0.150	18.0	100	5.24	50.0
3.003	S4	PP	7.748	0.600	139.050	139.000	0.050	155.0	100	5.45	50.0
4.000	S5	S6	10.863	0.600	139.450	139.250	0.200	54.3	100	5.17	50.0
4.001	S6	S7	2.042	0.600	139.250	139.050	0.200	10.2	100	5.19	50.0
4.002	S7	PP	5.717	0.600	139.050	139.000	0.050	114.3	100	5.32	50.0
2.000	S8	S9	11.235	0.600	139.450	139.250	0.200	56.2	100	5.18	50.0
2.001	S9	S10	3.630	0.600	139.250	139.150	0.100	36.3	100	5.23	50.0
2.002	S10	S11	2.042	0.600	139.150	139.050	0.100	20.4	100	5.25	50.0
2.003	S11	PP	7.760	0.600	139.050	139.000	0.050	155.2	100	5.46	50.0
1.000	S12	S13	13.240	0.600	139.450	139.220	0.230	57.6	100	5.22	50.0
1.001	S13	S14	2.841	0.600	139.220	139.170	0.050	56.8	100	5.26	50.0
1.002	S14	S15	4.750	0.600	139.170	139.090	0.080	59.4	100	5.34	50.0
1.003	S15	S16	3.468	0.600	139.090	139.020	0.070	49.5	100	5.39	50.0
1.004	S16	S17	3.873	0.600	139.020	138.950	0.070	55.3	100	5.46	50.0
1.005	S17	PP	8.827	0.600	138.950	138.800	0.150	58.8	100	5.60	50.0
1.006	PP	S18	8.454	0.600	138.800	138.700	0.100	84.5	150	5.73	50.0
1.007	S18	S19	2.043	0.600	138.700	138.670	0.030	68.1	150	5.76	50.0
1.008	S19	S20	27.398	0.600	138.670	138.380	0.290	94.5	150	6.20	49.4
1.009	S20	EXMH	12.096	0.600	138.380	138.250	0.130	93.0	150	6.40	48.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.026	8.1	0.5	0.450	0.650	0.004	0.0	18	0.579
3.001	1.116	8.8	0.5	0.650	0.700	0.004	0.0	17	0.612
3.002	1.829	14.4	0.5	0.700	0.850	0.004	0.0	14	0.882
3.003	0.615	4.8	0.5	0.850	0.900	0.004	0.0	23	0.408
4.000	1.047	8.2	1.1	0.450	0.650	0.008	0.0	25	0.725
4.001	2.432	19.1	1.1	0.650	0.850	0.008	0.0	16	1.301
4.002	0.718	5.6	1.1	0.850	0.900	0.008	0.0	30	0.557
2.000	1.030	8.1	1.1	0.450	0.650	0.008	0.0	25	0.713
2.001	1.284	10.1	1.1	0.650	0.750	0.008	0.0	22	0.838
2.002	1.716	13.5	1.1	0.750	0.850	0.008	0.0	19	1.024
2.003	0.615	4.8	1.1	0.850	0.900	0.008	0.0	32	0.496
1.000	1.017	8.0	0.7	0.450	0.680	0.005	0.0	20	0.620
1.001	1.024	8.0	0.7	0.680	0.730	0.005	0.0	20	0.624
1.002	1.001	7.9	0.7	0.730	0.810	0.005	0.0	20	0.610
1.003	1.097	8.6	1.1	0.810	0.880	0.008	0.0	24	0.745
1.004	1.038	8.1	1.1	0.880	0.950	0.008	0.0	25	0.718
1.005	1.006	7.9	1.1	0.950	1.100	0.008	0.0	25	0.709
1.006	1.094	19.3	6.4	1.050	1.150	0.047	0.0	59	0.984
1.007	1.220	21.6	6.4	1.150	1.180	0.047	0.0	56	1.065
1.008	1.034	18.3	6.3	1.180	1.470	0.047	0.0	61	0.939
1.009	1.042	18.4	8.6	1.470	1.600	0.065	0.0	72	1.023

Pipeline Schedule

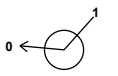
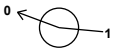
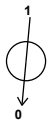
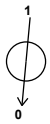
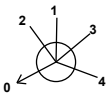
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	11.316	56.6	100	Circular	140.000	139.450	0.450	140.000	139.250	0.650
3.001	2.397	47.9	100	Circular	140.000	139.250	0.650	140.000	139.200	0.700
3.002	2.700	18.0	100	Circular	140.000	139.200	0.700	140.000	139.050	0.850
3.003	7.748	155.0	100	Circular	140.000	139.050	0.850	140.000	139.000	0.900
4.000	10.863	54.3	100	Circular	140.000	139.450	0.450	140.000	139.250	0.650
4.001	2.042	10.2	100	Circular	140.000	139.250	0.650	140.000	139.050	0.850
4.002	5.717	114.3	100	Circular	140.000	139.050	0.850	140.000	139.000	0.900
2.000	11.235	56.2	100	Circular	140.000	139.450	0.450	140.000	139.250	0.650
2.001	3.630	36.3	100	Circular	140.000	139.250	0.650	140.000	139.150	0.750
2.002	2.042	20.4	100	Circular	140.000	139.150	0.750	140.000	139.050	0.850
2.003	7.760	155.2	100	Circular	140.000	139.050	0.850	140.000	139.000	0.900
1.000	13.240	57.6	100	Circular	140.000	139.450	0.450	140.000	139.220	0.680
1.001	2.841	56.8	100	Circular	140.000	139.220	0.680	140.000	139.170	0.730
1.002	4.750	59.4	100	Circular	140.000	139.170	0.730	140.000	139.090	0.810
1.003	3.468	49.5	100	Circular	140.000	139.090	0.810	140.000	139.020	0.880
1.004	3.873	55.3	100	Circular	140.000	139.020	0.880	140.000	138.950	0.950
1.005	8.827	58.8	100	Circular	140.000	138.950	0.950	140.000	138.800	1.100
1.006	8.454	84.5	150	Circular	140.000	138.800	1.050	140.000	138.700	1.150
1.007	2.043	68.1	150	Circular	140.000	138.700	1.150	140.000	138.670	1.180
1.008	27.398	94.5	150	Circular	140.000	138.670	1.180	140.000	138.380	1.470
1.009	12.096	93.0	150	Circular	140.000	138.380	1.470	140.000	138.250	1.600

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	S1	450	Manhole	Adoptable	S2	450	Manhole	Adoptable
3.001	S2	450	Manhole	Adoptable	S3	450	Manhole	Adoptable
3.002	S3	450	Manhole	Adoptable	S4	450	Manhole	Adoptable
3.003	S4	450	Manhole	Adoptable	PP	600	Manhole	Adoptable
4.000	S5	450	Manhole	Adoptable	S6	450	Manhole	Adoptable
4.001	S6	450	Manhole	Adoptable	S7	450	Manhole	Adoptable
4.002	S7	450	Manhole	Adoptable	PP	600	Manhole	Adoptable
2.000	S8	450	Manhole	Adoptable	S9	450	Manhole	Adoptable
2.001	S9	450	Manhole	Adoptable	S10	450	Manhole	Adoptable
2.002	S10	450	Manhole	Adoptable	S11	450	Manhole	Adoptable
2.003	S11	450	Manhole	Adoptable	PP	600	Manhole	Adoptable
1.000	S12	450	Manhole	Adoptable	S13	450	Manhole	Adoptable
1.001	S13	450	Manhole	Adoptable	S14	450	Manhole	Adoptable
1.002	S14	450	Manhole	Adoptable	S15	450	Manhole	Adoptable
1.003	S15	450	Manhole	Adoptable	S16	450	Manhole	Adoptable
1.004	S16	450	Manhole	Adoptable	S17	450	Manhole	Adoptable
1.005	S17	450	Manhole	Adoptable	PP	600	Manhole	Adoptable
1.006	PP	600	Manhole	Adoptable	S18	600	Manhole	Adoptable
1.007	S18	600	Manhole	Adoptable	S19	600	Manhole	Adoptable
1.008	S19	600	Manhole	Adoptable	S20	900	Manhole	Adoptable
1.009	S20	900	Manhole	Adoptable	EXMH	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	418734.415	424067.570	140.000	0.550	450				
						0	3.000	139.450	100
S2	418733.374	424056.302	140.000	0.750	450	1	3.000	139.250	100
						0	3.001	139.250	100
S3	418735.761	424056.082	140.000	0.800	450	1	3.001	139.200	100
						0	3.002	139.200	100
S4	418737.864	424054.388	140.000	0.950	450	1	3.002	139.050	100
						0	3.003	139.050	100
S5	418743.734	424066.701	140.000	0.550	450				
						0	4.000	139.450	100
S6	418742.735	424055.884	140.000	0.750	450	1	4.000	139.250	100
						0	4.001	139.250	100
S7	418742.547	424053.851	140.000	0.950	450	1	4.001	139.050	100
						0	4.002	139.050	100
S8	418753.239	424065.985	140.000	0.550	450				
						0	2.000	139.450	100
S9	418752.206	424054.798	140.000	0.750	450	1	2.000	139.250	100
						0	2.001	139.250	100
S10	418748.591	424055.132	140.000	0.850	450	1	2.001	139.150	100
						0	2.002	139.150	100
S11	418748.403	424053.099	140.000	0.950	450	1	2.002	139.050	100
						0	2.003	139.050	100
S12	418762.732	424063.020	140.000	0.550	450				
						0	1.000	139.450	100
S13	418761.514	424049.836	140.000	0.780	450	1	1.000	139.220	100
						0	1.001	139.220	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S14	418759.619	424047.720	140.000	0.830	450	 1	1.001	139.170	100
						0	1.002	139.170	100
S15	418754.889	424048.157	140.000	0.910	450	 1	1.002	139.090	100
						0	1.003	139.090	100
S16	418754.570	424044.704	140.000	0.980	450	 1	1.003	139.020	100
						0	1.004	139.020	100
S17	418750.713	424045.061	140.000	1.050	450	 1	1.004	138.950	100
						0	1.005	138.950	100
S18	418734.975	424044.166	140.000	1.300	600	 1	1.006	138.700	150
						0	1.007	138.700	150
S19	418734.788	424042.132	140.000	1.330	600	 1	1.007	138.670	150
						0	1.008	138.670	150
S20	418732.267	424014.850	140.000	1.620	900	 1	1.008	138.380	150
						0	1.009	138.380	150
EXMH	418731.154	424002.805	140.000	1.750	1200	 1	1.009	138.250	150
PP	418742.439	424048.135	140.000	1.200	600	 1	4.002	139.000	100
						2	3.003	139.000	100
						3	2.003	139.000	100
						4	1.005	138.800	100
						0	1.006	138.800	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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 %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node S20 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.0		
Invert Level (m)	138.380	Diameter (m)	0.028		

Node PP Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	138.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Time to half empty (mins)	274

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	186.0	0.0	0.250	186.0	0.0	0.251	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year 15 minute winter	188.566	76.035
1 year 15 minute winter	76.857	30.991	30 year 30 minute summer	174.929	49.499
1 year 30 minute summer	71.439	20.215	30 year 30 minute winter	122.757	49.499
1 year 30 minute winter	50.133	20.215	30 year 60 minute summer	116.589	30.811
1 year 60 minute summer	48.435	12.800	30 year 60 minute winter	77.459	30.811
1 year 60 minute winter	32.179	12.800	30 year 120 minute summer	70.438	18.615
1 year 120 minute summer	30.053	7.942	30 year 120 minute winter	46.797	18.615
1 year 120 minute winter	19.966	7.942	30 year 180 minute summer	53.298	13.715
1 year 180 minute summer	23.233	5.979	30 year 180 minute winter	34.645	13.715
1 year 180 minute winter	15.102	5.979	30 year 240 minute summer	41.604	10.995
1 year 240 minute summer	18.475	4.882	30 year 240 minute winter	27.641	10.995
1 year 240 minute winter	12.274	4.882	30 year 360 minute summer	31.221	8.034
1 year 360 minute summer	14.169	3.646	30 year 360 minute winter	20.295	8.034
1 year 360 minute winter	9.210	3.646	30 year 480 minute summer	24.324	6.428
1 year 480 minute summer	11.185	2.956	30 year 480 minute winter	16.160	6.428
1 year 480 minute winter	7.431	2.956	30 year 600 minute summer	19.756	5.404
1 year 600 minute summer	9.182	2.511	30 year 600 minute winter	13.498	5.404
1 year 600 minute winter	6.274	2.511	30 year 720 minute summer	17.490	4.687
1 year 720 minute summer	8.203	2.199	30 year 720 minute winter	11.754	4.687
1 year 720 minute winter	5.513	2.199	30 year 960 minute summer	14.215	3.743
1 year 960 minute summer	6.768	1.782	30 year 960 minute winter	9.416	3.743
1 year 960 minute winter	4.483	1.782	30 year 1440 minute summer	10.161	2.723
1 year 1440 minute summer	4.949	1.326	30 year 1440 minute winter	6.829	2.723
1 year 1440 minute winter	3.326	1.326	100 year 15 minute summer	348.738	98.681
30 year 15 minute summer	268.706	76.035	100 year 15 minute winter	244.728	98.681

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 30 minute summer	228.965	64.789
100 year 30 minute winter	160.677	64.789
100 year 60 minute summer	153.288	40.510
100 year 60 minute winter	101.841	40.510
100 year 120 minute summer	92.562	24.461
100 year 120 minute winter	61.496	24.461
100 year 180 minute summer	69.806	17.964
100 year 180 minute winter	45.376	17.964
100 year 240 minute summer	54.269	14.342
100 year 240 minute winter	36.055	14.342
100 year 360 minute summer	40.484	10.418
100 year 360 minute winter	26.315	10.418
100 year 480 minute summer	31.414	8.302
100 year 480 minute winter	20.871	8.302
100 year 600 minute summer	25.431	6.956
100 year 600 minute winter	17.376	6.956
100 year 720 minute summer	22.452	6.017
100 year 720 minute winter	15.089	6.017
100 year 960 minute summer	18.166	4.784
100 year 960 minute winter	12.033	4.784
100 year 1440 minute summer	12.896	3.456
100 year 1440 minute winter	8.667	3.456
100 year +40% CC 15 minute summer	488.233	138.153
100 year +40% CC 15 minute winter	342.620	138.153
100 year +40% CC 30 minute summer	320.551	90.705
100 year +40% CC 30 minute winter	224.948	90.705
100 year +40% CC 60 minute summer	214.603	56.713
100 year +40% CC 60 minute winter	142.577	56.713
100 year +40% CC 120 minute summer	129.587	34.246
100 year +40% CC 120 minute winter	86.094	34.246
100 year +40% CC 180 minute summer	97.729	25.149
100 year +40% CC 180 minute winter	63.526	25.149
100 year +40% CC 240 minute summer	75.977	20.078
100 year +40% CC 240 minute winter	50.477	20.078
100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 600 minute winter	24.327	9.738
100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 1440 minute winter	12.134	4.839

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	139.468	0.018	0.6	0.0055	0.0000	OK
15 minute winter	S2	11	139.269	0.019	0.6	0.0029	0.0000	OK
15 minute winter	S3	11	139.214	0.014	0.6	0.0022	0.0000	OK
15 minute winter	S4	12	139.073	0.023	0.6	0.0036	0.0000	OK
15 minute winter	S5	11	139.477	0.027	1.1	0.0121	0.0000	OK
15 minute winter	S6	11	139.266	0.016	1.1	0.0026	0.0000	OK
15 minute winter	S7	11	139.081	0.031	1.1	0.0049	0.0000	OK
15 minute winter	S8	10	139.476	0.026	1.1	0.0115	0.0000	OK
15 minute winter	S9	11	139.274	0.024	1.1	0.0038	0.0000	OK
15 minute winter	S10	11	139.169	0.019	1.1	0.0031	0.0000	OK
15 minute winter	S11	11	139.083	0.033	1.1	0.0053	0.0000	OK
15 minute winter	S12	10	139.470	0.020	0.7	0.0069	0.0000	OK
15 minute winter	S13	11	139.241	0.021	0.7	0.0033	0.0000	OK
15 minute winter	S14	11	139.190	0.020	0.7	0.0032	0.0000	OK
15 minute winter	S15	11	139.115	0.025	1.1	0.0057	0.0000	OK
15 minute winter	S16	11	139.046	0.026	1.1	0.0041	0.0000	OK
15 minute winter	S17	11	138.977	0.026	1.1	0.0042	0.0000	OK
60 minute winter	S18	52	138.849	0.149	2.3	0.0421	0.0000	OK
60 minute winter	S19	52	138.849	0.179	1.6	0.0506	0.0000	SURCHARGED
60 minute winter	S20	39	138.853	0.473	2.4	0.4056	0.0000	SURCHARGED
15 minute summer	EXMH	1	138.250	0.000	1.0	0.0000	0.0000	OK
60 minute winter	PP	51	138.848	0.048	3.5	2.9522	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 winter	S1	3.000	S2	0.6	0.585	0.070	0.0109	
15 minute winter	S2	3.001	S3	0.6	0.690	0.064	0.0020	
15 minute winter	S3	3.002	S4	0.6	0.785	0.039	0.0026	
15 minute winter	S4	3.003	PP	0.5	0.402	0.110	0.0102	
15 minute winter	S5	4.000	S6	1.1	0.883	0.134	0.0137	
15 minute winter	S6	4.001	S7	1.1	0.851	0.058	0.0030	
15 minute winter	S7	4.002	PP	1.1	0.544	0.195	0.0115	
15 minute winter	S8	2.000	S9	1.1	0.729	0.136	0.0170	
15 minute winter	S9	2.001	S10	1.1	0.881	0.109	0.0045	
15 minute winter	S10	2.002	S11	1.1	0.805	0.082	0.0034	
15 minute winter	S11	2.003	PP	1.1	0.489	0.226	0.0173	
15 minute winter	S12	1.000	S13	0.7	0.609	0.088	0.0153	
15 minute winter	S13	1.001	S14	0.7	0.605	0.087	0.0033	
15 minute winter	S14	1.002	S15	0.7	0.531	0.089	0.0064	
15 minute winter	S15	1.003	S16	1.1	0.695	0.127	0.0055	
15 minute winter	S16	1.004	S17	1.1	0.669	0.133	0.0063	
15 minute winter	S17	1.005	PP	1.1	0.811	0.138	0.0150	
60 minute winter	S18	1.007	S19	1.6	0.607	0.076	0.0359	
60 minute winter	S19	1.008	S20	1.2	0.119	0.067	0.4823	
60 minute winter	S20	Orifice	EXMH	1.1				6.8
60 minute winter	PP	1.006	S18	2.3	0.653	0.121	0.0945	

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	139.478	0.028	1.4	0.0086	0.0000	OK
15 minute winter	S2	11	139.279	0.029	1.4	0.0047	0.0000	OK
15 minute winter	S3	11	139.221	0.021	1.4	0.0033	0.0000	OK
15 minute winter	S4	11	139.088	0.037	1.4	0.0060	0.0000	OK
15 minute winter	S5	10	139.494	0.044	2.8	0.0199	0.0000	OK
15 minute winter	S6	10	139.276	0.026	2.8	0.0041	0.0000	OK
15 minute winter	S7	11	139.102	0.052	2.7	0.0083	0.0000	OK
15 minute winter	S8	10	139.492	0.042	2.8	0.0189	0.0000	OK
15 minute winter	S9	10	139.289	0.039	2.8	0.0062	0.0000	OK
15 minute winter	S10	11	139.183	0.033	2.7	0.0053	0.0000	OK
15 minute winter	S11	11	139.107	0.057	2.7	0.0090	0.0000	OK
15 minute winter	S12	10	139.482	0.031	1.7	0.0107	0.0000	OK
15 minute winter	S13	11	139.253	0.033	1.7	0.0053	0.0000	OK
15 minute winter	S14	11	139.202	0.032	1.7	0.0052	0.0000	OK
15 minute winter	S15	11	139.132	0.042	2.7	0.0094	0.0000	OK
15 minute winter	S16	11	139.063	0.043	2.7	0.0068	0.0000	OK
15 minute winter	S17	11	138.990	0.040	2.7	0.0064	0.0000	OK
120 minute winter	S18	114	138.988	0.288	1.8	0.0814	0.0000	SURCHARGED
120 minute winter	S19	114	138.987	0.317	2.6	0.0898	0.0000	SURCHARGED
120 minute winter	S20	114	138.987	0.607	1.9	0.5204	0.0000	SURCHARGED
15 minute summer	EXMH	1	138.250	0.000	1.2	0.0000	0.0000	OK
120 minute winter	PP	114	138.988	0.188	5.6	11.6470	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 winter	S1	3.000	S2	1.4	0.735	0.171	0.0212	
15 minute winter	S2	3.001	S3	1.4	0.879	0.155	0.0037	
15 minute winter	S3	3.002	S4	1.4	0.814	0.095	0.0052	
15 minute winter	S4	3.003	PP	1.4	0.519	0.280	0.0202	
15 minute winter	S5	4.000	S6	2.8	1.134	0.335	0.0267	
15 minute winter	S6	4.001	S7	2.7	0.980	0.143	0.0058	
15 minute winter	S7	4.002	PP	2.7	0.687	0.482	0.0226	
15 minute winter	S8	2.000	S9	2.8	0.929	0.341	0.0333	
15 minute winter	S9	2.001	S10	2.7	1.074	0.269	0.0092	
15 minute winter	S10	2.002	S11	2.7	0.821	0.202	0.0070	
15 minute winter	S11	2.003	PP	2.7	0.620	0.566	0.0342	
15 minute winter	S12	1.000	S13	1.7	0.764	0.210	0.0290	
15 minute winter	S13	1.001	S14	1.7	0.742	0.206	0.0064	
15 minute winter	S14	1.002	S15	1.7	0.633	0.212	0.0125	
15 minute winter	S15	1.003	S16	2.7	0.850	0.309	0.0109	
15 minute winter	S16	1.004	S17	2.7	0.866	0.326	0.0119	
15 minute winter	S17	1.005	PP	2.7	0.884	0.338	0.0441	
120 minute winter	S18	1.007	S19	2.6	0.577	0.121	0.0360	
120 minute winter	S19	1.008	S20	1.2	0.119	0.068	0.4823	
120 minute winter	S20	Orifice	EXMH	1.3				20.0
120 minute winter	PP	1.006	S18	1.8	0.622	0.094	0.1488	

Results for 100 year Critical Storm Duration. Lowest mass balance: 97.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	139.483	0.033	1.8	0.0099	0.0000	OK
15 minute winter	S2	11	139.284	0.034	1.8	0.0054	0.0000	OK
15 minute winter	S3	11	139.224	0.024	1.8	0.0038	0.0000	OK
120 minute winter	S4	116	139.157	0.107	0.6	0.0170	0.0000	SURCHARGED
15 minute winter	S5	10	139.501	0.051	3.6	0.0230	0.0000	OK
15 minute winter	S6	10	139.280	0.029	3.6	0.0047	0.0000	OK
120 minute winter	S7	116	139.157	0.107	1.1	0.0170	0.0000	SURCHARGED
15 minute winter	S8	10	139.499	0.049	3.6	0.0219	0.0000	OK
15 minute winter	S9	10	139.295	0.045	3.6	0.0072	0.0000	OK
15 minute winter	S10	11	139.189	0.039	3.5	0.0063	0.0000	OK
120 minute winter	S11	116	139.157	0.107	1.1	0.0170	0.0000	SURCHARGED
15 minute winter	S12	10	139.486	0.036	2.2	0.0123	0.0000	OK
15 minute winter	S13	11	139.259	0.039	2.2	0.0062	0.0000	OK
15 minute winter	S14	11	139.208	0.038	2.2	0.0060	0.0000	OK
120 minute winter	S15	116	139.157	0.067	1.1	0.0151	0.0000	OK
120 minute winter	S16	116	139.157	0.137	1.1	0.0218	0.0000	SURCHARGED
120 minute winter	S17	116	139.157	0.207	1.1	0.0329	0.0000	SURCHARGED
120 minute winter	S18	116	139.157	0.457	2.0	0.1292	0.0000	SURCHARGED
120 minute winter	S19	116	139.157	0.487	2.9	0.1377	0.0000	SURCHARGED
120 minute winter	S20	116	139.155	0.775	2.6	0.6653	0.0000	SURCHARGED
15 minute summer	EXMH	1	138.250	0.000	1.2	0.0000	0.0000	OK
120 minute winter	PP	116	139.157	0.357	7.6	15.5896	0.0000	SURCHARGED

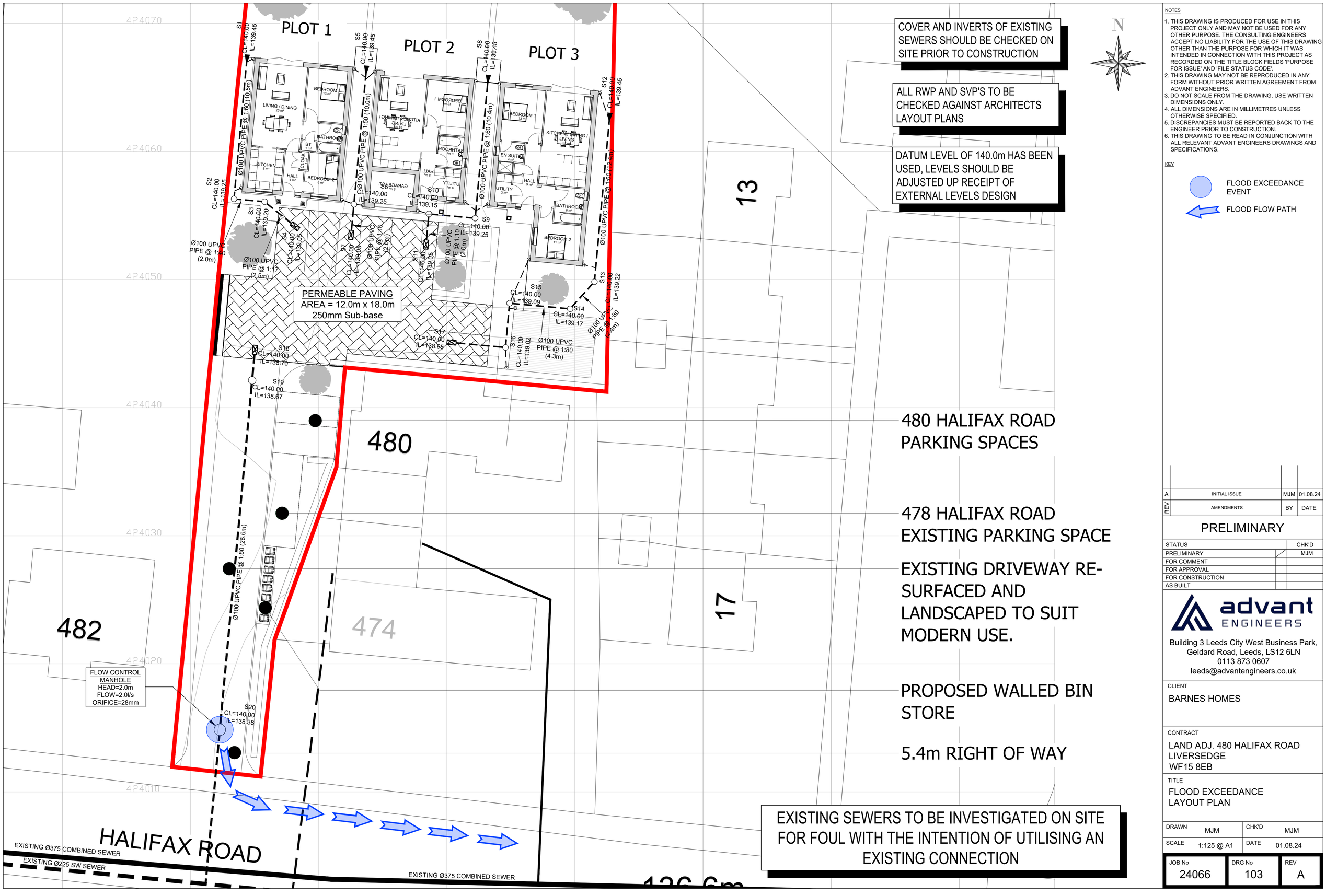
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	3.000	S2	1.8	0.783	0.220	0.0257	
15 minute winter	S2	3.001	S3	1.8	0.941	0.200	0.0045	
15 minute winter	S3	3.002	S4	1.8	0.858	0.123	0.0063	
120 minute winter	S4	3.003	PP	0.6	0.415	0.124	0.0606	
15 minute winter	S5	4.000	S6	3.6	1.205	0.432	0.0323	
15 minute winter	S6	4.001	S7	3.5	1.029	0.185	0.0071	
120 minute winter	S7	4.002	PP	1.1	0.545	0.195	0.0447	
15 minute winter	S8	2.000	S9	3.6	0.987	0.440	0.0405	
15 minute winter	S9	2.001	S10	3.5	1.123	0.349	0.0114	
15 minute winter	S10	2.002	S11	3.5	0.853	0.261	0.0087	
120 minute winter	S11	2.003	PP	1.1	0.491	0.228	0.0607	
15 minute winter	S12	1.000	S13	2.2	0.813	0.273	0.0355	
15 minute winter	S13	1.001	S14	2.2	0.785	0.268	0.0078	
15 minute winter	S14	1.002	S15	2.2	0.666	0.275	0.0155	
120 minute winter	S15	1.003	S16	1.1	0.695	0.128	0.0233	
120 minute winter	S16	1.004	S17	1.1	0.693	0.135	0.0303	
120 minute winter	S17	1.005	PP	1.1	0.611	0.139	0.0691	
120 minute winter	S18	1.007	S19	2.9	0.556	0.137	0.0360	
120 minute winter	S19	1.008	S20	1.3	0.077	0.073	0.4823	
120 minute winter	S20	Orifice	EXMH	1.4				24.4
120 minute winter	PP	1.006	S18	1.9	0.630	0.096	0.1488	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S1	116	139.638	0.188	0.8	0.0572	0.0000	SURCHARGED
120 minute winter	S2	116	139.638	0.388	0.8	0.0617	0.0000	SURCHARGED
120 minute winter	S3	116	139.638	0.438	1.0	0.0696	0.0000	SURCHARGED
120 minute winter	S4	116	139.638	0.588	1.9	0.0935	0.0000	SURCHARGED
120 minute winter	S5	116	139.638	0.188	1.6	0.0846	0.0000	SURCHARGED
120 minute winter	S6	116	139.638	0.388	1.6	0.0617	0.0000	SURCHARGED
120 minute winter	S7	116	139.638	0.588	1.8	0.0935	0.0000	SURCHARGED
120 minute winter	S8	116	139.638	0.188	1.6	0.0846	0.0000	SURCHARGED
120 minute winter	S9	116	139.638	0.388	1.6	0.0617	0.0000	SURCHARGED
120 minute winter	S10	116	139.638	0.488	1.6	0.0776	0.0000	SURCHARGED
120 minute winter	S11	116	139.638	0.588	1.6	0.0935	0.0000	SURCHARGED
120 minute winter	S12	116	139.638	0.188	1.0	0.0641	0.0000	SURCHARGED
120 minute winter	S13	116	139.638	0.418	1.0	0.0665	0.0000	SURCHARGED
120 minute winter	S14	116	139.638	0.468	1.5	0.0744	0.0000	SURCHARGED
120 minute winter	S15	116	139.638	0.548	1.6	0.1233	0.0000	SURCHARGED
120 minute winter	S16	116	139.638	0.618	1.6	0.0983	0.0000	SURCHARGED
120 minute winter	S17	116	139.638	0.688	2.0	0.1094	0.0000	SURCHARGED
120 minute winter	S18	116	139.637	0.937	2.0	0.2652	0.0000	SURCHARGED
120 minute winter	S19	116	139.637	0.967	2.7	0.2736	0.0000	SURCHARGED
120 minute winter	S20	116	139.635	1.255	3.6	1.0768	0.0000	SURCHARGED
15 minute summer	EXMH	1	138.250	0.000	1.3	0.0000	0.0000	OK
120 minute winter	PP	116	139.638	0.838	10.9	15.8776	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)
120 minute winter	S1	3.000	S2	0.8	0.632	0.099	0.0885	
120 minute winter	S2	3.001	S3	0.8	0.763	0.091	0.0188	
120 minute winter	S3	3.002	S4	0.8	0.641	0.056	0.0211	
120 minute winter	S4	3.003	PP	-1.1	0.450	-0.234	0.0606	
120 minute winter	S5	4.000	S6	1.6	0.980	0.195	0.0850	
120 minute winter	S6	4.001	S7	1.6	0.855	0.084	0.0160	
120 minute winter	S7	4.002	PP	1.6	0.601	0.284	0.0447	
120 minute winter	S8	2.000	S9	1.6	0.807	0.198	0.0879	
120 minute winter	S9	2.001	S10	1.6	0.963	0.159	0.0284	
120 minute winter	S10	2.002	S11	1.6	0.726	0.119	0.0160	
120 minute winter	S11	2.003	PP	1.6	0.542	0.331	0.0607	
120 minute winter	S12	1.000	S13	1.0	0.666	0.125	0.1036	
120 minute winter	S13	1.001	S14	1.0	0.658	0.124	0.0222	
120 minute winter	S14	1.002	S15	1.0	0.573	0.127	0.0372	
120 minute winter	S15	1.003	S16	1.6	0.788	0.186	0.0271	
120 minute winter	S16	1.004	S17	1.6	0.757	0.197	0.0303	
120 minute winter	S17	1.005	PP	-1.7	0.563	-0.221	0.0691	
120 minute winter	S18	1.007	S19	2.7	0.579	0.124	0.0360	
120 minute winter	S19	1.008	S20	-2.1	-0.122	-0.117	0.4823	
120 minute winter	S20	Orifice	EXMH	1.8				29.0
120 minute winter	PP	1.006	S18	2.0	0.602	0.102	0.1488	

APPENDIX G
FLOOD EXCEEDANCE LAYOUT



COVER AND INVERTS OF EXISTING SEWERS SHOULD BE CHECKED ON SITE PRIOR TO CONSTRUCTION

ALL RWP AND SVP'S TO BE CHECKED AGAINST ARCHITECTS LAYOUT PLANS

DATUM LEVEL OF 140.0m HAS BEEN USED, LEVELS SHOULD BE ADJUSTED UP RECEIPT OF EXTERNAL LEVELS DESIGN

480 HALIFAX ROAD
PARKING SPACES

478 HALIFAX ROAD
EXISTING PARKING SPACE

EXISTING DRIVEWAY RE-SURFACED AND LANDSCAPED TO SUIT MODERN USE.

PROPOSED WALLED BIN STORE

5.4m RIGHT OF WAY

EXISTING SEWERS TO BE INVESTIGATED ON SITE FOR FOUL WITH THE INTENTION OF UTILISING AN EXISTING CONNECTION

N

NOTES

1. THIS DRAWING IS PRODUCED FOR USE IN THIS PROJECT ONLY AND MAY NOT BE USED FOR ANY OTHER PURPOSE. THE CONSULTING ENGINEERS ACCEPT NO LIABILITY FOR THE USE OF THIS DRAWING OTHER THAN THE PURPOSE FOR WHICH IT WAS INTENDED IN CONNECTION WITH THIS PROJECT AS RECORDED ON THE TITLE BLOCK FIELDS 'PURPOSE FOR ISSUE' AND 'FILE STATUS CODE'.
2. THIS DRAWING MAY NOT BE REPRODUCED IN ANY FORM WITHOUT PRIOR WRITTEN AGREEMENT FROM ADVANT ENGINEERS.
3. DO NOT SCALE FROM THE DRAWING, USE WRITTEN DIMENSIONS ONLY.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
5. DISCREPANCIES MUST BE REPORTED BACK TO THE ENGINEER PRIOR TO CONSTRUCTION.
6. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ADVANT ENGINEERS DRAWINGS AND SPECIFICATIONS.

KEY

FLOOD EXCEEDANCE EVENT

FLOOD FLOW PATH

REV		BY	DATE
A	INITIAL ISSUE	MJM	01.08.24

PRELIMINARY

STATUS	CHK'D
PRELIMINARY	MJM
FOR COMMENT	
FOR APPROVAL	
FOR CONSTRUCTION	
AS BUILT	

advant ENGINEERS
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CLIENT
BARNES HOMES

CONTRACT
LAND ADJ. 480 HALIFAX ROAD
LIVERSEDGE
WF15 8EB

TITLE
FLOOD EXCEEDANCE
LAYOUT PLAN

DRAWN	MJM	CHK'D	MJM
SCALE	1:125 @ A1	DATE	01.08.24

JOB No	DRG No	REV
24066	103	A

Building 3
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