# LAND ADJACENT
# 482 HALIFAX ROAD
# HIGHTOWN
# LIVERSEDGE
# WF15 8EB

## Drainage Strategy

DOCUMENT No:
25097-DSR-001-A

5th JANUARY 2026

## Issue Sheet.

| Prepared | Date | | Checked | Date |
|---|---|---|---|---|
| RR | 05.01.26 | | MJM | 05.01.26 |

| Revisions | Comment | Date |
|---|---|---|
| A | Initial Issue | 05.01.26 |
| | | |
| | | |
| | | |

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 has been commissioned by Cedar Building Solutions, to undertake a Drainage Strategy in connection with the proposed development at the land off Halifax Road, Liversedge. The proposal consists of 2 new build dwellings with associated parking and access road.

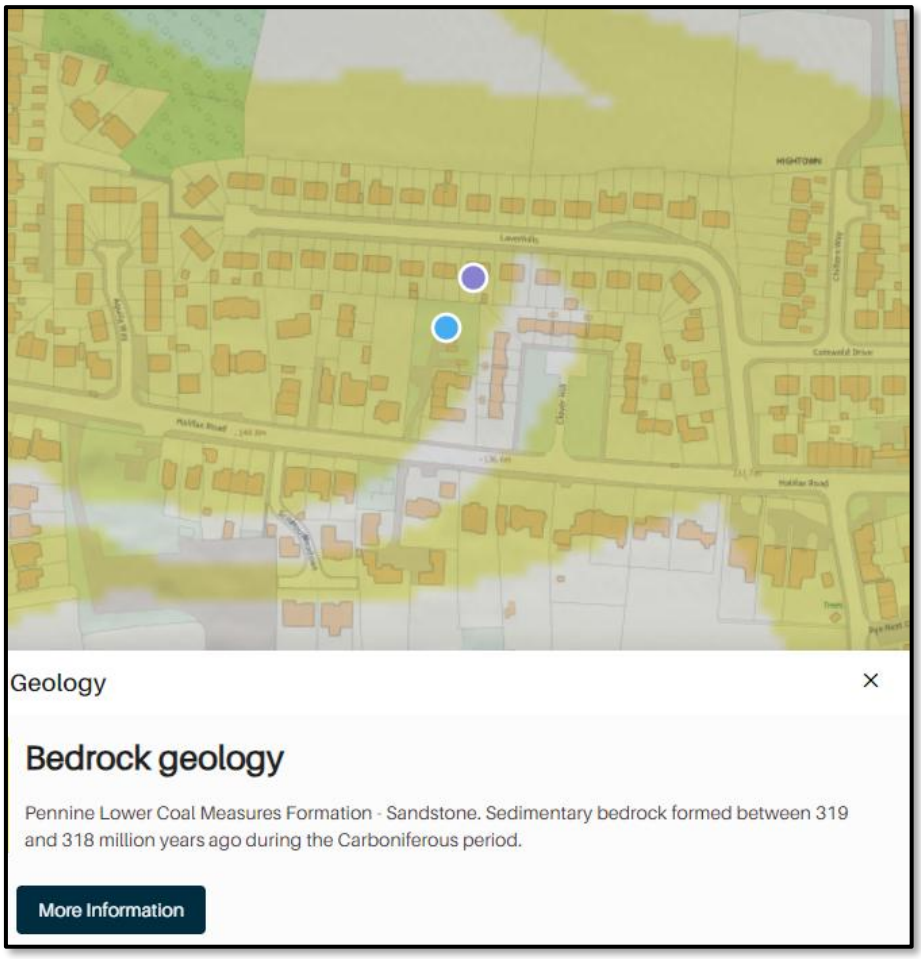
1.2. This report should be read in conjunction with drawing 25097-101 and associated architectural and engineering drawings.

# 2. Existing Site

2.1. The site currently is a greenfield piece of land at the rear of No. 482 with no existing development and located of Halifax Road and access via a driveway that runs along the gable end of No.482, the overall site area is 1,194m² (0.119ha).

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 A for sewer records).

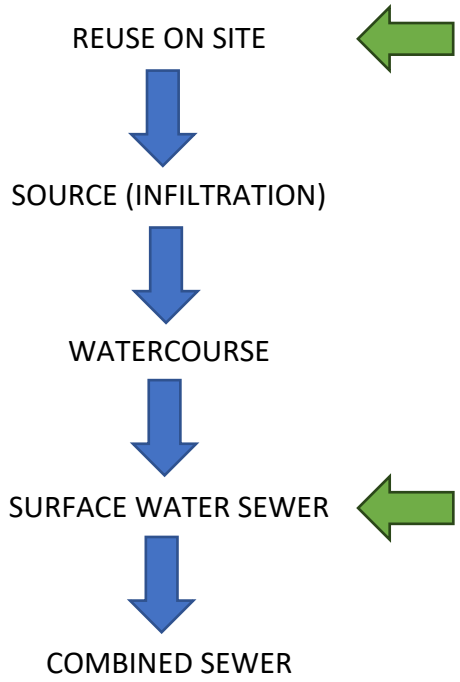
## 3. Proposed Development

3.1. The proposed development is for 2 new build dwellings with associated parking and a new private driveway into the site. (See Appendix B 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:




4.3. In the first instance the reuse of water on site should be implemented, we have achieved this with the use of water butts in the rear gardens, however this on its own does not provide attenuation on site.

4.4. 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.

4.5. 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.

4.6. Next would be to discharge to a surface water sewer, it is proposed to discharge to the public surface water sewer via an existing connection located on the adjacent site at a controlled rate.

4.7. 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 C for calc).

QBAR = 0.60 l/s
1 in 1 Year = 0.50 l/s
1 in 30 Year = 1.10 l/s
1 in 100 Year = 1.30 l/s

4.8. 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 **0.5 l/s** which requires a 32mm orifice and attenuate the **1 in 100 Year + 40%** climate change rainfall event on site in the subbase of the permeable paving. (See Appendix D for Drainage Layout and Appendix E for drainage calcs).

**4.9. Foul Drainage**

4.10. The foul drainage is proposed to connect into the public foul sewer under Halifax Road via an existing connection on the adjacent 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 | ✓ | Water butts have been proposed in each rear garden |
| 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 F for layout) and from this we can see that flood would occur at the flow control manhole and then would flow towards the road and then follow the road as per the original contours of the site.

## 8. Conclusion

8.1. Advant Engineers were commissioned by Cedar Building Solutions 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 1,1194m² (0.119ha).

8.3. It is proposed to discharge the surface water to the public surface water sewer via an existing connection on the adjacent site.

8.4. The surface water will be restricted to 0.5 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 via an existing connection on the adjacent 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
# 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.

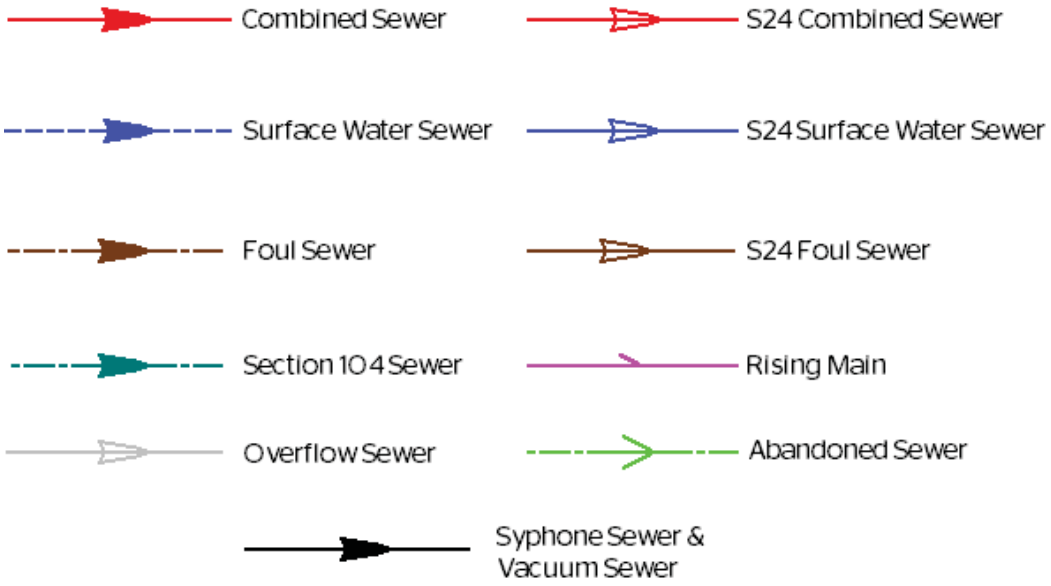
Private pumping stations will also transfer during the period 1 October 2011 – 1 Oct 2016. Records of these assets may not yet be shown on the existing mains record drawing(s). If you encounter any of these assets you must inform Yorkshire Water Services Ltd (YWS).

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.

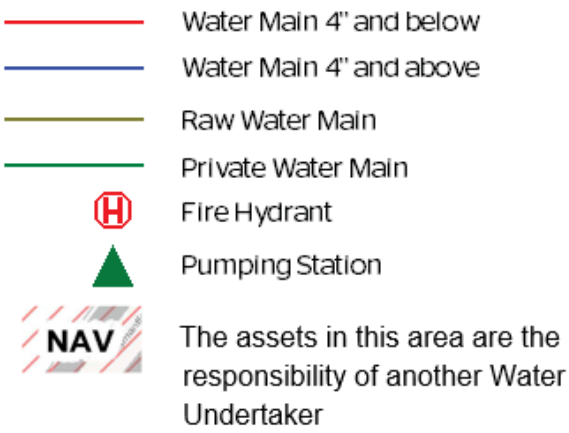
## Property Identfier

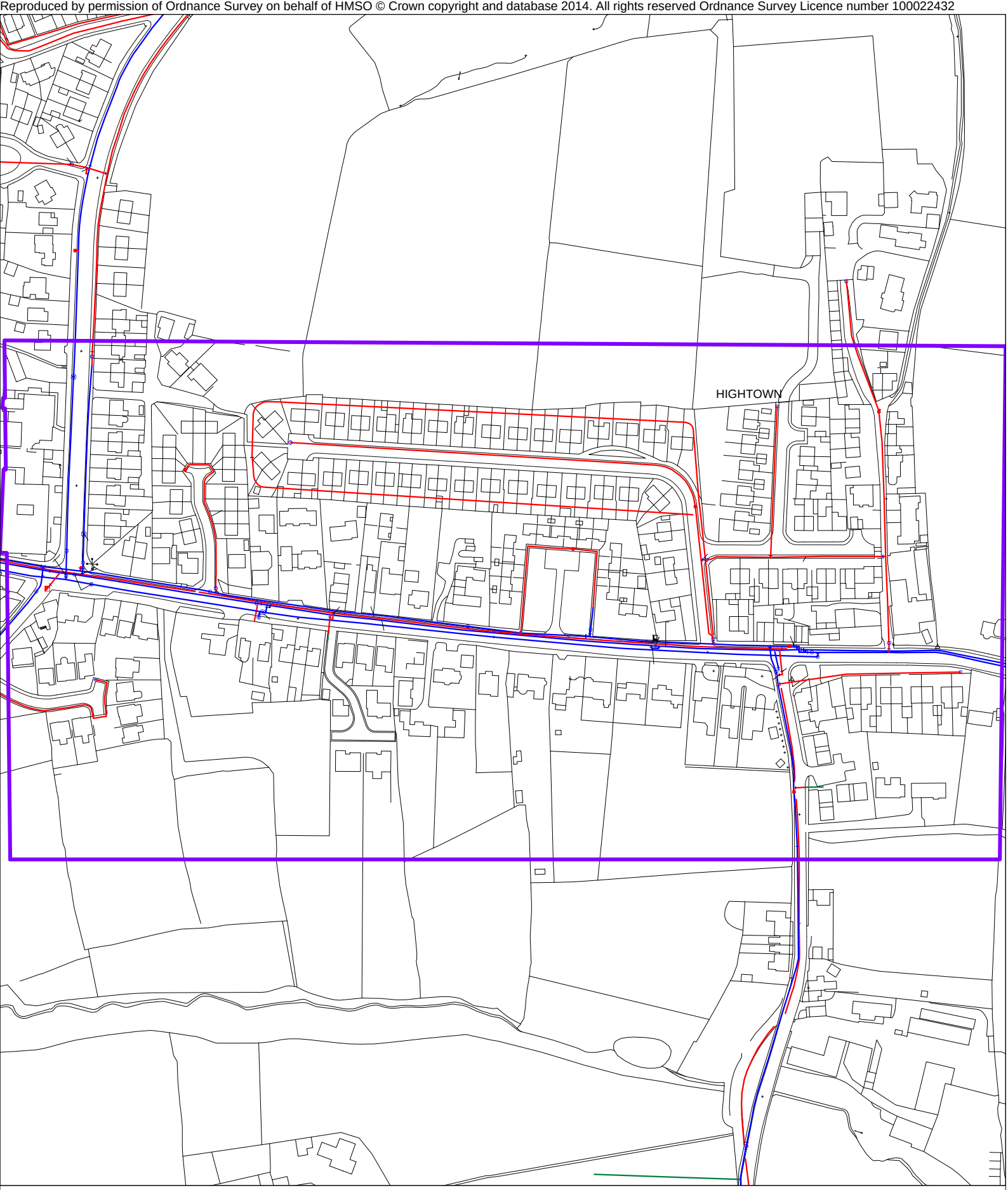

## Sewer Legend



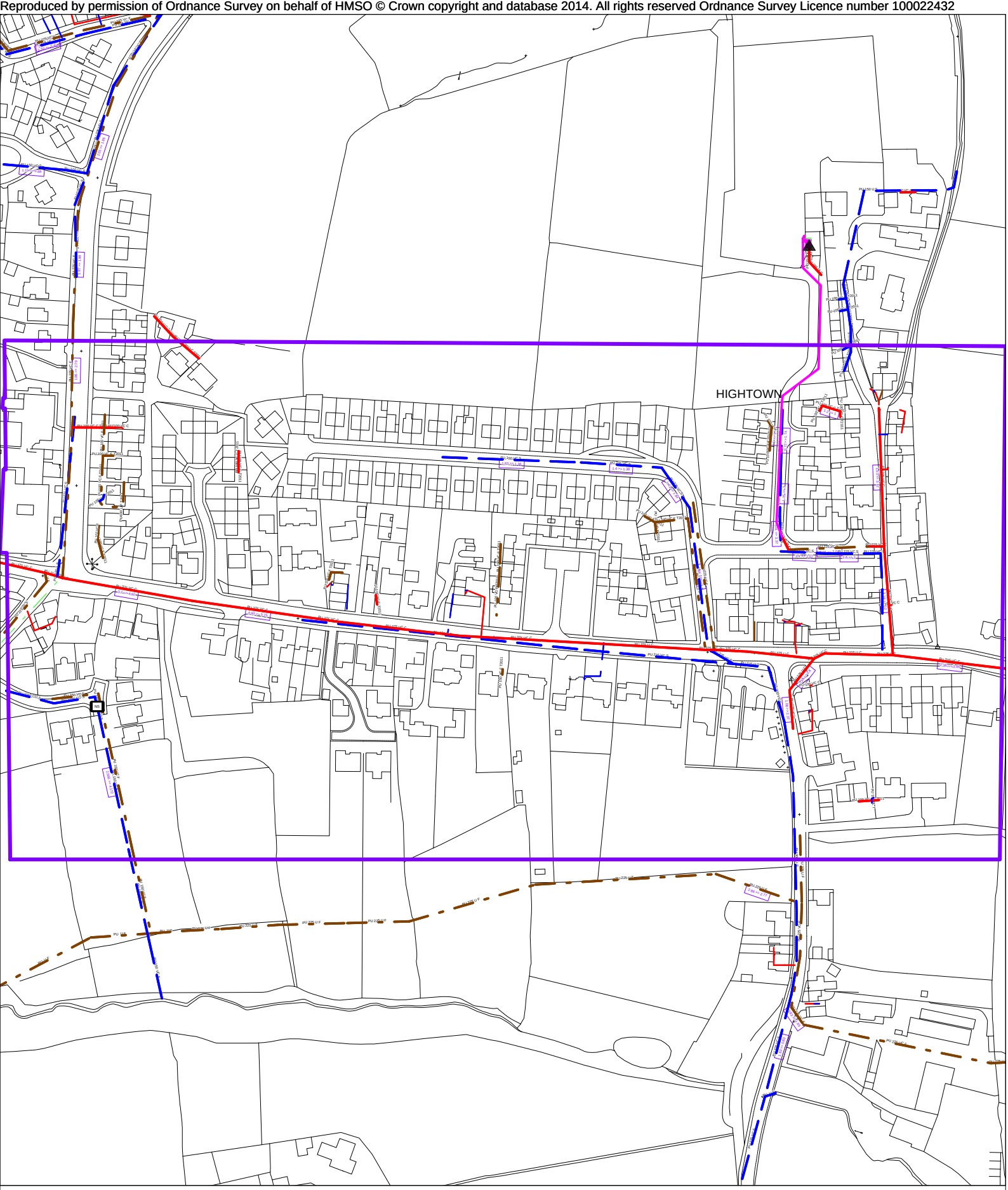

Please note that the direction of flow arrows may not always appear depending on the scale of the map.

## Water Legend



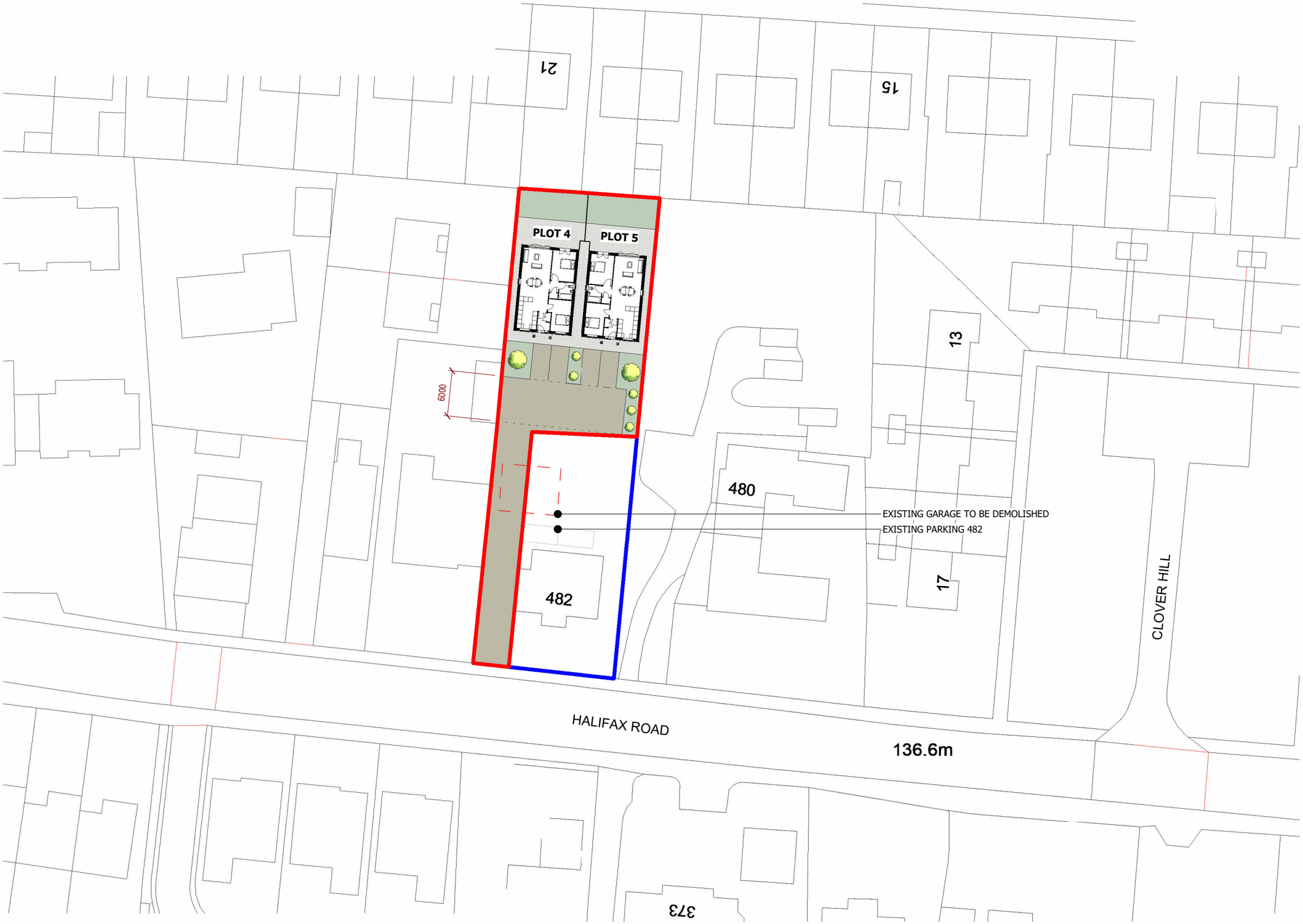



Public Clean Water Network 01/08/2024 09:04:50 OS Grid Coordinates: 418482 : 423689 Map Name : SE1823NW svcGISSafeMovePD




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

# APPENDIX B
# PROPOSED LAYOUT




# Proposed Site Plan

1 : 500

SCALE 1:500

0 5m 10m 15m 20m 25m

CLIENT
Cedar Building Solutions

PROJECT
Land Adj. to 482 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 |
|---|---|---|---|---|---|---|---|---|
| 90097 | BAS | 00 | 00 | DR | A | 00100 | S4 | - |

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

North
W E
S

| REV | DESCRIPTION | DATE | ISSED BY |
|---|---|---|---|

ISSUE/REVISION HISTORY

bas architects
Unit 9, 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 Ltd

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 C
# GREENFIELD CALC

# Greenfield runoff rate estimation tool

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

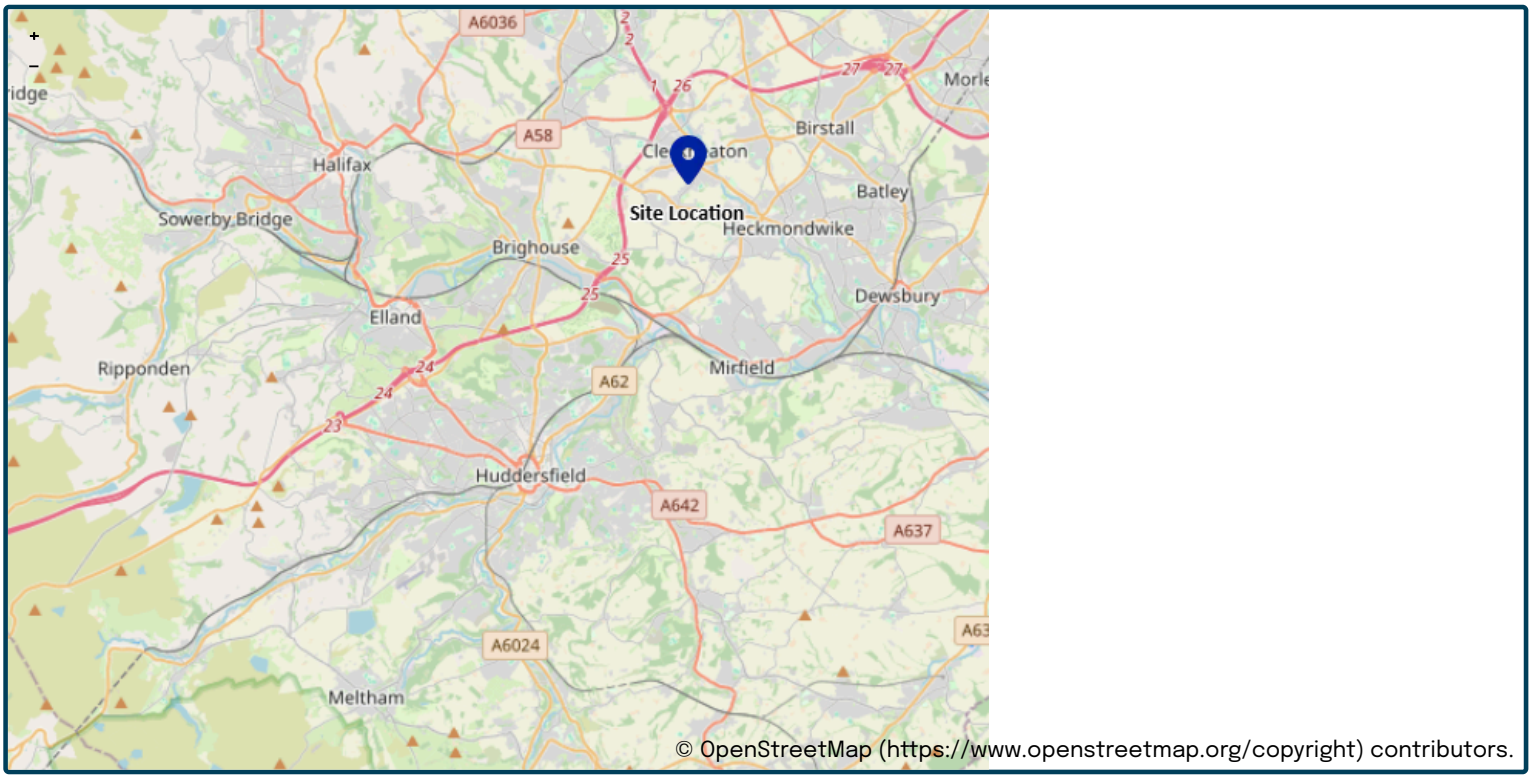
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

## Project details

| | |
|---|---|
| Date | 05/01/2026 |
| Calculated by | Reship Raina |
| Reference | |
| Model version | 2.2.2 |

## Location

| | |
|---|---|
| Site name | |
| Site location | |




| | |
|---|---|
| Site easting (British National Grid) | 418758 |
| Site northing (British National Grid) | 424086 |

## Site details

| | |
|---|---|
| Total site area (ha) | 0.1194 ha |

# Greenfield runoff

## Method

| | |
|---|---|
| Method | IH124 |

## IH124

| | My value | | Map value |
|---|---|---|---|
| SAAR (mm) | 762 mm | | 762 |
| How should SPR be derived? | WRAP soil type | | |
| WRAP soil type | 4 | | 4 |
| SPR | 0.47 | | |
| QBar (IH124) (l/s) | 0.6 l/s | | |

## Growth curve factors

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

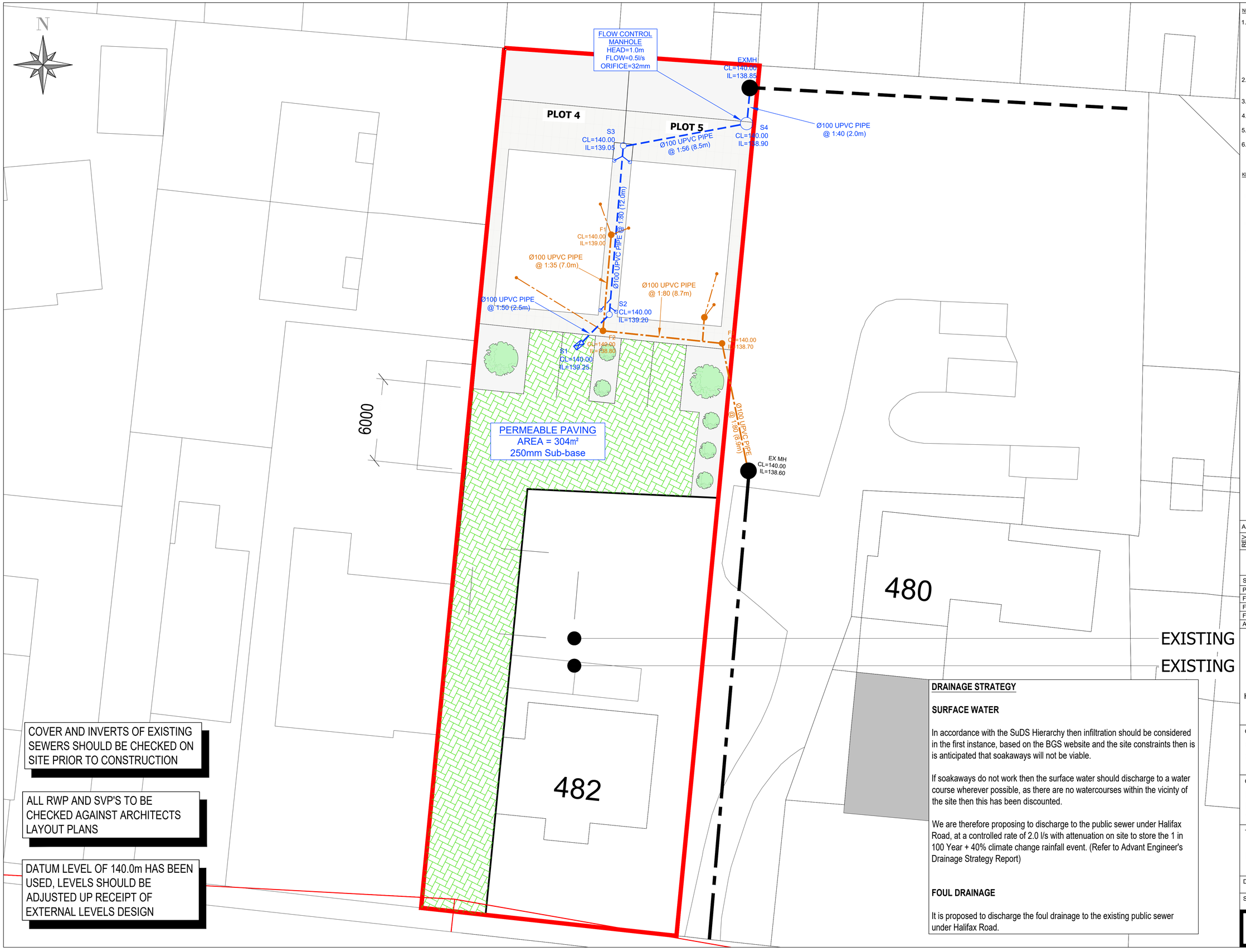
## Results

| | |
|---|---|
| Method | IH124 |
| Flow rate 1 year (l/s) | 0.5 l/s |
| Flow rate 2 year (l/s) | 0.6 l/s |
| Flow rate 10 years (l/s) | 0.9 l/s |
| Flow rate 30 years (l/s) | 1.1 l/s |
| Flow rate 100 years (l/s) | 1.3 l/s |
| Flow rate 200 years (l/s) | 1.5 l/s |

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

### Disclaimer

# APPENDIX D
# PROPOSED 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

**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.

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

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

| REV | | | |
|---|---|---|---|
| A | INITIAL ISSUE | RR | 05.01.26 |
| REV | AMENDMENTS | BY | DATE |

PRELIMINARY

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

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CLIENT
CEDAR BUILDING SOLUTIONS

CONTRACT
LAND ADJ. 482 HALIFAX ROAD
LIVERSEDGE
WF15 8EB

TITLE
PROPOSED DRAINAGE LAYOUT PLAN

| DRAWN | RR | CHK'D | MJM |
|---|---|---|---|
| SCALE | 1:200 @ A1 | DATE | 05.01.26 |

| JOB No | DRG No | REV |
|---|---|---|
| 25097 | 101 | A |

# APPENDIX E
# DRAINAGE CALCS

# Network Details

## Manhole Schedule

| Manhole | Catchment Area (ha) | Diameter (m) | Type | CL (m) | IL (m) | Depth To Soffit (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|---|
| S1 | 0.030 | 0.450 | Unknown | 140.000 | 139.250 | 0.650 | -80.126 | 17.532 |
| S2 | 0.018 | 0.450 | Unknown | 140.000 | 139.200 | 0.700 | -77.197 | 20.323 |
| S3 | 0.000 | 0.450 | Unknown | 140.000 | 139.050 | 0.850 | -76.170 | 32.687 |
| S4 | 0.000 | 1.200 | Unknown | 140.000 | 138.900 | 1.000 | -67.147 | 34.301 |
| S5 | 0.000 | 0.600 | Unknown | 140.000 | 138.850 | 1.050 | -66.891 | 36.938 |

## Pipe Schedule

| Pipe Number | US Manhole | US IL (m) | DS Manhole | DS IL (m) | Shape | Dimension (m) | Length (m) | Gradient (1:x) | Roughness (mm) | US Depth To Soffit (m) | DS Depth To Soffit (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 139.250 | S2 | 139.200 | Circ | 0.1mØ | 4.046 | 81 | 0.600 | 0.650 | 0.700 |
| 1.001 | S2 | 139.200 | S3 | 139.050 | Circ | 0.1mØ | 12.406 | 83 | 0.600 | 0.700 | 0.850 |
| 1.002 | S3 | 139.050 | S4 | 138.900 | Circ | 0.1mØ | 9.167 | 61 | 0.600 | 0.850 | 1.000 |
| 1.003 | S4 | 138.900 | S5 | 138.850 | Circ | 0.1mØ | 2.650 | 53 | 0.600 | 1.000 | 1.050 |

## Permeable Paving Schedule

| Permeable Paving | Assigned Manhole | Effective Storage Volume (m3) | CL (m) | IL (m) | Storage Infil Rate (m/hr) | Safety Factor | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|---|
| Permeable Paving 1 | S1 | 30.484 | 140.000 | 139.620 | 0.00000000 | 2.00 | -81.581 | 11.261 |

# Outfall Details

Outfall Manhole S5 : Free Discharge

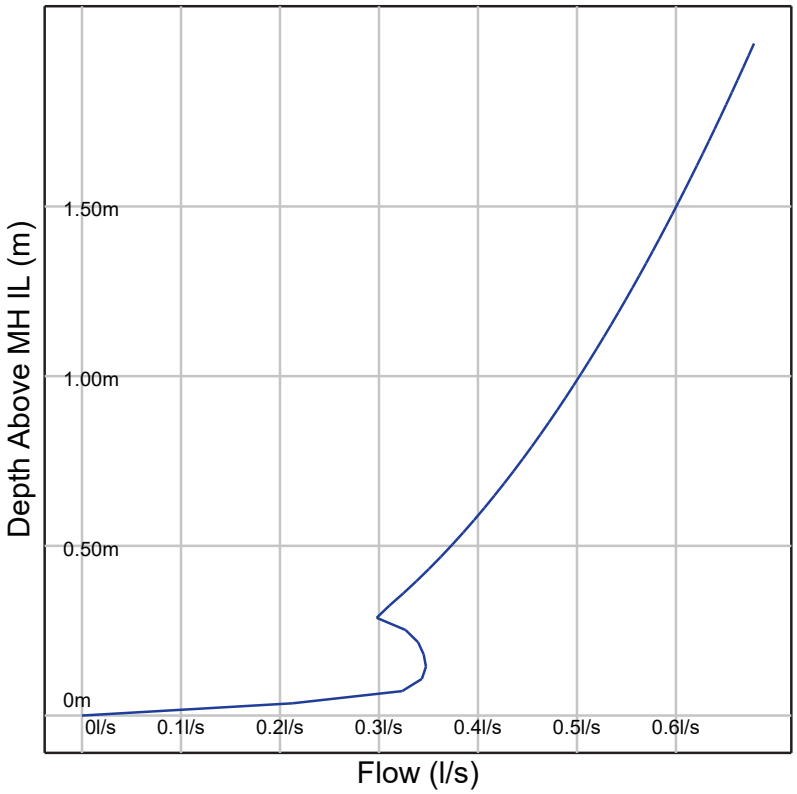
# Flow Control Details

Controls within Manhole S4

## Hydro-Brake® Optimum Control

| Model Ref | Design Depth (m) | Design Flow (l/s) | Invert Offset (m) | FF Head (m) | FF Flow (l/s) | KF Head (m) | KF Flow (l/s) |
|---|---|---|---|---|---|---|---|
| SHE-0032-5000-1000-5000 | 1.000 | 0.500 | 0.000 | 0.143 | 0.347 | 0.289 | 0.296 |

## Hydro-Brake® Optimum Control from S4 to S5



## Simulation Settings

FSR: M5-60=19.00, R=0.35, Locale=England and Wales

Summer (Cv: 1.00), Winter (Cv: 1.00)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +0%), (30, +0%), (100, +0%), (100, +40%)

Manhole Flood Risk Freeboard: 0.300m

## Simulated Rainfall Events

| Storm | Average Intensity (mm/hr) | Runoff Continuity % | Flow Continuity % | Item Volume Continuity Errors |
|---|---|---|---|---|
| 1Yr 15Min Winter | 33.289 | 0.00 | 1.44 | |
| 1Yr 15Min Summer | 33.289 | 0.00 | 1.55 | |
| 1Yr 30Min Winter | 21.560 | 0.00 | 4.02 | |
| 1Yr 30Min Summer | 21.560 | 0.00 | 3.94 | |
| 1Yr 60Min Winter | 13.523 | 0.00 | 6.13 | S3 0.33m3, S2 0.17m3, S1 0.13m3, S4 0.11m3 |
| 1Yr 60Min Summer | 13.523 | 0.00 | 6.12 | S3 0.33m3, S2 0.17m3, S1 0.13m3, S4 0.11m3 |
| 1Yr 120Min Summer | 8.362 | 0.00 | 2.44 | |
| 1Yr 120Min Winter | 8.362 | 0.00 | 2.37 | |
| 1Yr 180Min Winter | 6.304 | 0.00 | 0.00 | |
| 1Yr 180Min Summer | 6.304 | 0.00 | 0.00 | |
| 1Yr 240Min Winter | 5.165 | 0.00 | 0.00 | |
| 1Yr 240Min Summer | 5.165 | 0.00 | 0.00 | |
| 1Yr 360Min Summer | 3.897 | 0.00 | 0.00 | |
| 1Yr 360Min Winter | 3.897 | 0.00 | 0.00 | |
| 1Yr 480Min Winter | 3.187 | 0.00 | 0.00 | |
| 1Yr 480Min Summer | 3.187 | 0.00 | 0.00 | |
| 1Yr 600Min Winter | 2.727 | 0.00 | 0.00 | |
| 1Yr 600Min Summer | 2.727 | 0.00 | 0.00 | |
| 1Yr 720Min Winter | 2.401 | 0.00 | 0.00 | |
| 1Yr 720Min Summer | 2.401 | 0.00 | 0.00 | |
| 1Yr 960Min Summer | 1.963 | 0.00 | 0.00 | |
| 1Yr 960Min Winter | 1.963 | 0.00 | 0.00 | |
| 1Yr 1440Min Summer | 1.479 | 0.00 | 0.00 | |
| 1Yr 1440Min Winter | 1.479 | 0.00 | 0.00 | |
| 1Yr 2160Min Summer | 1.115 | 0.00 | 0.00 | |
| 1Yr 2160Min Winter | 1.115 | 0.00 | 0.00 | |
| 1Yr 2880Min Winter | 0.913 | 0.00 | 0.00 | |
| 1Yr 2880Min Summer | 0.913 | 0.00 | 0.00 | |
| 1Yr 4320Min Summer | 0.689 | 0.00 | 0.00 | |
| 1Yr 4320Min Winter | 0.689 | 0.00 | 0.00 | |
| 1Yr 5760Min Summer | 0.565 | 0.00 | 0.00 | |
| 1Yr 5760Min Winter | 0.565 | 0.00 | 0.00 | |
| 1Yr 7200Min Winter | 0.484 | 0.00 | 0.00 | |
| 1Yr 7200Min Summer | 0.484 | 0.00 | 0.00 | |
| 1Yr 8640Min Summer | 0.427 | 0.00 | 0.00 | |
| 1Yr 8640Min Winter | 0.427 | 0.00 | 0.00 | |
| 1Yr 10080Min Summer | 0.383 | 0.00 | 0.00 | |
| 1Yr 10080Min Winter | 0.383 | 0.00 | 0.00 | |
| 30Yr 15Min Summer | 68.836 | 0.00 | 11.32 | S3 0.58m3, S2 0.43m3, S1 0.38m3, S4 0.15m3 |
| 30Yr 15Min Winter | 68.836 | 0.00 | 11.42 | S3 0.58m3, S2 0.43m3, S1 0.38m3, S4 0.15m3 |
| 30Yr 30Min Summer | 45.828 | 0.00 | 8.91 | S3 0.61m3, S2 0.46m3, S1 0.41m3, S4 0.16m3 |
| 30Yr 30Min Winter | 45.828 | 0.00 | 8.88 | S3 0.61m3, S2 0.46m3, S1 0.41m3, S4 0.16m3 |
| 30Yr 60Min Summer | 29.238 | 0.00 | 7.11 | S3 0.63m3, S2 0.48m3, S1 0.44m3, S4 0.16m3 |
| 30Yr 60Min Winter | 29.238 | 0.00 | 7.12 | S3 0.63m3, S2 0.48m3, S1 0.43m3, S4 0.16m3 |
| 30Yr 120Min Summer | 18.112 | 0.00 | 5.69 | S3 0.63m3, S2 0.48m3, S1 0.41m3, S4 0.16m3 |
| 30Yr 120Min Winter | 18.112 | 0.00 | 5.71 | S3 0.63m3, S2 0.48m3, S1 0.41m3, S4 0.16m3 |
| 30Yr 180Min Summer | 13.534 | 0.00 | 4.98 | |
| 30Yr 180Min Winter | 13.534 | 0.00 | 5.00 | |
| 30Yr 240Min Summer | 10.952 | 0.00 | 4.50 | |
| 30Yr 240Min Winter | 10.952 | 0.00 | 4.51 | |
| 30Yr 360Min Winter | 8.106 | 0.00 | 3.70 | |
| 30Yr 360Min Summer | 8.106 | 0.00 | 3.71 | |
| 30Yr 480Min Summer | 6.544 | 0.00 | 0.73 | |
| 30Yr 480Min Winter | 6.544 | 0.00 | 0.58 | |

## Simulated Rainfall Events

| Storm | Average Intensity (mm/hr) | Runoff Continuity % | Flow Continuity % | Item Volume Continuity Errors |
|---|---|---|---|---|
| 30Yr 600Min Summer | 5.539 | 0.00 | 0.00 | |
| 30Yr 600Min Winter | 5.539 | 0.00 | 0.00 | |
| 30Yr 720Min Winter | 4.832 | 0.00 | 0.00 | |
| 30Yr 720Min Summer | 4.832 | 0.00 | 0.00 | |
| 30Yr 960Min Summer | 3.892 | 0.00 | 0.00 | |
| 30Yr 960Min Winter | 3.892 | 0.00 | 0.00 | |
| 30Yr 1440Min Summer | 2.866 | 0.00 | 0.00 | |
| 30Yr 1440Min Winter | 2.866 | 0.00 | 0.00 | |
| 30Yr 2160Min Summer | 2.108 | 0.00 | 0.00 | |
| 30Yr 2160Min Winter | 2.108 | 0.00 | 0.00 | |
| 30Yr 2880Min Summer | 1.693 | 0.00 | 0.00 | |
| 30Yr 2880Min Winter | 1.693 | 0.00 | 0.00 | |
| 30Yr 4320Min Summer | 1.242 | 0.00 | 0.00 | |
| 30Yr 4320Min Winter | 1.242 | 0.00 | 0.00 | |
| 30Yr 5760Min Summer | 0.996 | 0.00 | 0.00 | |
| 30Yr 5760Min Winter | 0.996 | 0.00 | 0.00 | |
| 30Yr 7200Min Summer | 0.839 | 0.00 | 0.00 | |
| 30Yr 7200Min Winter | 0.839 | 0.00 | 0.00 | |
| 30Yr 8640Min Winter | 0.730 | 0.00 | 0.00 | |
| 30Yr 8640Min Summer | 0.730 | 0.00 | 0.00 | |
| 30Yr 10080Min Summer | 0.648 | 0.00 | 0.00 | |
| 30Yr 10080Min Winter | 0.648 | 0.00 | 0.00 | |
| 100Yr 15Min Summer | 89.024 | 0.00 | 9.12 | S3 0.61m3, S2 0.46m3, S1 0.41m3, S4 0.16m3 |
| 100Yr 15Min Winter | 89.024 | 0.00 | 9.22 | S3 0.61m3, S2 0.46m3, S1 0.41m3, S4 0.16m3 |
| 100Yr 30Min Summer | 59.849 | 0.00 | 7.09 | S3 0.64m3, S2 0.48m3, S1 0.44m3, S4 0.16m3 |
| 100Yr 30Min Winter | 59.849 | 0.00 | 7.07 | S3 0.64m3, S2 0.49m3, S1 0.44m3, S4 0.16m3 |
| 100Yr 60Min Summer | 38.413 | 0.00 | 5.71 | S3 0.66m3, S2 0.51m3, S1 0.47m3, S4 0.17m3 |
| 100Yr 60Min Winter | 38.413 | 0.00 | 5.72 | S3 0.67m3, S2 0.51m3, S1 0.47m3, S4 0.17m3 |
| 100Yr 120Min Summer | 23.812 | 0.00 | 4.65 | |
| 100Yr 120Min Winter | 23.812 | 0.00 | 4.67 | |
| 100Yr 180Min Summer | 17.737 | 0.00 | 4.13 | |
| 100Yr 180Min Winter | 17.737 | 0.00 | 4.14 | |
| 100Yr 240Min Summer | 14.290 | 0.00 | 3.77 | |
| 100Yr 240Min Winter | 14.290 | 0.00 | 3.78 | |
| 100Yr 360Min Summer | 10.505 | 0.00 | 3.25 | |
| 100Yr 360Min Winter | 10.505 | 0.00 | 3.26 | |
| 100Yr 480Min Summer | 8.441 | 0.00 | 2.85 | |
| 100Yr 480Min Winter | 8.441 | 0.00 | 2.85 | |
| 100Yr 600Min Summer | 7.118 | 0.00 | 2.13 | |
| 100Yr 600Min Winter | 7.118 | 0.00 | 2.04 | |
| 100Yr 720Min Summer | 6.190 | 0.00 | 0.00 | |
| 100Yr 720Min Winter | 6.190 | 0.00 | 0.00 | |
| 100Yr 960Min Summer | 4.959 | 0.00 | 0.00 | |
| 100Yr 960Min Winter | 4.959 | 0.00 | 0.00 | |
| 100Yr 1440Min Summer | 3.622 | 0.00 | 0.00 | |
| 100Yr 1440Min Winter | 3.622 | 0.00 | 0.00 | |
| 100Yr 2160Min Summer | 2.640 | 0.00 | 0.00 | |
| 100Yr 2160Min Winter | 2.640 | 0.00 | 0.00 | |
| 100Yr 2880Min Summer | 2.107 | 0.00 | 0.00 | |
| 100Yr 2880Min Winter | 2.107 | 0.00 | 0.00 | |
| 100Yr 4320Min Summer | 1.530 | 0.00 | 0.00 | |
| 100Yr 4320Min Winter | 1.530 | 0.00 | 0.00 | |
| 100Yr 5760Min Summer | 1.218 | 0.00 | 0.00 | |
| 100Yr 5760Min Winter | 1.218 | 0.00 | 0.00 | |
| 100Yr 7200Min Summer | 1.019 | 0.00 | 0.00 | |
| 100Yr 7200Min Winter | 1.019 | 0.00 | 0.00 | |
| 100Yr 8640Min Summer | 0.882 | 0.00 | 0.00 | |
| 100Yr 8640Min Winter | 0.882 | 0.00 | 0.00 | |
| 100Yr 10080Min Summer | 0.781 | 0.00 | 0.00 | |
| 100Yr 10080Min Winter | 0.781 | 0.00 | 0.00 | |
| 100Yr+40% 15Min Summer | 124.633 | 0.00 | 6.84 | S3 0.64m3, S2 0.49m3, S1 0.44m3, S4 0.16m3 |
| 100Yr+40% 15Min Winter | 124.633 | 0.00 | 6.91 | S3 0.65m3, S2 0.49m3, S1 0.44m3, S4 0.16m3 |
| 100Yr+40% 30Min Summer | 83.789 | 0.00 | 5.43 | S3 0.68m3, S2 0.53m3, S1 0.48m3, S4 0.17m3 |
| 100Yr+40% 30Min Winter | 83.789 | 0.00 | 5.42 | S3 0.68m3, S2 0.53m3, S1 0.48m3, S4 0.17m3 |
| 100Yr+40% 60Min Summer | 53.779 | 0.00 | 4.47 | |
| 100Yr+40% 60Min Winter | 53.779 | 0.00 | 4.48 | |
| 100Yr+40% 120Min Summer | 33.337 | 0.00 | 3.73 | |
| 100Yr+40% 120Min Winter | 33.337 | 0.00 | 3.74 | |

## Simulated Rainfall Events

| Storm | Average Intensity (mm/hr) | Runoff Continuity % | Flow Continuity % | Item Volume Continuity Errors |
|---|---|---|---|---|
| 100Yr+40% 180Min Summer | 24.832 | 0.00 | 3.35 | |
| 100Yr+40% 180Min Winter | 24.832 | 0.00 | 3.36 | |
| 100Yr+40% 240Min Summer | 20.006 | 0.00 | 3.09 | |
| 100Yr+40% 240Min Winter | 20.006 | 0.00 | 3.10 | |
| 100Yr+40% 360Min Summer | 14.706 | 0.00 | 2.71 | |
| 100Yr+40% 360Min Winter | 14.706 | 0.00 | 2.72 | |
| 100Yr+40% 480Min Summer | 11.818 | 0.00 | 2.42 | |
| 100Yr+40% 480Min Winter | 11.818 | 0.00 | 2.43 | |
| 100Yr+40% 600Min Summer | 9.966 | 0.00 | 2.18 | |
| 100Yr+40% 600Min Winter | 9.966 | 0.00 | 2.18 | |
| 100Yr+40% 720Min Summer | 8.665 | 0.00 | 1.97 | |
| 100Yr+40% 720Min Winter | 8.665 | 0.00 | 1.97 | |
| 100Yr+40% 960Min Summer | 6.943 | 0.00 | 1.28 | |
| 100Yr+40% 960Min Winter | 6.943 | 0.00 | 1.25 | |
| 100Yr+40% 1440Min Summer | 5.071 | 0.00 | 0.00 | |
| 100Yr+40% 1440Min Winter | 5.071 | 0.00 | 0.00 | |
| 100Yr+40% 2160Min Summer | 3.696 | 0.00 | 0.00 | |
| 100Yr+40% 2160Min Winter | 3.696 | 0.00 | 0.00 | |
| 100Yr+40% 2880Min Summer | 2.949 | 0.00 | 0.00 | |
| 100Yr+40% 2880Min Winter | 2.949 | 0.00 | 0.00 | |
| 100Yr+40% 4320Min Summer | 2.142 | 0.00 | 0.00 | |
| 100Yr+40% 4320Min Winter | 2.142 | 0.00 | 0.00 | |
| 100Yr+40% 5760Min Summer | 1.705 | 0.00 | 0.00 | |
| 100Yr+40% 5760Min Winter | 1.705 | 0.00 | 0.00 | |
| 100Yr+40% 7200Min Summer | 1.427 | 0.00 | 0.00 | |
| 100Yr+40% 7200Min Winter | 1.427 | 0.00 | 0.00 | |
| 100Yr+40% 8640Min Summer | 1.235 | 0.00 | 0.00 | |
| 100Yr+40% 8640Min Winter | 1.235 | 0.00 | 0.00 | |
| 100Yr+40% 10080Min Winter | 1.093 | 0.00 | 0.00 | |
| 100Yr+40% 10080Min Summer | 1.093 | 0.00 | 0.00 | |

# Simulation Results

Return Period (yrs) + Climate Change (%):

1yr+0%

## Manholes

| Manhole | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status |
|---|---|---|---|---|---|---|---|
| S1 | 600 min Summer | 382 | 139.637 | 0.387 | 0.292 | | Surcharged |
| S2 | 600 min Summer | 382 | 139.637 | 0.437 | 0.438 | | Surcharged |
| S3 | 600 min Summer | 382 | 139.636 | 0.586 | 0.437 | | Surcharged |
| S4 | 600 min Summer | 383 | 139.636 | 0.736 | 0.436 | | Surcharged |
| S5 | 600 min Summer | 383 | 138.864 | 0.014 | 0.436 | | Outfall |

## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1440 min Winter | 831 | S1 | S2 | 0.100 | 0.358 | 0.559 | 0.083 | Surcharged |
| 1.001 | 15 min Summer | 11 | S2 | S3 | 0.100 | 0.857 | 3.437 | 0.518 | Surcharged |
| 1.002 | 15 min Summer | 8 | S3 | S4 | 0.100 | 0.676 | 2.318 | 0.300 | Surcharged |
| 1.003 | 600 min Summer | 383 | S4 | S5 | 0.014 | 0.651 | 0.436 | 0.052 | OK |

## Permeable Paving Storage

| Permeable Paving | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Surface Runoff (m3) | Status |
|---|---|---|---|---|---|---|---|---|
| Permeable Paving 1 | 360 min Summer | 218 | 139.643 | 0.023 | 0.535 | | | OK |

Return Period (yrs) + Climate Change (%):

30yr+0%

## Manholes

| Manhole | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status |
|---|---|---|---|---|---|---|---|
| S1 | 480 min Summer | 363 | 139.717 | 0.467 | 0.290 | | Flood Risk |
| S2 | 480 min Summer | 363 | 139.717 | 0.517 | 0.457 | | Flood Risk |
| S3 | 480 min Summer | 363 | 139.717 | 0.667 | 0.457 | | Flood Risk |
| S4 | 480 min Summer | 363 | 139.716 | 0.816 | 0.457 | | Flood Risk |
| S5 | 480 min Summer | 364 | 138.864 | 0.014 | 0.457 | | Outfall |

## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 4320 min Winter | 2246 | S1 | S2 | 0.100 | 0.351 | 0.729 | 0.109 | Surcharged |
| 1.001 | 15 min Winter | 7 | S2 | S3 | 0.100 | 0.847 | 4.331 | 0.653 | Surcharged |
| 1.002 | 15 min Winter | 6 | S3 | S4 | 0.100 | 0.735 | 2.501 | 0.323 | Surcharged |
| 1.003 | 480 min Summer | 364 | S4 | S5 | 0.014 | 0.660 | 0.457 | 0.055 | OK |

## Permeable Paving Storage

| Permeable Paving | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Surface Runoff (m3) | Status |
|---|---|---|---|---|---|---|---|---|
| Permeable Paving 1 | 480 min Summer | 363 | 139.717 | 0.097 | 0.289 | | | OK |

Return Period (yrs) + Climate Change (%):

100yr+0%

## Manholes

| Manhole | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status |
|---|---|---|---|---|---|---|---|
| S1 | 480 min Winter | 403 | 139.767 | 0.517 | 0.296 | | Flood Risk |
| S2 | 480 min Winter | 403 | 139.766 | 0.566 | 0.469 | | Flood Risk |
| S3 | 480 min Winter | 403 | 139.766 | 0.716 | 0.469 | | Flood Risk |
| S4 | 480 min Winter | 403 | 139.765 | 0.865 | 0.469 | | Flood Risk |
| S5 | 480 min Winter | 403 | 138.864 | 0.014 | 0.468 | | Outfall |

## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 10080 min Summer | 5210 | S1 | S2 | 0.100 | 0.353 | 0.637 | 0.095 | Surcharged |
| 1.001 | 15 min Winter | 9 | S2 | S3 | 0.100 | 0.906 | 4.470 | 0.674 | Surcharged |
| 1.002 | 15 min Winter | 5 | S3 | S4 | 0.100 | 0.815 | 2.960 | 0.382 | Surcharged |
| 1.003 | 480 min Winter | 403 | S4 | S5 | 0.015 | 0.665 | 0.468 | 0.056 | OK |

## Permeable Paving Storage

| Permeable Paving | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Surface Runoff (m3) | Status |
|---|---|---|---|---|---|---|---|---|
| Permeable Paving 1 | 480 min Winter | 405 | 139.767 | 0.147 | 0.300 | | | OK |

Return Period (yrs) + Climate Change (%):

100yr+40%

## Manholes

| Manhole | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Status |
|---|---|---|---|---|---|---|---|
| S1 | 600 min Winter | 530 | 139.860 | 0.610 | 0.311 | | Flood Risk |
| S2 | 600 min Winter | 528 | 139.860 | 0.660 | 0.490 | | Flood Risk |
| S3 | 600 min Winter | 529 | 139.859 | 0.809 | 0.490 | | Flood Risk |
| S4 | 600 min Winter | 529 | 139.858 | 0.958 | 0.490 | | Flood Risk |
| S5 | 600 min Winter | 529 | 138.865 | 0.015 | 0.490 | | Outfall |

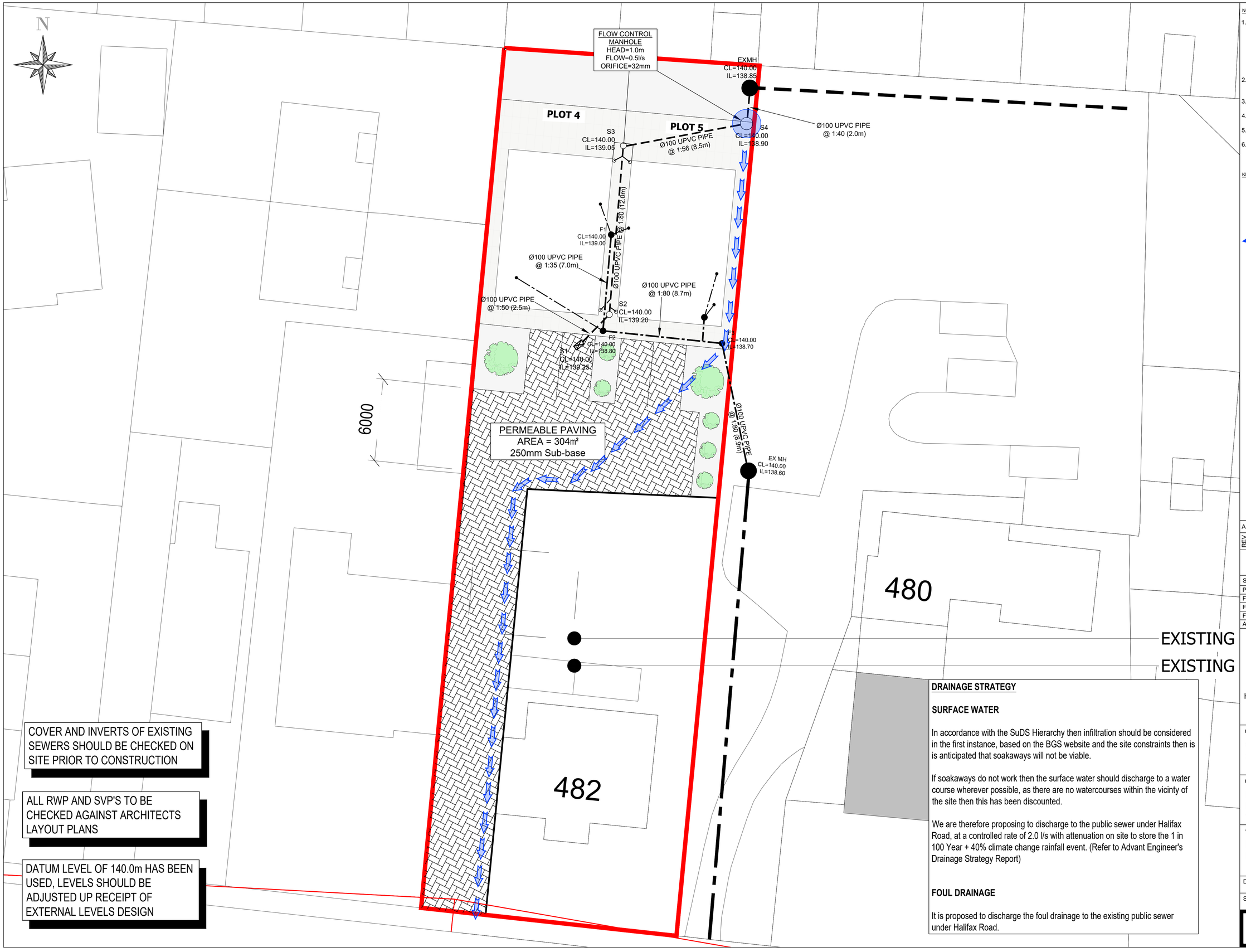
## Conduits

| Pipe No. | Critical Storm | Peak (mins) | US Manhole | DS Manhole | Flow Depth (m) | Max Velocity (m/s) | Max Flow (l/s) | Flow / Capacity | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 8640 min Winter | 4205 | S1 | S2 | 0.100 | 0.349 | 0.616 | 0.092 | Surcharged |
| 1.001 | 15 min Winter | 8 | S2 | S3 | 0.100 | 0.883 | 5.923 | 0.892 | Surcharged |
| 1.002 | 15 min Winter | 8 | S3 | S4 | 0.100 | 0.847 | 3.294 | 0.426 | Surcharged |
| 1.003 | 600 min Winter | 529 | S4 | S5 | 0.015 | 0.674 | 0.490 | 0.059 | OK |

## Permeable Paving Storage

| Permeable Paving | Critical Storm | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Flood (m3) | Surface Runoff (m3) | Status |
|---|---|---|---|---|---|---|---|---|
| Permeable Paving 1 | 600 min Winter | 531 | 139.860 | 0.240 | 0.309 | | | OK |

# APPENDIX F
# FLOOD EXCEEDANCE PLAN




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

**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.

NOTES

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KEY

FLOOD EXCEEDANCE EVENT

FLOOD FLOW PATH

| REV | | BY | DATE |
|---|---|---|---|
| A | INITIAL ISSUE | RR | 05.01.26 |
| REV | AMENDMENTS | BY | DATE |

PRELIMINARY

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

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CLIENT
CEDAR BUILDING SOLUTIONS

CONTRACT
LAND ADJ. 483 HALIFAX ROAD
LIVERSEDGE
WF15 8EB

TITLE
FLOOD EXCEEDANCE LAYOUT PLAN

| DRAWN | RR | CHK'D | MJM |
|---|---|---|---|
| SCALE | 1:200 @ A1 | DATE | 05.01.26 |

| JOB No | DRG No | REV |
|---|---|---|
| 25097 | 102 | A |

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