

Built Development Ltd.

Bury Old Road, Heywood

Sustainable Drainage Strategy

January 2025



Revision Schedule

Bury Old Road, Heywood

Drainage Strategy

January 2025

Doc Ref: BDL-1763-01-DS-001

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-	28 th June 2024	First Issue	Calum Reford, BSc (Hons), MSc.	Lee Barnes, BSc (Hons), MCIHT	Lee Barnes, BSc (Hons), MCIHT
P1	19 th July 2024	First Revision	Calum Reford, BSc (Hons), MSc.	Lee Barnes, BSc (Hons), MCIHT	Lee Barnes, BSc (Hons), MCIHT
P2	30 th August 2024	Second Revision	Calum Reford, BSc (Hons), MSc.	Lee Barnes, BSc (Hons), MCIHT	Lee Barnes, BSc (Hons), MCIHT
P3	18 th November 2024	Third Revision	Calum Reford, BSc (Hons), MSc.	Lee Barnes, BSc (Hons), MCIHT	Lee Barnes, BSc (Hons), MCIHT
P4	22 nd January 2025	Fourth Revision	Calum Reford, BSc (Hons), MSc.	Stephen Riley BSc CEng MICE	Lee Barnes, BSc (Hons), MCIHT

REVISION NOTES	
P1	Revised to include references to BDL-1763-01-FRA-001 – Flood Risk Assessment
P2	Revised to remove permeable paving and replacement with attenuation crates.
P3	Revised following infiltration testing to address LLFA and UU comments. Site 1 now includes infiltration to ground.
P4	Updated to address comments from the LLFA and UU, following a meeting with the LLFA on 12/12/2024.

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1.0 INTRODUCTION

1.1 Instructions

1.1.1 This Drainage Strategy report has been prepared in accordance with instructions from Bernard Taylor Partnership Architects, on behalf of Built Developments Ltd, to support a planning application to Rochdale Borough Council for a residential development of 28no. dwellings over two sites. Site 1 is located to the south of Bury Old Road, and to the east of Sutherland Road, Heywood. Site 2 is located to the north of Argyle Street, Heywood. Both sites are located within the curtilage of Our Lady's and St Paul's Roman Catholic Primary School, OL10 3PD.

1.1.2 The purpose of this report is to assess flood risk and determine a drainage strategy for the proposed development. It does not purport to be a detailed design for approval or construction purposes.

1.2 Planning History

1.2.1 Rochdale Borough Council have provided pre-application advice concerning flood risk as follows:

The site is within Flood Zone 1, having a less than a 1 in 1,000 annual probability of flooding, however, does fall in the Heywood Critical Drainage Area. Given the proposals would comprise of major development, a Flood Risk Assessment and a Sustainable Drainage Strategy will be required with any future application.

1.2.2 Inspire Design and Development have prepared a Site-Specific Flood Risk Assessment (doc ref: BDL-1763-01-FRA-001) which should be read in conjunction with this Sustainable Drainage Strategy.

1.2.3 Comments on the planning application were received from the Lead Local Flood Authority (LLFA) on 12th September 2024, and can be summarised as below:

- The current proposals (to combined sewer) are not acceptable in principle.
- Infiltration to ground should be comprehensively assessed by an on-site investigation to establish the feasibility of soakaways.

1.2.4 In accordance with these comments, BRE365 soakaway testing was conducted by Humberside Laboratories. The on-site surveys concluded that infiltration is feasible at Site 1. However, no soakage was observed on part of Site 2, and therefore, the Drainage Strategy (P3) was updated to reflect these findings.

1.2.5 This current report (P4) has been further updated to reflect recent comments from the LLFA, received on 5th December 2024. Comments are summarised below:

- Site 2 to be revised to include infiltration based on favourable results at Trial Pit 5.
The drawing BDL-1763-01-DR-001 Drainage Strategy has been updated to Rev P3 to remove disposal to sewer in favour of a private soakaway system at Plots 1-2 which will serve all of Site 2.
- SUDS source controls should be applied to the design.
Permeable Paving has been included in all private drive areas to provide a form of source control and treatment to surface water runoff.
- Development should consider adoptable drainage.
Discussions with UU Adoptions Team (see Appendix H) highlighted that UU would not adopt soakaways in a private area. Due to the constrained nature of the site, and as discussed at the meeting with the LLFA on 12th December 2024, two separate drainage systems are proposed, a private system for properties and driveways, and a public system for the adoptable highway.
- Hydraulic calculations should be updated to reflect the 45% Climate Change scenario.
Hydraulic Calculations have been updated to reflect the 45% Climate Change scenario and remove references to orifices (see Appendix D).

1.2.6 Comments were also received from UU dated 3rd December 2024. The comments can be summarised below:

- Surface water calculations show surcharge in the 1 in 1-year event.
The hydraulic calculations have been updated (see Appendix D).
- The surface water sewer to the north of the site should be used as a connection point for Site 1.
Infiltration is achievable at Site 1, and therefore we have accorded with the SUDS hierarchy to favour infiltration to ground over connection to the surface water sewer.

2.0 SITE INFORMATION

2.1 Existing Site

- 2.1.1 The site comprises two sites (Site 1 (0.5ha) and Site 2 (0.1ha)), with a total site area of 0.6ha. Both sites comprise of disused land which forms part of the curtilage to Our Lady's and St Paul's Roman Catholic Primary School, off Sutherland Road, Heywood, OL10 3PD. A Location Plan (BDL-1763-01-GA-001) is available within Appendix A of this report.
- 2.1.2 Site 1 is bound to the north by Old Bury Road, and to the west by Sutherland Road, and is relatively rectangular in shape. Levels on the site are generally sloping, with +135.7m AOD along the east boundary down to +132.2m AOD.
- 2.1.3 Site 2 is bound to the south by Argyle Street, and to the west and north by the curtilage of Our Lady's and St Paul's Roman Catholic Primary School. Levels on Site 2 is relatively flat, with +133.1m AOD in the north, and +132.5m AOD in the south.
- 2.1.4 The nearest watercourse in the River Roch, 660m to the northwest of the site. The River Roch is a main river, a tributary of the River Irwell, running east to west. The River Roch joins the River Irwell 4.5km to the southwest of the site.
- 2.1.5 According to sewer records from United Utilities (Appendix B), there are 225mm diameter public combined sewers located under Sutherland Road, and a 225mm diameter public combined sewer under Argyle Street.
- 2.1.6 According to BGS data, the site is located within the Pennine Lower Coal Measures formation comprising mudstone, siltstone and sandstone. Superficial deposits of Glaciofluvial Deposits are also present with sand and gravel.

2.2 Development Proposals

- 2.2.1 The proposed development is to construct 28no. residential dwellings over two plots of land, complete with access, driveways, and associated landscaping. The total impermeable area of the development is approximately 60% of the total site area, with the remaining 40% public open space and private gardens.

3.0 FLOOD RISK

3.1.1 This section provides a brief overview of Flood Risk. However, full flood risk information is available within the Inspire Design & Development Report BDL-1763-01-FRA-001 *Flood Risk Assessment*, which has been submitted in support of this planning application.

3.2 Potential for Fluvial Flood Risk

3.2.1 The Environment Agency's *Flood Map for Planning* shows the site is located within Flood Zone 1 (low probability), see Appendix F. Consequently, there is no significant risk of fluvial flooding and therefore no need to consider the NPPF Sequential and Exception Tests.

3.3 Potential for Surface Water Flooding

3.3.1 According to the EA's *Flood Risk from Surface Water* shows a small area of low risk surface water flooding in the centre of Site 1. However, the remainder of Site 1, and all of Site 2, shows no risk of surface water flooding.

3.3.2 The proposed drainage system, described within Section 4, will utilise sustainable drainage techniques to attenuate runoff to a low discharge rate, thereby reducing any potential for surface water flooding at the site.

3.4 Potential for Reservoir Flooding

3.4.1 The EA's *Flood Risk from Reservoirs* map shows no risk of reservoir flooding at or in the vicinity of the site.

3.5 Potential for Groundwater Flooding

3.5.1 In view of the geological data from BGS, which identifies the site to be within coal measures geology, flood risk from groundwater is considered to be low.

4.0 DRAINAGE STRATEGY

4.1 Existing Drainage

4.1.1 There is no known positive drainage from the site at present.

4.2 Sustainable Urban Drainage Systems (SUDS)

4.2.1 The proposed drainage system will be based on SUDS principles for the attenuation and treatment of the surface water runoff, as shown on the drawing BDL-1763-01-DS-001 P3 *Drainage Strategy* and described below.

4.2.2 The first consideration in the SUDS hierarchy is infiltration to ground. According to BGS data, there is relatively impermeable Coal Measure geology present at or near the surface of the site. There is also the possibility of Made Ground in some areas of the site. BRE365 soakaway testing was commissioned by Inspire Design and Development to further assess the feasibility of infiltration at the application sites. Full results from Humberside Laboratories can be found in Appendix G of this report. The report concluded that infiltration was feasible at Site 1, with infiltration rates of between 1×10^{-5} and 1×10^{-6} . At Site 2, infiltration rates were observed at Trial Pit 5 at 3×10^{-5} ; however, no soakage was observed at trail pit 6 within Site 2.

4.2.3 Consequently, as infiltration is feasible at both sites, the proposed drainage strategy will incorporate infiltration to ground. The runoff from roofs, private driveways, and adoptable access roads will be conveyed to soakaways as shown on the drawing BDL-1763-01-DR-001 P3 *Drainage Strategy*.

4.2.4 As it is possible to infiltrate to the ground, therefore, the remaining steps of the sustainable drainage hierarchy have not been assessed at this stage, as it is considered that infiltration to ground would be favoured over a discharge to surface water sewer.

4.3 Site 1 Proposed Drainage

Surface Water Drainage

4.3.1 The proposed surface water drainage for Site 1 will collect future surface water runoff from roofs and private driveways, and will be conveyed to one of three soakaways as shown on the drawing BDL-1763-01-DR-001 P3 *Drainage Strategy*, with hydraulic calculations within Appendix D.

- 4.3.2 In order to protect groundwater, treatment of surface water runoff prior to infiltration will be given particular attention. Runoff from the dwelling roofs will be clean enough to discharge directly and will be conveyed by a series of pipes to the soakaways shown on the drawing BDL-1763-01-DR-001 *Drainage Strategy*.
- 4.3.3 Runoff from private driveways and parking areas will be collected by permeable paving which will provide a form of primary treatment prior to conveyance to the soakaway. The soakaway itself will provide a second level of treatment. Therefore, this 2-stage treatment train will be sufficient to adequately protect ground water, and thereby permit discharge to the ground.
- 4.3.4 A separate adoptable drainage system is proposed to collect surface water runoff from the adopted highway of Site 1. Drainage from the highway will be conveyed by a series of underground pipes to the soakaway located to the north of Plot 11 located in an area of public open space.
- 4.3.5 The proposed attenuation will be sufficient to cater for the 1 in 100-year rainfall event with 45% climate change allowance in accordance with the EA Guidance *Flood Risk Assessments: Climate Change Allowances*, May 2022. Hydraulic calculations are available within Appendix D.
- 4.3.6 The areas of open space and private gardens will be soft landscaped and offer a measure of bioretention through shallow infiltration into topsoil and the evapotranspiration of the vegetation.
- 4.3.7 The proposed drainage system will ensure that there will be no significant flooding caused either within the site, or in the surrounding area by future site surface water runoff.

Foul Sewerage

- 4.3.8 Foul sewerage for Site 1 will collect sewerage from various sanitary facilities and convey the sewerage via a new foul sewer under the proposed access road before discharging to the existing combined sewer under Sutherland Road, as shown on the drawing BDL-1763-01-DR-001 P3 *Drainage Strategy*.

4.4 Site 2 Proposed Drainage

Surface Water Drainage

- 4.4.1 The proposed private surface water drainage system will collect future runoff from the site and discharge the flow to the soakaway located under the gardens of Plots 1 and 2, as shown on the drawing BDL-1763-01-DR-001 P3 *Drainage Strategy*. Permeable paving will be located on the private driveways of Site 2 to provide a degree of source control and treatment to surface water runoff.
- 4.4.2 The proposed attenuation will be sufficient to cater for the 1 in 100-year rainfall event with 45% climate change allowance in accordance with the EA Guidance *Flood Risk Assessments: Climate Change Allowances*, May 2022. Hydraulic calculations are available within Appendix D.
- 4.4.3 The areas of open space and private gardens will be soft landscaped and offer a measure of bioretention through shallow infiltration into topsoil and the evapotranspiration of the vegetation.
- 4.4.4 The proposed drainage system will ensure that there will be no significant flooding caused either within the site, or in the surrounding area by future site surface water runoff.

Foul Sewerage

- 4.4.5 Foul sewerage for Site 2 will collect sewerage from various sanitary facilities and convey the sewerage via a new foul sewer under the proposed access road before discharging to the existing foul sewer under Argyle Street, as shown on the drawing BDL-1763-01-DR-001 P3 *Drainage Strategy*.

4.5 Management and Maintenance

Treatment

- 4.5.1 Surface water will be collected via permeable paving located under the private driveways, and conveyed to soakaway chambers which will provide adequate treatment. Areas of soft landscaping will provide a significant degree of bioretention and amenity value.

- 4.5.2 To ensure the appropriate SUDS measures used to treat surface water and prevent the risk of pollution from the discharging runoff, the CIRIA SUDS Manual's *Simple Index Approach* has been used. A summary of the *Simple Index Approach Tool* by HR Wallingford is supplied within Appendix E of this report.

Foul Sewerage Approvals

- 4.5.3 At the detailed design stage, an application will be made to United Utilities under Section 106 of the Water Industry Act 1991 for consent to discharge foul sewage from the site to the public sewer system.
- 4.5.4 All relevant authorities will be kept fully informed regarding the detailed design of the foul sewerage system. It is normal practice for detailed foul water drainage design to be the subject of approval by the Local Planning Authority subsequent to the grant of planning permission. This will be sought from Rochdale Borough Council at the appropriate time.

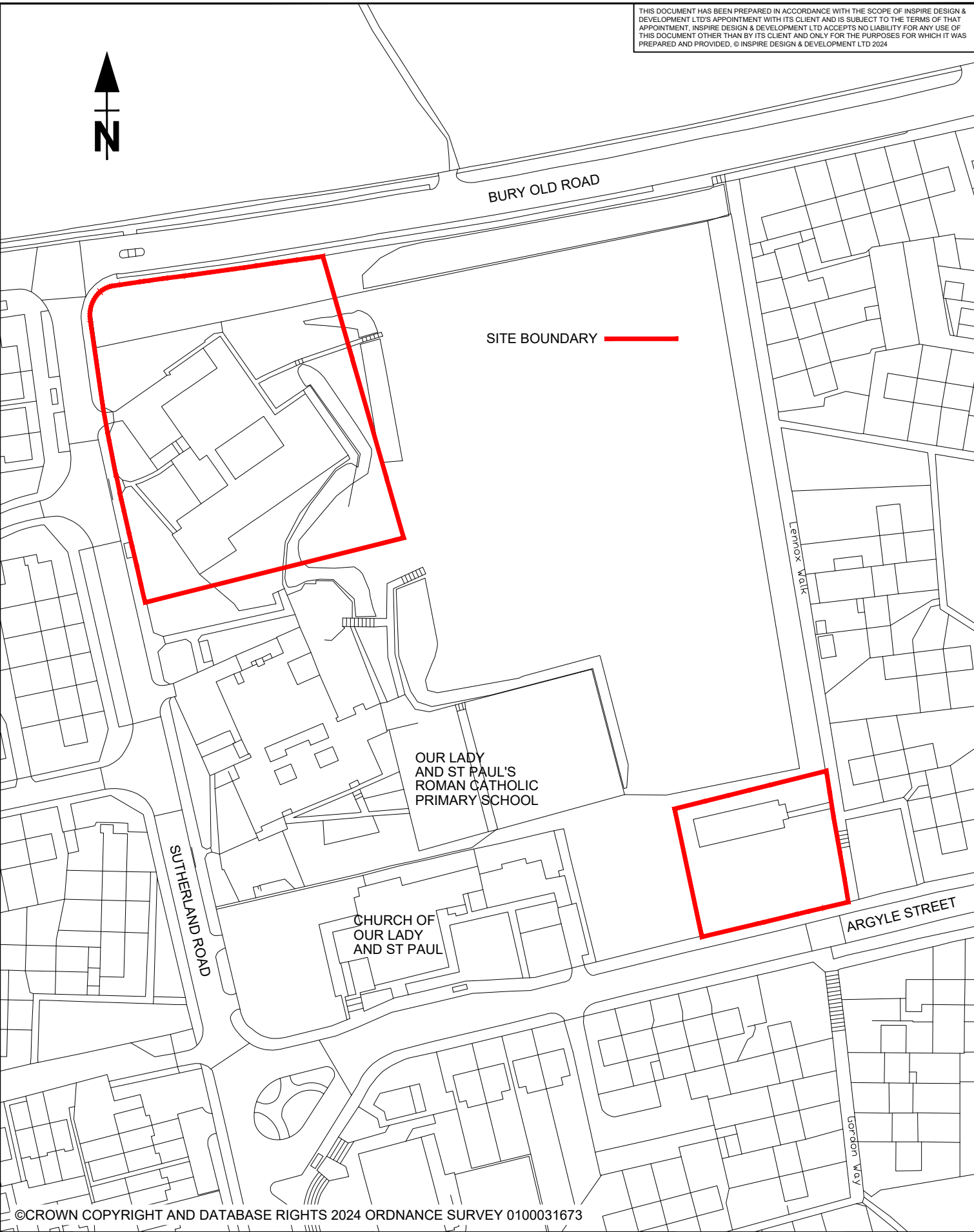
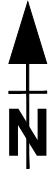
Maintenance

- 4.5.5 The completed development will have two drainage systems, with the private system operated by the housing association, who may employ an operation and maintenance team to maintain the proposed drainage system to a standardised procedure and ensure that all features of the drainage system are regularly and adequately managed and maintained. A small adoptable surface water drainage system has been designed to collect surface water runoff from the adoptable highway of Site 1 and convey runoff to the adoptable soakaway located to the north of Plot 11 in an area of Public Open Space.
- 4.5.6 It is proposed that development is operated by a local housing association in perpetuity, who will adopt regular maintenance regimes, and maintain the private drainage system on behalf of their tenants.
- 4.5.7 The adoptable drainage system will be offered for adoption to the Local Highway Authority as part of the adoption process for the proposed adoptable highway for Site 1.
- 4.5.8 A detailed Management and Maintenance Plan may be provided at the detailed design stage, as and when required.

5.0 CONCLUSIONS

- 5.1.1 The site is not at risk of flooding from any source and there is no need to consider the NPPF Sequential or Exception Tests.
- 5.1.2 The site will be drained via infiltration to ground. Surface water runoff will be drained via a soakaway following results from Humberside Laboratories' BRE365 soakaway testing exercise. Permeable paving will be located in the private driveways to provide a degree of source control and treatment to the surface water runoff. A small adoptable drainage system is proposed to serve the adoptable highway of Site 1, and this will be separate to the private system.
- 5.1.3 The proposed drainage system will be sufficient to cater for the 1 in 100-year rainfall event with 45% climate change allowance in accordance with the EA Guidance *Flood Risk Assessments: Climate Change Allowances*, May 2022.
- 5.1.4 Following implementation of the surface water drainage system, there will be no significant risk of surface water flooding at the site.
- 5.1.5 Foul sewerage will be disposed of the public sewers in Sutherland Road (Site 1), and Argyle Street (Site 2).
- 5.1.6 With regard to flood risk and drainage, therefore, the site is suitable for the proposed use. Subject to the implementation of this Drainage Strategy, the development may be occupied safely and adequately drained without increasing flood risk overall.

APPENDIX A LOCATION PLAN



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DATE: 26/06/2024	DRAWING TITLE: LOCATION PLAN		REV	DATE	NAME	CHK	NOTES
DRAWN: NGP			DRAWING STATUS: FOR APPROVAL				
CHECKED: CGR	PROJECT:	CLIENT:	DRAWING No:		REVISION No:		
APPROVED: CR	BURY OLD ROAD, HEYWOOD	BUILT DEVELOPMENTS LTD	BDL-1763-01-GA-001				
SCALE @ A4: 1:1250							

APPENDIX B SEWER RECORDS

Inspire Design And Development

Unit 2a, Church View Business Park
Coney Green Rd, Inspire Design And Development
Clay Cross, Chesterfield,
S45 9HA

FAO:

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Your Ref: 1763
Our Ref: UUPS-ORD-580703
Date: 24/06/2024

Dear Sirs

Location: 105 SUTHERLAND ROAD, HEYWOOD, OL10 3PD

I acknowledge with thanks your request dated 20/06/2024 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Refo	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
2313	CO		122.84	225		VC	1.481851	100	
5204	VC		122.84	225		VC	6.047706	100	
5102	125.97	CO	122.84	225		VC	62.0867	1 in 93	
5201	130.73	SW	128.63	225		VC	84.43379	1 in 70	
3104	123.82	CO	122.14	450		CO	53.41125	1 in 281	
6401	140.25	VC	137.22	225		VC	83.55747	1 in 31	
3314	CO		150			VC	11.28187		
6214	CO		100			VC	9.225163		
4112	128.57	SW	127.22	225		UN	34.54596	1 in 24	
3304	128.52	CO	123.13	300		CO	38.62966	1 in 180	
5101	127.21	SW	124.63	225		VC	28.16026	1 in 83	
6311	FO		100			VC	22.84217		
6210	VC		225			VC	15.57762		
6106	CO		100			PF	18.53318		
7406	CO		150			VC	20.37769		
2304	125.48	CO	123.31	200		VC	57.47657		
3101	124.72	CO	122.44	450		CO	41.43546	1 in 206	
4202	132.38	SW	129.55	225		VC	52.88667	1 in 171	
6302	CO		0	225		VC	18.88154		
3202	125.09	CO	123.9	150		VC	12.20656	1 in 31	
4115	128.87	SW	0			UN	0.3689028		
6402	142.07	CO	140.21	225		VC	26.29477	1 in 166	
6407	CO		150			VC	39.8257		
6217	VC		150			VC	10.38363		
3103	123.67	CO	122.17	450		CO	8.494541	1 in 280	
5001	124.16	CO	121.04	600		CO	89.28666		
4107	128.89	CO	121.69	450		CO	12.707	1 in 254	
3304	129.71	CO	127.61	225		VC	49.65884	1 in 69	
7403	CO		150			VC	38.18105		
4105	128.83	CO	121.72	450		CO	9.035317	1 in 301	
4114	129.21	SW	127.02	525		UN	7.159987	1 in 720	
3311	125.22	CO	124.36	150		VC	30.91666	1 in 71	
8401	CO		150			VC	16.40287		
6001	CO		0	600		VC	50.9902		
7318	FO		100			VC	31.715		
3209	CO		100			VC	6.794676		
6501	142.59	CO	139.6	300		VC	49.47727	1 in 206	
3205	124.12	CO	122.71	375		VC	31.94403	1 in 246	
7316	CO		100			VC	19.77962		
3010	126.36	SW	120.69	150		UN	40.32331	1 in 9	
3404	122.66	CO	120.69	100		PVC	13.03947		
5003	123.62	CO	120.37	225		VC	34	1 in 179	
6111	VC		150			VC	8.358182		
3401	126.36	SW	125.63	300		VC	91.23595	1 in 30	
6213	CO		100			VC	20.47199		
7502	142.25	FO	141.12	150		PVC	33.25555	1 in 138	
6306	VC		150			VC	22.50286		
7405	CO		150			VC	12.42427		
4302	130.87	CO	125.86	225		VC	89.91656	1 in 71	
4402	132.04	SW	129.89	225		VC	28.15476	1 in 265	
3107	123.46	SW	122.22	300		UN	9.587879	1 in 137	
3307	126.45	CO	124.88	150		VC	8.468633	1 in 10	
4204	131.84	SW	127.15	525		UN	41.05666	1 in 513	
3106	123.57	SW	0			UN	0.2702629		
4304	CO		0	225		VC	69.2315		
4201	CO		127.62	300		CO	80.59266		
7314	CO		150			VC	12.20593		
6201	135.59	FO	133.25	225		VC	18.78289	1 in 18	
6202	135.63	CO	134.25	225		VC	10.44031	1 in 34	
7303	139.37	CO	133.93	450		CO	49.0408	1 in 175	
3405	CO		100			PVC	10.57144		
6105	VC		150			VC	8.113223		
3105	124.65	SW	122.39	600		VC	83.42997	1 in 521	
6230	CO		150			VC	7.166772		
4303	130.81	CO	129.11	150		VC	11.18034	1 in 36	
3305	129.09	CO	126.66	300		VC	17.02039	1 in 155	
2301	124.41	SW	121.02	300		VC	47.42362	1 in 30	
3201	126.32	CO	124.53	300		VC	23.5372	1 in 137	
4103	126.06	CO	121.95	450		CO	29.97428	1 in 300	
6104	CO		100			VC	22.12554		
6110	CO		150			VC	25.49229		
6204	134.57	CO	132.15	300		VC	77.12076	1 in 117	
4108	128.02	CO	121.49	300		CO	21.0302	1 in 191	
6219	CO		150			VC	11.40588		
6305	VC		150			VC	35.35233		
3302	131.13	CO	129.36	150		UN	6.703054		
4109	128.94	CO	0			UN	6.4013444		
6207	CO		100			VC	10.00156		
5111	CO		150			PF	8.261626		
7501	142.41	CO	139.31	300		VC	106.3203	1 in 226	
6103	CO		100			PF	17.11239		
7410	CO		150			VC	10.48514		
7401	142.79	CO	140.82	225		VC	60.40685	1 in 118	
6206	CO		100			VC	15.75202		
7306	CO		150			VC	20.83036		
3306	126.55	CO	125.05	150		VC	7.619773	1 in 19	
6301	141.02	CO	138.78	300		CO	113	1 in 231	
5011	CO		150			VC	23.67817		
7404	CO		150			VC	13.2453		
5401	136.02	SW	133.16	225		VC	72.43038	1 in 37	
6305	CO		100			VC	21.95093		
3310	126.73	CO	125.1	150		VC	14.14214		
4305	136.18	CO	128	150		VC	2.236066		
6218	CO		150			VC	15.589		
6228	CO		100			VC	11.57588		
7002	CO		0	225		VC	57.31462		
7302	140.03	CO	138.29	300		CO	17.72005	1 in 148	
7202	135.29	CO	130.08	450		CO	38.20995	1 in 212	
7301	141.02	SW	139.29	225		VC	35.12834	1 in 39	
7207	SW		150			VC	27.76678		
4101	131.11	CO	127.46	225		VC	2.236068		
3216	127.82	SW	128.47	150		UN	58.9927	1 in 25	
6309	CO		225			VC	21.72583		
6224	FO		100			VC	18.4165		
4113	131.32	SW	127.07	525		UN	40.85127	1 in 817	
5202	127.34	CO	125.27	225		VC	56.88895	1 in 55	
4110	126.44	SW	124.11	600		UN	20.22145	1 in 506	
3102	124.27	CO	122.3	450		CO	40.32373	1 in 310	
6403	140.67	CO	139.55	225		VC	30.35445	1 in 607	
6404	140.36	CO	139.61	225		VC	5.656854	1 in 94	
4401	132.52	SW	129.92	300		VC	106.3015	1 in 31	
6205	CO		150			VC	20.18107		
6204	133.19	SW	129.73	225		VC	57.48913	1 in 64	
7003	124.97	CO	120.13	600		CO	46.64346	1 in 177	
4301	131.88	CO	128.72	225		VC	26.83282		
6405	143.38	CO	139.39	225		VC	57.87054	1 in 113	
7305	CO		100			VC	9.379339		
4102	129.74	CO	126.69	300		CO	24.1921	1 in 5	
6007	CO		100			PF	7.220846		
6220	CO		150			VC	13.62927		
5103	126.77	CO	121.38	600		VC	71.67468	1 in 217	
6307	CO		225			VC	13.23467		
2003	124.67	CO	123.1	150		VC	4.123106		
5002	CO		0	225		VC	45.35416		
3308	126.82	CO	124.77	300		VC	35.1141	1 in 195	
5105	CO		225			VC	38.33984		
6203	132.16	CO	130.21	225		VC	34.78905	1 in 193	
4009	125.24	SW	123.89	150		UN	63.3173	1 in 19	
3309	126.2	CO	124.64	150		VC	4	1 in 33	
6303	CO		0	225		VC	13.18295		
4104	127.32	CO	121.85	450		CO	35.7648	1 in 275	
6205	127.46	CO	125.54	150		PF	4.123106	1 in 32	
6107	CO		100			VC	8.413028		
6101	124.96	SW	122.83	225		VC	43.41659		
3402	131.19	SW	129.69	150		UN	13.92839	1 in 66	
6212	127.11	SW	125.76	225		VC	87.73544	1 in 28	
2303	125.47	CO	123.47	150		VC	5.517274		
3206	123.81	CO	122.58	450		CO	4.472136		
3301	131.16	CO	128.46	150		VC	40.42694	1 in 289	
6223	CO		100			VC	3.162278	1 in 63	
7402	142.85	CO	139.03	300		CO	32.16652		
7001	126.25	CO	124.64	225		VC	39.21734	1 in 157	
7203	131.39	SW	129.97	225		VC	69.27216	1 in 185	
7409	CO		150			VC	35.05709		
8504	CO		0			UN	11.55051		
7408	CO		150			VC	6.843242	1 in	
7201	134	CO	129.71	300		CO	16.97377	1 in 130	
5104	CO		150			VC	1.857179		

Refo	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
5102	125.97	CO	122.84	225		VC	62.0867	1 in 93	
5201	130.73	SW	128.63	225		VC	84.43379	1 in 70	
3104	123.82	CO	122.14	450		CO	53.41125	1 in 281	
6401	140.25	VC	137.22	225		VC	83.55747	1 in 31	
3314	CO		150			VC	11.28187		
6214	CO		100			VC			

APPENDIX C DRAINAGE STRATEGY DRAWING



KEY:

FFL 134.40 PROPOSED FINISH FLOOR LEVEL

132.06 + EXISTING SPOT LEVEL

EXISTING

PUBLIC COMBINED DRAINAGE

PUBLIC FOUL DRAINAGE

PUBLIC SURFACE WATER DRAINAGE

PROPOSED

PRIVATE SURFACE WATER DRAINAGE

PRIVATE FOUL DRAINAGE

PRIVATE FOUL RISING MAIN

PRIVATE COMBINED DRAINAGE

CHANNEL DRAIN

GULLY

SOAKAWAY CRATES

PERMEABLE PAVING

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- NOTES:
- DO NOT SCALE FROM THIS DRAWING.
 - ALL MEASUREMENTS ARE IN METERS UNLESS OTHERWISE STATED.
 - DRAWING NOT ISSUED FOR CONSTRUCTION.
 - SITE LAYOUT PROVIDED BY BTP ARCHITECTS DWG No. BR-BTP-00-SP-A-4299-107.2
 - LOCATION OF SVPs TO BE CONFIRMED BY THE ARCHITECT
 - PROPOSED EXTERNAL WORKS LEVELS TO BE CONFIRMED AT DETAILED DESIGN
 - OUTFALL INVERT LEVELS TO BE CONFIRMED & REPORTED BACK TO INSPIRE DESIGN & DEVELOPMENT
 - SOAKAWAY RESULTS TO BE CONFIRMED AT LOCATION OF SOAKAWAYS.

P3	21/01/20	CR	CR	REINSTATED PERMEABLE PAVING REVISED SOAKAWAY POSITIONS TO COMMENTS
P2	15/11/24	NGP	LDB	SITE LAYOUT AMENDED & PLOTS 1-22 DRAINED VIA SOAKAWAY CRATES CHANGED TO CRATES
P1	28/08/24	CR	CR	
REV	DATE	NAME	CHECK	NOTE

DRAWING STATUS:

FOR APPROVAL

CLIENT

BUILT DEVELOPMENTS LTD



PROJECT

BURY OLD ROAD, HEYWOOD

DRAWING TITLE

DRAINAGE STRATEGY

DRAWN	CHECKED	APPROVED
NGP	CGR	CR
DATE		SCALE @ A1
26/06/24		1:250
DRAWING No.		REVISION No.
BDL-1763-01-DR-001		P3

APPENDIX D HYDRAULIC CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.004	5.00	133.700	1200	383620.679	410295.293	1.000
2			133.700	1200	383619.181	410300.265	1.088
3	0.006	5.00	133.250	1200	383611.414	410288.139	1.000
4	0.009	5.00	133.250	1200	383609.010	410298.014	1.172
5	0.001	5.00	132.550	1200	383601.786	410285.724	1.000
6	0.009	5.00	132.550	1200	383599.369	410295.655	1.174
7	0.002	5.00	132.550	1200	383600.773	410284.830	1.000
8	0.005	5.00	132.550	1200	383598.207	410295.373	1.243
9	0.005	5.00	132.550	1200	383590.086	410282.159	0.800
10			132.550	1200	383587.444	410293.013	1.504
soakaway			132.550	1200	383586.816	410294.865	1.537

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)
1.000	1	2	5.193	0.600	132.700	132.612	0.088	59.0	100	5.09	50.0
1.001	2	4	10.417	0.600	132.612	132.078	0.534	19.5	100	5.19	50.0
2.000	3	4	10.163	0.600	132.250	132.078	0.172	59.1	100	5.17	50.0
1.002	4	6	9.925	0.600	132.078	131.376	0.702	14.1	100	5.27	50.0
3.000	5	6	10.221	0.600	131.550	131.376	0.174	58.7	100	5.17	50.0
1.003	6	8	1.196	0.600	131.376	131.357	0.019	62.9	100	5.29	50.0
4.000	7	8	10.851	0.600	131.550	131.357	0.193	56.2	100	5.18	50.0
1.004	8	10	11.019	0.600	131.307	131.121	0.186	59.2	150	5.43	50.0
5.000	9	10	11.171	0.600	131.750	131.121	0.629	17.8	150	5.08	50.0
1.005	10	soakaway	1.956	0.600	131.046	131.013	0.033	59.3	225	5.45	50.0

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)
1.000	1.004	7.9	0.8	0.900	0.988	0.004	0.0	21	0.641
1.001	1.756	13.8	0.8	0.988	1.072	0.004	0.0	16	0.938
2.000	1.004	7.9	1.2	0.900	1.072	0.006	0.0	26	0.720
1.002	2.065	16.2	3.7	1.072	1.074	0.019	0.0	32	1.673
3.000	1.007	7.9	0.2	0.900	1.074	0.001	0.0	11	0.426
1.003	0.972	7.6	5.7	1.074	1.093	0.029	0.0	64	1.065
4.000	1.029	8.1	0.4	0.900	1.093	0.002	0.0	15	0.530
1.004	1.309	23.1	7.1	1.093	1.279	0.036	0.0	57	1.155
5.000	2.401	42.4	1.0	0.650	1.279	0.005	0.0	16	0.982
1.005	1.702	67.7	8.1	1.279	1.312	0.041	0.0	52	1.155

Pipeline Schedule

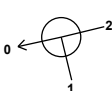
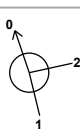
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	5.193	59.0	100	Circular	133.700	132.700	0.900	133.700	132.612	0.988
1.001	10.417	19.5	100	Circular	133.700	132.612	0.988	133.250	132.078	1.072
2.000	10.163	59.1	100	Circular	133.250	132.250	0.900	133.250	132.078	1.072
1.002	9.925	14.1	100	Circular	133.250	132.078	1.072	132.550	131.376	1.074
3.000	10.221	58.7	100	Circular	132.550	131.550	0.900	132.550	131.376	1.074
1.003	1.196	62.9	100	Circular	132.550	131.376	1.074	132.550	131.357	1.093
4.000	10.851	56.2	100	Circular	132.550	131.550	0.900	132.550	131.357	1.093
1.004	11.019	59.2	150	Circular	132.550	131.307	1.093	132.550	131.121	1.279
5.000	11.171	17.8	150	Circular	132.550	131.750	0.650	132.550	131.121	1.279
1.005	1.956	59.3	225	Circular	132.550	131.046	1.279	132.550	131.013	1.312

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.000	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.002	4	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.003	6	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
4.000	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.004	8	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
5.000	9	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
1.005	10	1200	Manhole	Adoptable	soakaway	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	383620.679	410295.293	133.700	1.000	1200				
						0	1.000	132.700	100
2	383619.181	410300.265	133.700	1.088	1200		1	1.000	132.612
						0	1.001	132.612	100
3	383611.414	410288.139	133.250	1.000	1200				
						0	2.000	132.250	100
4	383609.010	410298.014	133.250	1.172	1200		1	2.000	132.078
						2	1.001	132.078	100
						0	1.002	132.078	100
5	383601.786	410285.724	132.550	1.000	1200				
						0	3.000	131.550	100
6	383599.369	410295.655	132.550	1.174	1200		1	3.000	131.376
						2	1.002	131.376	100
						0	1.003	131.376	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
7	383600.773	410284.830	132.550	1.000	1200				
						0	4.000	131.550	100
8	383598.207	410295.373	132.550	1.243	1200		1	4.000	131.357
						2	1.003	131.357	100
						0	1.004	131.307	150
9	383590.086	410282.159	132.550	0.800	1200				
						0	5.000	131.750	150
10	383587.444	410293.013	132.550	1.504	1200		1	5.000	131.121
						2	1.004	131.121	150
						0	1.005	131.046	225
soakaway	383586.816	410294.865	132.550	1.537	1200		1	1.005	131.013
									225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	10	0

Node soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03395	Safety Factor	2.0	Invert Level (m)	131.013
Side Inf Coefficient (m/hr)	0.03395	Porosity	0.95	Time to half empty (mins)	1650

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	48.0	48.0	0.800	48.0	48.0	0.801	0.0	48.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	132.721	0.021	0.7	0.0239	0.0000	OK
15 minute summer	2	11	132.627	0.015	0.7	0.0168	0.0000	OK
15 minute summer	3	10	132.274	0.024	1.0	0.0268	0.0000	OK
15 minute summer	4	10	132.107	0.029	3.1	0.0333	0.0000	OK
15 minute summer	5	11	131.561	0.011	0.2	0.0123	0.0000	OK
15 minute summer	6	11	131.445	0.069	4.7	0.0776	0.0000	OK
15 minute summer	7	12	131.563	0.013	0.3	0.0151	0.0000	OK
15 minute summer	8	11	131.361	0.054	5.8	0.0606	0.0000	OK
15 minute summer	9	11	131.765	0.015	0.8	0.0164	0.0000	OK
720 minute winter	10	495	131.152	0.106	1.7	0.1193	0.0000	OK
720 minute winter	soakaway	495	131.152	0.139	1.9	6.4731	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	2	0.7	0.702	0.084	0.0050
15 minute summer	2	1.001	4	0.7	0.509	0.047	0.0138
15 minute summer	3	2.000	4	1.0	0.582	0.123	0.0169
15 minute summer	4	1.002	6	3.0	0.811	0.187	0.0379
15 minute summer	5	3.000	6	0.2	0.067	0.025	0.0316
15 minute summer	6	1.003	8	4.7	0.908	0.613	0.0062
15 minute summer	7	4.000	8	0.3	0.489	0.037	0.0067
15 minute summer	8	1.004	10	5.8	1.060	0.250	0.0602
15 minute summer	9	5.000	10	0.8	0.928	0.019	0.0096
720 minute winter	10	1.005	soakaway	1.9	0.555	0.029	0.0429
720 minute winter	soakaway	Infiltration		0.2			

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	132.733	0.033	1.6	0.0373	0.0000	OK
15 minute summer	2	10	132.635	0.023	1.6	0.0257	0.0000	OK
15 minute summer	3	10	132.288	0.038	2.4	0.0427	0.0000	OK
15 minute summer	4	10	132.126	0.048	7.5	0.0540	0.0000	OK
15 minute winter	5	11	131.565	0.015	0.4	0.0173	0.0000	OK
15 minute summer	6	11	131.551	0.175	11.4	0.1983	0.0000	SURCHARGED
15 minute summer	7	11	131.571	0.021	0.8	0.0241	0.0000	OK
15 minute summer	8	11	131.398	0.091	14.0	0.1032	0.0000	OK
15 minute summer	9	10	131.773	0.023	2.0	0.0255	0.0000	OK
480 minute winter	10	456	131.391	0.345	2.8	0.3904	0.0000	SURCHARGED
480 minute winter	soakaway	456	131.391	0.378	3.9	17.6747	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	2	1.6	0.886	0.200	0.0093
15 minute summer	2	1.001	4	1.5	0.634	0.112	0.0262
15 minute summer	3	2.000	4	2.4	0.744	0.302	0.0325
15 minute summer	4	1.002	6	7.5	1.126	0.460	0.0572
15 minute winter	5	3.000	6	0.4	0.077	0.050	0.0438
15 minute summer	6	1.003	8	11.3	1.440	1.475	0.0093
15 minute summer	7	4.000	8	0.8	0.558	0.099	0.0231
15 minute summer	8	1.004	10	14.0	1.312	0.606	0.1178
15 minute summer	9	5.000	10	2.0	1.213	0.047	0.0182
480 minute winter	10	1.005	soakaway	3.9	0.629	0.058	0.0778
480 minute winter	soakaway	Infiltration		0.2			

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	132.749	0.049	3.3	0.0559	0.0000	OK
15 minute summer	2	10	132.645	0.033	3.3	0.0374	0.0000	OK
960 minute winter	3	915	132.521	0.271	0.4	0.3070	0.0000	SURCHARGED
960 minute winter	4	930	132.524	0.446	1.3	0.5045	0.0000	SURCHARGED
960 minute winter	5	930	132.521	0.971	0.3	1.0981	0.0000	FLOOD RISK
960 minute winter	6	930	132.522	1.146	2.0	1.2956	0.0000	FLOOD RISK
960 minute winter	7	930	132.521	0.971	0.3	1.0985	0.0000	FLOOD RISK
960 minute winter	8	930	132.521	1.214	2.3	1.3732	0.0000	FLOOD RISK
960 minute winter	9	930	132.518	0.768	0.3	0.8686	0.0000	FLOOD RISK
960 minute winter	10	915	132.528	1.481	2.6	1.6756	0.0000	FLOOD RISK
960 minute winter	soakaway	930	132.520	1.507	2.5	38.2073	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	2	3.3	1.071	0.413	0.0159
15 minute summer	2	1.001	4	3.2	0.654	0.234	0.0525
960 minute winter	3	2.000	4	0.4	0.472	0.051	0.0795
960 minute winter	4	1.002	6	1.3	0.626	0.080	0.0777
960 minute winter	5	3.000	6	-0.3	0.079	-0.035	0.0800
960 minute winter	6	1.003	8	1.9	0.698	0.252	0.0094
960 minute winter	7	4.000	8	-0.3	0.351	-0.032	0.0849
960 minute winter	8	1.004	10	2.3	0.584	0.097	0.1940
960 minute winter	9	5.000	10	0.4	0.501	0.010	0.1967
960 minute winter	10	1.005	soakaway	2.5	0.599	0.037	0.0778
960 minute winter	soakaway	Infiltration		0.2			

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	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	0.300	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
19	0.026	5.00	132.600	1200	383438.711	410410.997	1.500
20	0.046	5.00	132.800	1200	383471.764	410415.634	2.110
Soakaway			133.000	1200	383494.534	410418.750	2.538

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)
1.000	19	20	33.377	0.600	131.100	130.690	0.410	81.4	150	5.50	50.0
1.001	20	Soakaway	22.982	0.600	130.690	130.462	0.228	100.8	150	5.88	50.0

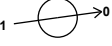
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.115	19.7	5.1	1.350	1.960	0.026	0.0	52	0.936
1.001	1.001	17.7	14.1	1.960	2.388	0.072	0.0	102	1.110

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)
1.000	33.377	81.4	150	Circular_Default Sewer Type	132.600	131.100	1.350	132.800	130.690	1.960
1.001	22.982	100.8	150	Circular_Default Sewer Type	132.800	130.690	1.960	133.000	130.462	2.388

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	19	1200	Manhole	Adoptable	20	1200	Manhole	Adoptable
1.001	20	1200	Manhole	Adoptable	Soakaway	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
19	383438.711	410410.997	132.600	1.500	1200		0	1.000	131.100
20	383471.764	410415.634	132.800	2.110	1200		1	1.000	130.690
							0	1.001	130.690
									150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Soakaway	383494.534	410418.750	133.000	2.538	1200	1	1.001	130.462	150



Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	10	0

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03395	Safety Factor	2.0	Invert Level (m)	130.462
Side Inf Coefficient (m/hr)	0.03395	Porosity	0.95	Time to half empty (mins)	2152

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	69.0	69.0	1.200	69.0	69.0	1.201	0.0	69.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 96.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	19	10	131.141	0.041	3.3	0.0464	0.0000	OK
15 minute winter	20	10	130.781	0.091	9.1	0.1030	0.0000	OK
600 minute winter	Soakaway	450	130.622	0.160	1.3	10.6705	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)
15 minute winter	19	1.000	20	3.2	0.439	0.163	0.2519
15 minute winter	20	1.001	Soakaway	9.2	1.471	0.522	0.1541
600 minute winter	Soakaway	Infiltration		0.3			

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	19	10	131.167	0.067	8.2	0.0755	0.0000	OK
15 minute winter	20	11	130.991	0.301	22.5	0.3408	0.0000	SURCHARGED
720 minute winter	Soakaway	675	130.878	0.416	2.3	27.7583	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	19	1.000	20	8.1	0.553	0.410	0.4203
15 minute winter	20	1.001	Soakaway	20.9	1.515	1.182	0.3628
720 minute winter	Soakaway	Infiltration		0.3			

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 96.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	19	12	132.105	1.005	16.8	1.1368	0.0000	SURCHARGED
15 minute winter	20	12	131.870	1.180	41.0	1.3349	0.0000	SURCHARGED
1440 minute winter	Soakaway	1410	131.490	1.028	2.7	68.5718	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	19	1.000	20	14.0	0.797	0.712	0.5876
15 minute winter	20	1.001	Soakaway	38.8	2.203	2.192	0.4046
1440 minute winter	Soakaway	Infiltration		0.3			

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	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	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
15	0.005	5.00	133.750	1200	383459.110	410429.516	0.700
16	0.010	5.00	132.450	1200	383435.803	410426.166	0.700
17	0.009	5.00	133.150	1200	383447.061	410427.819	1.642
18	0.007	5.00	133.000	1200	383447.873	410422.229	1.548
Soakaway			133.000	1200	383448.314	410418.825	1.583

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)
1.000	15	17	12.168	0.600	133.050	132.442	0.608	20.0	100	5.12	50.0
2.000	16	17	11.379	0.600	131.750	131.558	0.192	59.3	100	5.19	50.0
1.001	17	18	5.649	0.600	131.508	131.452	0.056	100.9	150	5.28	50.0
1.002	18	Soakaway	3.432	0.600	131.452	131.417	0.035	98.1	150	5.34	50.0

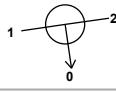
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.734	13.6	1.0	0.600	0.608	0.005	0.0	18	1.008
2.000	1.002	7.9	2.0	0.600	1.492	0.010	0.0	34	0.831
1.001	1.000	17.7	4.7	1.492	1.398	0.024	0.0	53	0.849
1.002	1.015	17.9	6.1	1.398	1.433	0.031	0.0	60	0.917

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)
1.000	12.168	20.0	100	Circular_Default Sewer Type	133.750	133.050	0.600	133.150	132.442	0.608
2.000	11.379	59.3	100	Circular_Default Sewer Type	132.450	131.750	0.600	133.150	131.558	1.492
1.001	5.649	100.9	150	Circular_Default Sewer Type	133.150	131.508	1.492	133.000	131.452	1.398
1.002	3.432	98.1	150	Circular_Default Sewer Type	133.000	131.452	1.398	133.000	131.417	1.433

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	15	1200	Manhole	Adoptable	17	1200	Manhole	Adoptable
2.000	16	1200	Manhole	Adoptable	17	1200	Manhole	Adoptable
1.001	17	1200	Manhole	Adoptable	18	1200	Manhole	Adoptable
1.002	18	1200	Manhole	Adoptable	Soakaway	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
15	383459.110	410429.516	133.750	0.700	1200				
						0	1.000	133.050	100
16	383435.803	410426.166	132.450	0.700	1200				
						0	2.000	131.750	100
17	383447.061	410427.819	133.150	1.642	1200		1	2.000	131.558
						2	1.000	132.442	100
						0	1.001	131.508	150
18	383447.873	410422.229	133.000	1.548	1200		1	1.001	131.452
						0	1.002	131.452	150
Soakaway	383448.314	410418.825	133.000	1.583	1200		1	1.002	131.417

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	10	0

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00284	Safety Factor	2.0	Invert Level (m)	131.417
Side Inf Coefficient (m/hr)	0.00284	Porosity	0.95	Time to half empty (mins)	3201

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	96.0	96.0	0.400	96.0	96.0	0.401	0.0	96.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	15	11	133.065	0.015	0.6	0.0164	0.0000	OK
15 minute winter	16	11	131.777	0.027	1.3	0.0309	0.0000	OK
15 minute summer	17	10	131.594	0.086	2.9	0.0973	0.0000	OK
15 minute summer	18	10	131.594	0.142	4.5	0.1604	0.0000	OK
1440 minute winter	Soakaway	990	131.490	0.073	0.5	6.7372	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)
15 minute winter	15	1.000	17	0.6	0.864	0.044	0.0085
15 minute winter	16	2.000	17	1.3	0.722	0.161	0.0242
15 minute summer	17	1.001	18	3.7	0.510	0.208	0.0782
15 minute summer	18	1.002	Soakaway	6.5	1.229	0.360	0.0298
1440 minute winter	Soakaway	Infiltration		0.0			

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	15	10	133.074	0.023	1.6	0.0265	0.0000	OK
15 minute winter	16	10	131.795	0.045	3.1	0.0507	0.0000	OK
15 minute winter	17	8	131.650	0.141	7.4	0.1600	0.0000	OK
15 minute winter	18	8	131.642	0.190	10.5	0.2147	0.0000	SURCHARGED
2880 minute winter	Soakaway	2040	131.593	0.176	0.5	16.2508	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	15	1.000	17	1.6	1.141	0.115	0.0168
15 minute winter	16	2.000	17	3.0	0.918	0.386	0.0579
15 minute winter	17	1.001	18	8.4	0.727	0.477	0.0983
15 minute winter	18	1.002	Soakaway	11.6	1.540	0.648	0.0313
2880 minute winter	Soakaway	Infiltration		0.0			

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	15	10	133.084	0.034	3.2	0.0382	0.0000	OK
7200 minute winter	16	4920	132.252	0.502	0.1	0.5682	0.0000	FLOOD RISK
7200 minute winter	17	4920	132.252	0.744	0.3	0.8419	0.0000	SURCHARGED
7200 minute winter	18	4920	132.252	0.800	0.5	0.9052	0.0000	SURCHARGED
7200 minute winter	Soakaway	4920	132.252	0.835	0.8	37.4704	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	15	1.000	17	3.2	1.384	0.232	0.0278
7200 minute winter	16	2.000	17	0.1	0.345	0.013	0.0890
7200 minute winter	17	1.001	18	0.3	0.332	0.017	0.0994
7200 minute winter	18	1.002	Soakaway	0.8	0.461	0.043	0.0604
7200 minute winter	Soakaway	Infiltration		0.0			

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	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	0.300	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
11	0.009	5.00	134.250	1200	383492.211	410434.231	0.700
12	0.009	5.00	133.850	1200	383481.031	410432.594	0.700
13	0.005	5.00	133.850	1200	383470.562	410431.122	1.123
14	0.010	5.00	133.250	1200	383471.423	410425.015	1.037
Soakaway			133.000	1200	383471.746	410422.795	0.974

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)
1.000	11	12	11.299	0.600	133.550	133.150	0.400	28.2	100	5.13	50.0
1.001	12	13	10.572	0.600	133.150	132.727	0.423	25.0	100	5.24	50.0
1.002	13	14	6.167	0.600	132.727	132.213	0.514	12.0	100	5.29	50.0
1.003	14	Soakaway	2.243	0.600	132.213	132.026	0.187	12.0	100	5.31	50.0

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)
1.000	1.457	11.4	1.8	0.600	0.600	0.009	0.0	27	1.065
1.001	1.550	12.2	3.5	0.600	1.023	0.018	0.0	37	1.347
1.002	2.243	17.6	4.5	1.023	0.937	0.023	0.0	35	1.886
1.003	2.243	17.6	6.5	0.937	0.874	0.033	0.0	42	2.069

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)
1.000	11.299	28.2	100	Circular_Default Sewer Type	134.250	133.550	0.600	133.850	133.150	0.600
1.001	10.572	25.0	100	Circular_Default Sewer Type	133.850	133.150	0.600	133.850	132.727	1.023
1.002	6.167	12.0	100	Circular_Default Sewer Type	133.850	132.727	1.023	133.250	132.213	0.937
1.003	2.243	12.0	100	Circular_Default Sewer Type	133.250	132.213	0.937	133.000	132.026	0.874

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
1.001	12	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable
1.002	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
1.003	14	1200	Manhole	Adoptable	Soakaway	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
11	383492.211	410434.231	134.250	0.700	1200				
						0	1.000	133.550	100
12	383481.031	410432.594	133.850	0.700	1200		1	1.000	133.150
						0	1.001	133.150	100
13	383470.562	410431.122	133.850	1.123	1200		1	1.001	132.727
						0	1.002	132.727	100
14	383471.423	410425.015	133.250	1.037	1200		1	1.002	132.213
						0	1.003	132.213	100
Soakaway	383471.746	410422.795	133.000	0.974	1200		1	1.003	132.026

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	10	0

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03395	Safety Factor	2.0	Invert Level (m)	132.026
Side Inf Coefficient (m/hr)	0.03395	Porosity	0.95	Time to half empty (mins)	779

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	96.0	96.0	0.400	96.0	96.0	0.401	0.0	96.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	11	10	133.572	0.022	1.2	0.0246	0.0000	OK
15 minute winter	12	10	133.181	0.031	2.4	0.0350	0.0000	OK
15 minute winter	13	11	132.755	0.028	2.9	0.0311	0.0000	OK
15 minute summer	14	9	132.294	0.081	3.9	0.0917	0.0000	OK
240 minute winter	Soakaway	176	132.068	0.042	1.1	3.8545	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	11	1.000	12	1.2	0.715	0.103	0.0187
15 minute winter	12	1.001	13	2.3	1.220	0.191	0.0201
15 minute winter	13	1.002	14	2.9	1.104	0.165	0.0249
15 minute summer	14	1.003	Soakaway	4.4	2.092	0.248	0.0077
240 minute winter	Soakaway	Infiltration		0.4			

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	11	10	133.584	0.034	2.8	0.0381	0.0000	OK
15 minute winter	12	10	133.200	0.050	5.6	0.0570	0.0000	OK
15 minute winter	13	10	132.771	0.044	7.1	0.0502	0.0000	OK
15 minute winter	14	9	132.351	0.138	10.2	0.1563	0.0000	SURCHARGED
360 minute winter	Soakaway	272	132.125	0.099	1.8	9.1505	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	11	1.000	12	2.8	0.891	0.243	0.0354
15 minute winter	12	1.001	13	5.5	1.518	0.455	0.0386
15 minute winter	13	1.002	14	7.1	1.421	0.403	0.0345
15 minute winter	14	1.003	Soakaway	10.9	2.335	0.620	0.0102
360 minute winter	Soakaway	Infiltration		0.5			

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	11	10	133.600	0.050	5.8	0.0569	0.0000	OK
15 minute winter	12	11	133.341	0.191	11.6	0.2161	0.0000	SURCHARGED
15 minute winter	13	11	132.977	0.250	13.1	0.2822	0.0000	SURCHARGED
15 minute winter	14	10	132.622	0.409	19.0	0.4628	0.0000	SURCHARGED
480 minute winter	Soakaway	440	132.282	0.256	2.9	23.6563	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	11	1.000	12	5.8	1.044	0.503	0.0665
15 minute winter	12	1.001	13	10.3	1.461	0.844	0.0827
15 minute winter	13	1.002	14	13.5	1.723	0.765	0.0483
15 minute winter	14	1.003	Soakaway	19.6	2.967	1.110	0.0169
480 minute winter	Soakaway	Infiltration		0.5			

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	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	0.300	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.010	5.00	132.450	450	383443.155	410388.860	0.700
2	0.017	5.00	132.450	450	383454.836	410390.032	0.898
3	0.010	5.00	131.950	450	383459.318	410378.592	1.285
4	0.003	5.00	131.950	450	383460.845	410367.727	1.100
5	0.008	5.00	133.100	450	383481.876	410407.247	0.700
6	0.001	5.00	133.100	450	383482.872	410400.390	0.817
7	0.009	5.00	133.100	450	383494.929	410391.938	0.700
8	0.008	5.00	133.100	450	383484.269	410390.445	0.986
9	0.007	5.00	133.350	450	383485.467	410374.240	0.700
10	0.022	5.00	133.350	450	383483.953	410385.417	1.321
10A			133.000		383476.645	410381.865	2.757
Soakaway			133.000		383476.581	410385.561	2.779

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)
1.000	1	2	11.740	0.600	131.750	131.552	0.198	59.3	100	5.20	50.0
1.001	2	3	12.287	0.600	131.552	131.250	0.302	40.7	100	5.36	50.0
2.000	4	3	10.972	0.600	130.850	130.665	0.185	59.3	100	5.18	50.0
1.002	3	10A	17.633	0.600	130.665	130.368	0.297	59.4	100	5.66	50.0
3.000	5	6	6.929	0.600	132.400	132.283	0.117	59.2	100	5.12	50.0
3.001	6	8	10.043	0.600	132.283	132.114	0.169	59.4	100	5.28	50.0
4.000	7	8	10.764	0.600	132.400	132.114	0.286	37.6	100	5.14	50.0
3.002	8	10	5.038	0.600	132.114	132.029	0.085	59.3	100	5.37	50.0
5.000	9	10	11.279	0.600	132.650	132.029	0.621	18.2	100	5.10	50.0
3.003	10	10A	8.125	0.600	132.029	130.368	1.661	4.9	100	5.40	50.0

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)
1.000	1.002	7.9	2.0	0.600	0.798	0.010	0.0	34	0.831
1.001	1.212	9.5	5.3	0.798	0.600	0.027	0.0	54	1.246
2.000	1.002	7.9	0.6	1.000	1.185	0.003	0.0	18	0.580
1.002	1.001	7.9	7.9	1.185	2.532	0.040	0.0	82	1.140
3.000	1.003	7.9	1.6	0.600	0.717	0.008	0.0	30	0.778
3.001	1.001	7.9	1.8	0.717	0.886	0.009	0.0	32	0.810
4.000	1.261	9.9	1.8	0.600	0.886	0.009	0.0	29	0.951
3.002	1.002	7.9	5.1	0.886	1.221	0.026	0.0	59	1.068
5.000	1.821	14.3	1.4	0.600	1.221	0.007	0.0	21	1.140
3.003	3.520	27.6	10.8	1.221	2.532	0.055	0.0	43	3.304

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)
1.003	10A	Soakaway	3.697	0.600	130.243	130.221	0.022	168.0	225	5.72	50.0

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)
1.003	1.006	40.0	18.7	2.532	2.554	0.095	0.0	108	0.987

Pipeline Schedule

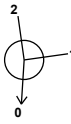
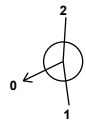
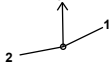
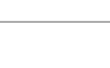
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	11.740	59.3	100	Circular_Default Sewer Type	132.450	131.750	0.600	132.450	131.552	0.798
1.001	12.287	40.7	100	Circular_Default Sewer Type	132.450	131.552	0.798	131.950	131.250	0.600
2.000	10.972	59.3	100	Circular_Default Sewer Type	131.950	130.850	1.000	131.950	130.665	1.185
1.002	17.633	59.4	100	Circular_Default Sewer Type	131.950	130.665	1.185	133.000	130.368	2.532
3.000	6.929	59.2	100	Circular_Default Sewer Type	133.100	132.400	0.600	133.100	132.283	0.717
3.001	10.043	59.4	100	Circular_Default Sewer Type	133.100	132.283	0.717	133.100	132.114	0.886
4.000	10.764	37.6	100	Circular_Default Sewer Type	133.100	132.400	0.600	133.100	132.114	0.886
3.002	5.038	59.3	100	Circular_Default Sewer Type	133.100	132.114	0.886	133.350	132.029	1.221
5.000	11.279	18.2	100	Circular_Default Sewer Type	133.350	132.650	0.600	133.350	132.029	1.221
3.003	8.125	4.9	100	Circular_Default Sewer Type	133.350	132.029	1.221	133.000	130.368	2.532
1.003	3.697	168.0	225	Circular_Default Sewer Type	133.000	130.243	2.532	133.000	130.221	2.554

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	450	Manhole	Adoptable	2	450	Manhole	Adoptable
1.001	2	450	Manhole	Adoptable	3	450	Manhole	Adoptable
2.000	4	450	Manhole	Adoptable	3	450	Manhole	Adoptable
1.002	3	450	Manhole	Adoptable	10A		Junction	
3.000	5	450	Manhole	Adoptable	6	450	Manhole	Adoptable
3.001	6	450	Manhole	Adoptable	8	450	Manhole	Adoptable
4.000	7	450	Manhole	Adoptable	8	450	Manhole	Adoptable
3.002	8	450	Manhole	Adoptable	10	450	Manhole	Adoptable
5.000	9	450	Manhole	Adoptable	10	450	Manhole	Adoptable
3.003	10	450	Manhole	Adoptable	10A		Junction	
1.003	10A		Junction		Soakaway		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	383443.155	410388.860	132.450	0.700	450				
						0	1.000	131.750	100
2	383454.836	410390.032	132.450	0.898	450		1	1.000	131.552
						0	1.001	131.552	100
3	383459.318	410378.592	131.950	1.285	450		1	2.000	130.665
						2	1.001	131.250	100
						0	1.002	130.665	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
4	383460.845	410367.727	131.950	1.100	450		0	2.000	130.850	100
5	383481.876	410407.247	133.100	0.700	450		0	3.000	132.400	100
6	383482.872	410400.390	133.100	0.817	450		1	3.000	132.283	100
7	383494.929	410391.938	133.100	0.700	450		0	3.001	132.283	100
8	383484.269	410390.445	133.100	0.986	450		1	4.000	132.400	100
9	383485.467	410374.240	133.350	0.700	450		0	3.001	132.114	100
10	383483.953	410385.417	133.350	1.321	450		1	5.000	132.029	100
10A	383476.645	410381.865	133.000	2.757			2	3.002	132.029	100
Soakaway	383476.581	410385.561	133.000	2.779			0	1.003	130.243	225
							1	1.003	130.221	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	10	0

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03395	Safety Factor	2.0	Invert Level (m)	130.221
Side Inf Coefficient (m/hr)	0.03395	Porosity	0.95	Time to half empty (mins)	607

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	120.0	120.0	0.800	120.0	120.0	0.801	0.0	120.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	131.777	0.027	1.3	0.0043	0.0000	OK
15 minute winter	2	10	131.595	0.043	3.5	0.0068	0.0000	OK
15 minute winter	3	11	130.724	0.059	5.1	0.0094	0.0000	OK
15 minute winter	4	11	130.865	0.015	0.4	0.0024	0.0000	OK
15 minute winter	5	10	132.425	0.025	1.0	0.0039	0.0000	OK
15 minute winter	6	11	132.308	0.025	1.1	0.0040	0.0000	OK
15 minute winter	7	10	132.423	0.023	1.2	0.0037	0.0000	OK
15 minute winter	8	11	132.163	0.049	3.3	0.0078	0.0000	OK
15 minute summer	9	10	132.667	0.017	0.9	0.0027	0.0000	OK
15 minute winter	10	10	132.064	0.035	6.9	0.0055	0.0000	OK
480 minute winter	10A	352	130.328	0.084	2.0	0.0000	0.0000	OK
480 minute winter	Soakaway	352	130.328	0.106	2.0	12.1394	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	1	1.000	2	1.3	0.521	0.162	0.0289
15 minute winter	2	1.001	3	3.4	1.088	0.357	0.0384
15 minute winter	3	1.002	10A	5.0	1.056	0.642	0.0843
15 minute winter	4	2.000	3	0.4	0.151	0.051	0.0307
15 minute winter	5	3.000	6	1.0	0.658	0.127	0.0106
15 minute winter	6	3.001	8	1.1	0.415	0.140	0.0270
15 minute winter	7	4.000	8	1.2	0.463	0.119	0.0278
15 minute winter	8	3.002	10	3.2	1.045	0.412	0.0157
15 minute summer	9	5.000	10	0.9	0.561	0.061	0.0181
15 minute winter	10	3.003	10A	6.8	2.873	0.247	0.0193
480 minute winter	10A	1.003	Soakaway	2.0	0.573	0.050	0.0593
480 minute winter	Soakaway	Infiltration		0.6			

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	131.794	0.043	3.1	0.0069	0.0000	OK
15 minute winter	2	10	131.629	0.077	8.4	0.0123	0.0000	OK
15 minute winter	3	12	131.012	0.347	11.3	0.0552	0.0000	SURCHARGED
15 minute winter	4	12	131.018	0.168	2.3	0.0267	0.0000	SURCHARGED
15 minute winter	5	10	132.440	0.040	2.5	0.0064	0.0000	OK
15 minute winter	6	10	132.324	0.041	2.8	0.0065	0.0000	OK
15 minute winter	7	10	132.436	0.036	2.8	0.0058	0.0000	OK
15 minute winter	8	11	132.213	0.098	8.0	0.0157	0.0000	OK
15 minute winter	9	10	132.677	0.027	2.2	0.0042	0.0000	OK
15 minute winter	10	10	132.088	0.059	16.9	0.0094	0.0000	OK
480 minute winter	10A	464	130.521	0.278	3.9	0.0000	0.0000	SURCHARGED
480 minute winter	Soakaway	464	130.521	0.300	3.9	34.1981	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	1	1.000	2	3.1	0.631	0.391	0.0573
15 minute winter	2	1.001	3	8.2	1.315	0.863	0.0768
15 minute winter	3	1.002	10A	10.3	1.321	1.314	0.1366
15 minute winter	4	2.000	3	2.3	0.320	0.294	0.0858
15 minute winter	5	3.000	6	2.5	0.831	0.315	0.0207
15 minute winter	6	3.001	8	2.8	0.498	0.350	0.0542
15 minute winter	7	4.000	8	2.8	0.542	0.281	0.0556
15 minute winter	8	3.002	10	7.8	1.251	0.996	0.0316
15 minute winter	9	5.000	10	2.2	0.685	0.153	0.0364
15 minute winter	10	3.003	10A	16.8	3.599	0.607	0.0379
480 minute winter	10A	1.003	Soakaway	3.9	0.779	0.097	0.1470
480 minute winter	Soakaway	Infiltration		0.6			

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	13	132.340	0.590	6.5	0.0938	0.0000	FLOOD RISK
15 minute winter	2	13	132.268	0.716	14.8	0.1138	0.0000	FLOOD RISK
15 minute winter	3	13	131.754	1.089	18.4	0.1732	0.0000	FLOOD RISK
15 minute winter	4	13	131.759	0.909	3.6	0.1446	0.0000	FLOOD RISK
15 minute winter	5	13	132.666	0.266	5.2	0.0423	0.0000	SURCHARGED
15 minute winter	6	13	132.636	0.353	5.4	0.0561	0.0000	SURCHARGED
15 minute winter	7	12	132.661	0.261	5.8	0.0415	0.0000	SURCHARGED
15 minute winter	8	12	132.593	0.479	13.1	0.0762	0.0000	SURCHARGED
15 minute winter	9	10	132.689	0.039	4.5	0.0061	0.0000	OK
15 minute winter	10	11	132.341	0.312	29.1	0.0496	0.0000	SURCHARGED
1440 minute winter	10A	1380	130.976	0.733	3.8	0.0000	0.0000	SURCHARGED
1440 minute winter	Soakaway	1380	130.976	0.755	6.1	86.0713	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	1	1.000	2	4.6	0.663	0.589	0.0919
15 minute winter	2	1.001	3	11.9	1.521	1.250	0.0961
15 minute winter	3	1.002	10A	15.8	2.025	2.014	0.1366
15 minute winter	4	2.000	3	4.5	0.575	0.571	0.0858
15 minute winter	5	3.000	6	4.8	0.923	0.607	0.0542
15 minute winter	6	3.001	8	5.3	0.689	0.674	0.0786
15 minute winter	7	4.000	8	5.0	0.708	0.503	0.0842
15 minute winter	8	3.002	10	13.8	1.759	1.749	0.0394
15 minute winter	9	5.000	10	4.5	0.778	0.313	0.0598
15 minute winter	10	3.003	10A	28.1	3.817	1.015	0.0636
1440 minute winter	10A	1.003	Soakaway	6.1	0.566	0.153	0.1470
1440 minute winter	Soakaway	Infiltration		0.6			

APPENDIX E SIMPLE INDEX APPROACH

SIMPLE INDEX APPROACH: TOOL



HRW shall not be liable for any direct or indirect damage claims, loss, cost, expense or liability whatsoever arising out of the use or impossibility to use the tool, even when HRW has been informed of the possibility of this claim. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

- The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL.

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

Runoff Area Land Use Description	Hazard Level	Pollution Hazard Indices		
		1 use suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable):				
Residential parking	Low	0.5	0.4	0.4
Landuse Pollution Hazard Index		Low	0.5	0.4

DESIGN CONDITIONS	
1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

SuDS Component Description		Pollution Mitigation Indices		
		Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component from the drop down list):	Proprietary treatment system	Enter User Defined Indices in row below		
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list:	None			
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list:	None			
If the proposed SuDS components are nonproprietary/proprietary and/or the generic indices above are not considered appropriate, select "Proprietary treatment system" or "User defined indices" and enter component descriptions and agreed user defined indices in these rows:				
SuDS Component 1		0.8	0.6	0.7
Aggregated Surface Water Pollution Mitigation Index		0.8	0.6	0.7

DESIGN CONDITIONS		
1	2	3
Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of designed indices.	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RMA-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system.	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at http://www.britishwater.co.uk/Publications/code-of-practice.aspx

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

Pollution Mitigation Indices			
	Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop-down list: →	None		
	If the proposed groundwater protection is Inadequate/Inappropriate and/or the generic indices above are not considered appropriate, select "Proprietary product" or "User defined indices" and enter a description of the protection and agreed user defined indices in this row:		
Groundwater Protection Pollution Mitigation Index	0	0	0

DESIGN CONDITIONS			
1	2	3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	0.8	0.6	0.7

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater (an additional treatment component (ie near and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices		
Total Suspended Solids	Metals	Hydrocarbons
Sufficient	Sufficient	Sufficient

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England.

APPENDIX F FLOOD MAP FOR PLANNING

Flood map for planning

Your reference
Site 1

Location (easting/northing)
383475/410403

Created
1 Jul 2024 15:01

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

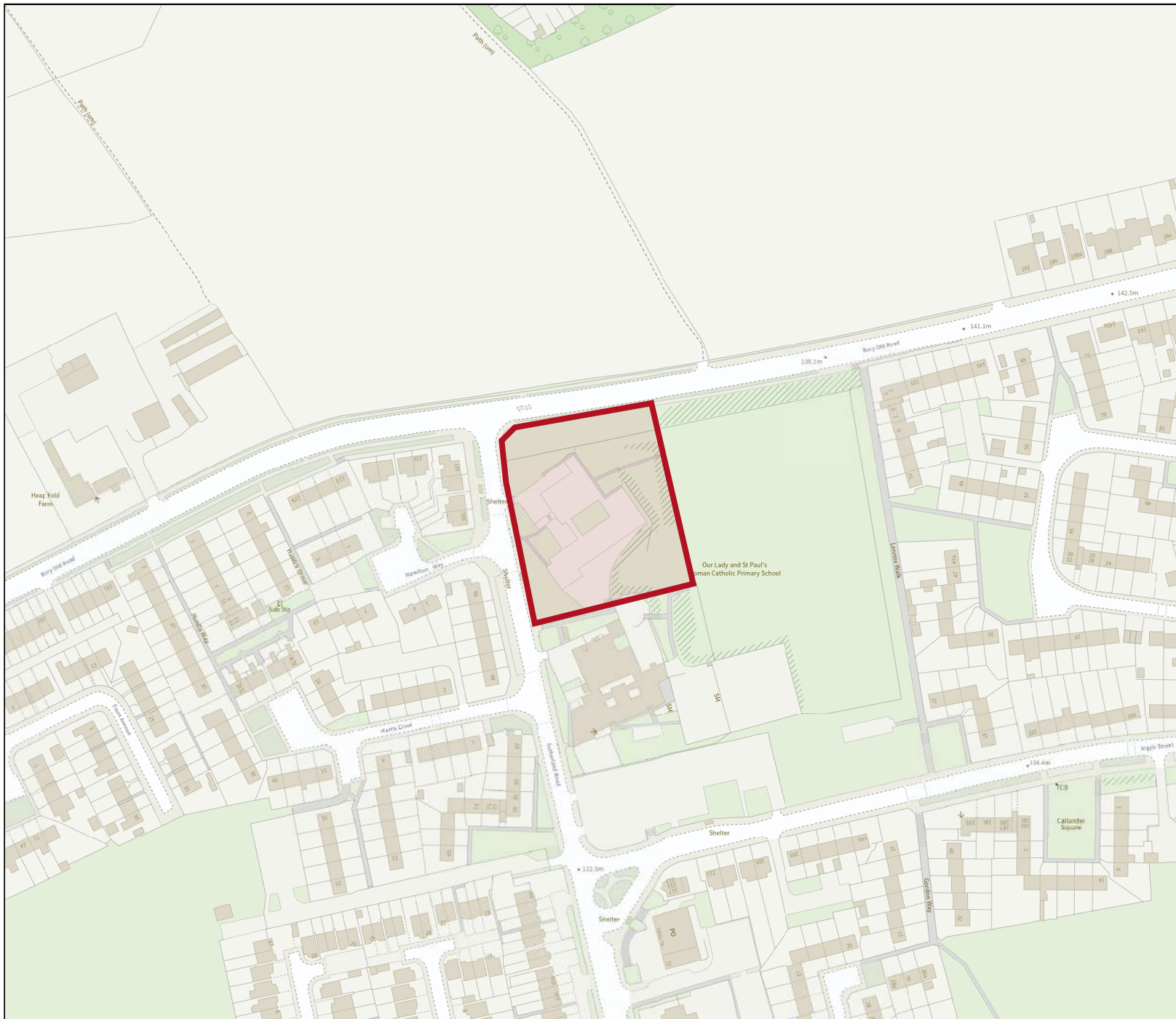
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

Site 1

Location (easting/northing)

383475/410403

Scale

1:2500

Created

1 Jul 2024 15:01

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

0 20 40 60m

Flood map for planning

Your reference
Site 2

Location (easting/northing)
383599/410296

Created
1 Jul 2024 15:02

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning

Your reference

Site 2

Location (easting/northing)

383599/410296

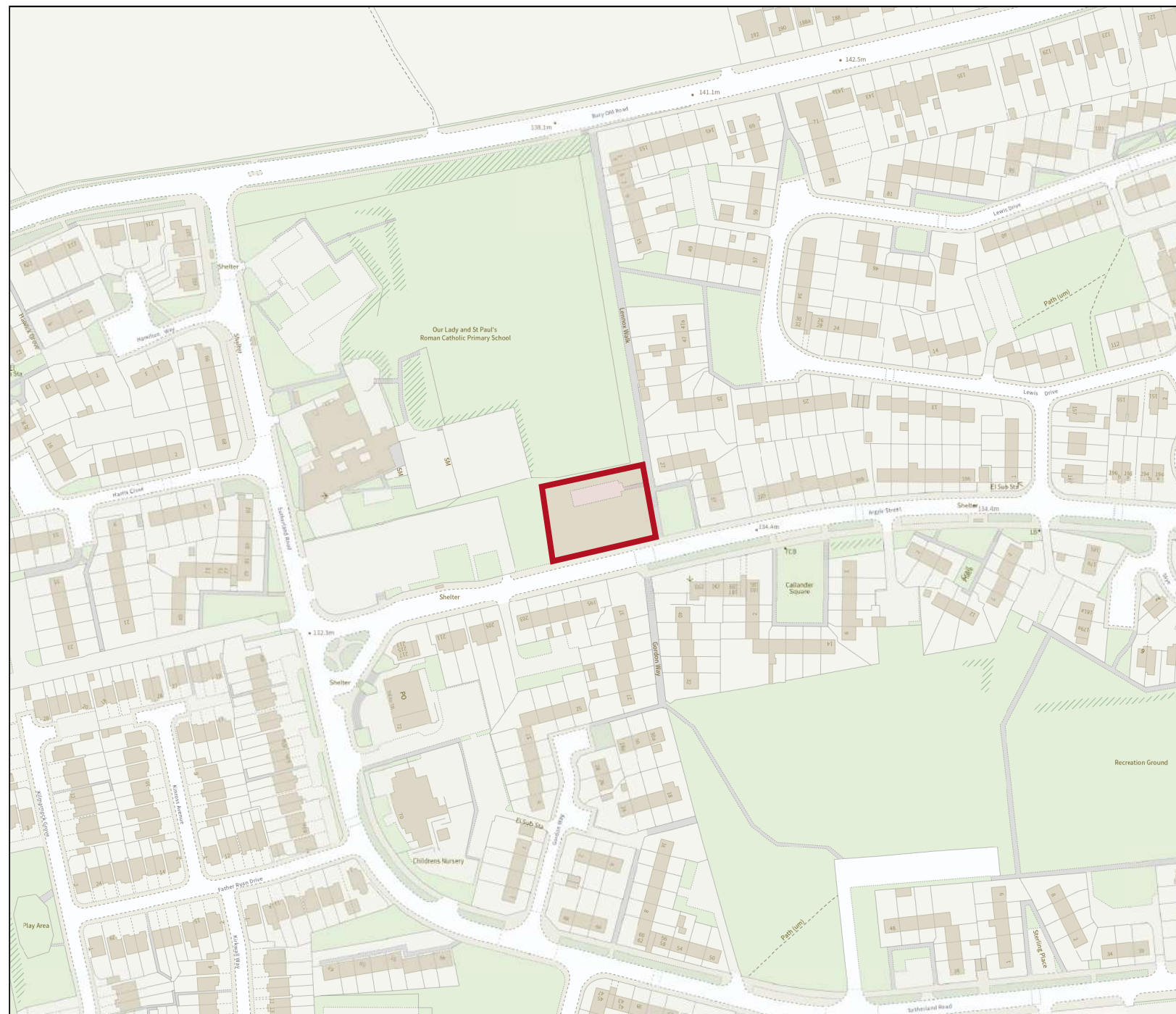
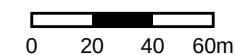
Scale

1:2500

Created

1 Jul 2024 15:02

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



APPENDIX G INFILTRATION TEST RESULTS

Our Ref: 1029/6544/G
Your Ref: 1763
Date: 29th October 2024

Built Development
c/o Inspire Design
Unit 2A
Church View Business Park
Coney Green Rd
Chesterfield S45 9HA



Humberside Materials Laboratory LTD
Atherton Way, Brigg
North Lincs DN20 8AR
Tel & fax 01652 652753
Email: info@humbersidematerialslab.co.uk

Dear Steven

1763 Sutherland Road, Heywood

Further to your instruction Humberside Materials Laboratory (HML) were engaged to undertake a site investigation within a proposed development off Sutherland Road, Heywood. The site investigation included six trial pits (S1 to S6) over two areas to assess the sites potential capacity for underground drainage via soakaway testing. Soakaway testing was undertaken within all six trial pits. All test locations were selected and positioned by the on-site HML engineer with reference to the supplied plan; locations are indicated on the plan below.



Trial pits

The trial pits were excavated by a tracked excavator utilising a 300mm width bucket. Encountered strata was logged on site as the trial pits advanced. Encountered strata is summarised within table 1 below. Photographs are enclosed.

Table 1: Summary of revealed ground conditions						
Strata descriptions	Exploratory hole					
	S1	S2	S3	S4	S5	S6
	Depth to base of stratum (m bgl)					
Dark brown to brown sandy (and clayey in S3 & S4) TOPSOIL with many rootlets (and roots in S1)	0.20	0.20	0.19	0.17	0.25	0.20
Orange brown slightly silty fine to medium SAND						0.45
Brown slightly silty fine to coarse SAND with occasional fine to coarse gravels of natural stone and rare coarse fragments of tar					0.75	
Brown clayey fine SAND	1.0					
Brown to dark brown clayey fine to coarse SAND with occasional Fine to coarse gravels of natural stone)and rare cobbles of natural stone in S4)				1.00		1.00
Orange brown slightly silty fine to medium SAND		1.25				
Light brown to brown silty fine SAND with pockets of stiff brown, grey mottled SILT/CLAY	1.90		1.90			2.10
Light brown to brown slightly silty fine to medium SAND (with very occasional fine to medium gravels in S2 & S4)		1.90		1.90	1.90	
Notes: Side of pit appeared very moist from 1.3m to 1.4m below ground level, possible very slight ingress						

Soakaway testing

Soakaway testing was completed within all excavated trial pits (S1 to S6), as per guidance within BRE Digest 365. A single sized 20mm gravel and slotted water pipe was placed within each pipe to prevent trial pit collapse during water placement, an air void quantity of 50% has been calculated from a sample of the 20mm gravel.

Trial pit 1 (S1) was excavated to 1.90m below ground level (bgl) with a width of 0.35m and a length of 1.60m. Water was introduced to the pit and monitored against time elapsed, this included three consecutive fills. Calculations show infiltration rates ranging from $1.71 \times 10^{-6} \text{m/s}$ to $9.76 \times 10^{-7} \text{m/s}$ with an effective test depth from 1.28m to 1.90m bgl. Individual test report enclosed.

Trial pit 2 (S2) was excavated to 1.90m below ground level (bgl) with a width of 0.35m and a length of 1.50m. Water was introduced to the pit and monitored against time elapsed, this included three consecutive fills. Calculations show infiltration

rates ranging from $2.01 \times 10^{-5} \text{m/s}$ to $9.43 \times 10^{-6} \text{m/s}$ with an effective test depth from 1.28m to 1.90m bgl. Individual test report enclosed.

Trial pit 3 (S3) was excavated to 1.90m below ground level (bgl) with a width of 0.35m and a length of 1.40m. Water was introduced to the pit and monitored against time elapsed, this included three consecutive fills. Calculations show infiltration rates ranging from $1.04 \times 10^{-6} \text{m/s}$ to $7.90 \times 10^{-7} \text{m/s}$ with an effective test depth from 1.15m to 1.90m bgl. Individual test report enclosed.

Trial pit 4 (S4) was excavated to 2.00m below ground level (bgl) with a width of 0.35m and a length of 1.40m. Water was introduced to the pit and monitored against time elapsed, this included three consecutive fills. Calculations show infiltration rates ranging from $2.39 \times 10^{-5} \text{m/s}$ to $1.77 \times 10^{-5} \text{m/s}$ with an effective test depth from 1.25m to 2.00m bgl. Individual test report enclosed.

Trial pit 5 (S5) was excavated to 1.90m below ground level (bgl) with a width of 0.35m and a length of 1.40m. Water was introduced to the pit and monitored against time elapsed, this included three consecutive fills. Calculations show infiltration rates ranging from $9.54 \times 10^{-5} \text{m/s}$ to $3.37 \times 10^{-5} \text{m/s}$ with an effective test depth from 1.27m to 1.90m bgl. Individual test report enclosed.

Trial pit 6 (S6) was excavated to 2.10m below ground level (bgl) with a width of 0.35m and a length of 1.50m. Water was introduced to the pit and monitored against time elapsed with an initial water depth of 1.49m bgl. The water level was monitored various times over a 130minute period with a final water level of 1.47m bgl recorded. With no drop in water level encountered over the test pits monitored period this test location was abandoned and deemed unsuitable for soakaways.

Summary

The encountered strata within the excavated trial pits appears to have identified two separate materials within the soakaway effective test depth ranges. S1, S3 and S6 has identified a silty sand with pockets of silt/clay were as S2, S4 and S5 have identified a slightly silty sand with gravels. These slightly differing material descriptions have given differing infiltration rates with trial pit S6 not providing any infiltration which may have been due to the encountered ingress.

For potential soakaway assessment and or design the following points may be considered.

- Exact locations of differing soil description noted above. Evidence of previous boreholes on site which could be utilised along with trial pit logs to identify soil areas, pockets of silt/clay may not have been easily identified within borehole and may have been logged as layers or bands
- Trial pits S1 to S4 are within a area separate from trial pits S5 and S6, each area may require its own assessment although soil description appear comparable between the two areas
- Trial pits S1 and S3, relatively slow infiltration encountered with a possible design rate of $7.90 \times 10^{-07} \text{m/s}$ within the silty sand with silt/clay pockets layer
- Trial pits S2, S4 and S5, reasonable infiltration encountered with a possible design rate of $9.43 \times 10^{-06} \text{m/s}$ within the slightly silty sand with gravels layer
- Trial pit S6, no infiltration achieved

If you require any further information, please contact the laboratory.

Yours Sincerely

D. Driver *Director*

*Enclosed: Photographs
 Soakaway test reports*



Trial Pit S1 – after excavations



Trial Pit S1 – excavated spoil



Trial Pit S2 – after excavations



Trial Pit S2 – excavated spoil



Trial Pit S3 – after excavations



Trial Pit S3 – excavated spoil



Trial Pit S4 – after excavations



Trial Pit S4 – excavated spoil



Trial Pit S5 – after excavations



Trial Pit S5 – excavated spoil



Trial Pit S6 – after excavations



Trial Pit S6 – excavated spoil

HUMBERSIDE MATERIALS LABORATORY LTD

Atherton Way, Brigg
North Lincolnshire DN20 8AR
Tel & Fax 01652 652753

DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/73092/01

Client Build Developments c/o Inspire Design

Site 1763 Sutherland Road, Heywood

Location S1

Date tested 23/10/2024

Determined by D. Driver (HML)

Soil type Silty fine sand with pockets of silt/clay

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	S1		
Anticipated invert level	Unknown		
Pit Dimensions (l x w x d) (m)	1.60	0.35	1.90
Effective Depth (75% - 25%)	Determination 1	0.300	m
	Determination 2	0.310	m
	Determination 3	0.310	m
Effective volume (75% - 25%)	Determination 1	0.084	m ³
	Determination 2	0.087	m ³
	Determination 3	0.087	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.730	m ²
	Determination 2	1.769	m ²
	Determination 3	1.769	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	28440	Sec.
	Determination 2	40320	Sec.
	Determination 3	50280	Sec.
Soil Infiltration Rate (m/s)	Determination 1	1.71E-06	m/s
	Determination 2	1.22E-06	m/s
	Determination 3	9.76E-07	m/s

Comments

File ref 1029/6544/G

Date tested 23/10/2024

Date reported 28/10/2024

Signed - M.Driver / D. Driver / C. Driver
Director

HUMBERSIDE MATERIALS LABORATORY LTD

Atherton Way, Brigg
North Lincolnshire DN20 8AR
Tel & Fax 01652 652753

DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/73092/02

Client Build Developments c/o Inspire Design

Site 1763 Sutherland Road, Heywood

Location S2

Date tested 23/10/2024

Determined by D. Driver (HML)

Soil type Slightly silty sand with gravels

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	S2		
Anticipated invert level	Unknown		
Pit Dimensions (l x w x d) (m)	1.50	0.35	1.90
Effective Depth (75% - 25%)	Determination 1	0.260	m
	Determination 2	0.310	m
	Determination 3	0.310	m
Effective volume (75% - 25%)	Determination 1	0.068	m ³
	Determination 2	0.081	m ³
	Determination 3	0.081	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.487	m ²
	Determination 2	1.672	m ²
	Determination 3	1.672	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	2280	Sec.
	Determination 2	3120	Sec.
	Determination 3	5160	Sec.
Soil Infiltration Rate (m/s)	Determination 1	2.01E-05	m/s
	Determination 2	1.56E-05	m/s
	Determination 3	9.43E-06	m/s

Comments

File ref 1029/6544/G

Date tested 23/10/2024

Date reported 28/10/2024

Signed - M.Driver / D. Driver / C. Driver
Director

HUMBERSIDE MATERIALS LABORATORY LTD

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North Lincolnshire DN20 8AR
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DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/73092/03

Client Build Developments c/o Inspire Design

Site 1763 Sutherland Road, Heywood

Location S3

Date tested 23/10/2024

Determined by D. Driver (HML)

Soil type Clayey sand with gravels and pockets of silt/clay

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	S3		
Anticipated invert level	Unknown		
Pit Dimensions (l x w x d) (m)	1.40	0.35	1.90
Effective Depth (75% - 25%)	Determination 1	0.365	m
	Determination 2	0.370	m
	Determination 3	0.375	m
Effective volume (75% - 25%)	Determination 1	0.089	m ³
	Determination 2	0.091	m ³
	Determination 3	0.092	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.768	m ²
	Determination 2	1.785	m ²
	Determination 3	1.803	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	48480	Sec.
	Determination 2	58260	Sec.
	Determination 3	64560	Sec.
Soil Infiltration Rate (m/s)	Determination 1	1.04E-06	m/s
	Determination 2	8.72E-07	m/s
	Determination 3	7.90E-07	m/s

Comments

File ref 1029/6544/G

Date tested 23/10/2024

Date reported 28/10/2024

Signed - M.Driver / D. Driver / C. Driver
Director

HUMBERSIDE MATERIALS LABORATORY LTD

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North Lincolnshire DN20 8AR
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DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/73092/04

Client Build Developments c/o Inspire Design

Site 1763 Sutherland Road, Heywood

Location S4

Date tested 23/10/2024

Determined by D. Driver (HML)

Soil type Slightly silty sand with gravels

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	S4		
Anticipated invert level	Unknown		
Pit Dimensions (l x w x d) (m)	1.40	0.35	2.00
Effective Depth (75% - 25%)	Determination 1	0.315	m
	Determination 2	0.380	m
	Determination 3	0.375	m
Effective volume (75% - 25%)	Determination 1	0.077	m ³
	Determination 2	0.093	m ³
	Determination 3	0.092	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.593	m ²
	Determination 2	1.820	m ²
	Determination 3	1.803	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	2028	Sec.
	Determination 2	2220	Sec.
	Determination 3	2880	Sec.
Soil Infiltration Rate (m/s)	Determination 1	2.39E-05	m/s
	Determination 2	2.30E-05	m/s
	Determination 3	1.77E-05	m/s

Comments

File ref 1029/6544/G

Date tested 23/10/2024

Date reported 28/10/2024

Signed - M.Driver / D. Driver / C. Driver
Director

HUMBERSIDE MATERIALS LABORATORY LTD

Atherton Way, Brigg
North Lincolnshire DN20 8AR
Tel & Fax 01652 652753

DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/73092/05

Client Build Developments c/o Inspire Design

Site 1763 Sutherland Road, Heywood

Location S5

Date tested 23/10/2024

Determined by D. Driver (HML)

Soil type Slightly silty sand

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	S5		
Anticipated invert level	Unknown		
Pit Dimensions (l x w x d) (m)	1.40	0.35	1.90
Effective Depth (75% - 25%)	Determination 1	0.265	m
	Determination 2	0.325	m
	Determination 3	0.315	m
Effective volume (75% - 25%)	Determination 1	0.065	m ³
	Determination 2	0.080	m ³
	Determination 3	0.077	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.418	m ²
	Determination 2	1.628	m ²
	Determination 3	1.593	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	480	Sec.
	Determination 2	810	Sec.
	Determination 3	1440	Sec.
Soil Infiltration Rate (m/s)	Determination 1	9.54E-05	m/s
	Determination 2	6.04E-05	m/s
	Determination 3	3.37E-05	m/s

Comments

File ref 1029/6544/G

Date tested 23/10/2024

Date reported 28/10/2024

Signed - M.Driver / D. Driver / C. Driver
Director

APPENDIX H UNITIED UTILITIED ADOPTION RESPONSE

Calum Reford

From: seweradoptions@uuplc.co.uk
Sent: 13 December 2024 14:31
To: Calum Reford
Cc: richard@builtdevelopments.co.uk; elliot@btparchitects.co.uk; planning.liaison@uuplc.co.uk
Subject: RE: UU Ref: DC/24/1872 - Land At Sutherland Road (North Of Our Lady And St Paul's Rc Primary School)

Good Afternoon Calum

I hope you're well

After reviewing the drainage strategy I can confirm that whilst UU would adopt geo-cellular tanks that infiltrate, we wouldn't adopt them being underneath private driveways. We would normally want SUDS to be located in a P.O.S or area that would not affect residents if doing maintenance. Therefore without a major re-design of the development or loss of plots, it's unlikely that we would be able to adopt the development in it's current format.

We could adopt the foul only for site 1 if that was of any benefit and as you've mentioned with site 2, this would have to remain private.

If I can be of any further assistance please do let me know.

Kind Regards

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Conor Donaghy
Developer Engineer
Developer Services & Metering
T: 01925 429097
unitedutilities.com

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 12/12/2024 11:07
To: calum@inspiredesigngroup.co.uk
Cc: richard@builtdevelopments.co.uk; elliot@btparchitects.co.uk; planning.liaison@uuplc.co.uk
Subject: RE: UU Ref: DC/24/1872 - Land At Sutherland Road (North Of Our Lady And St Paul's Rc Primary School)

Good Morning,

Many thanks for your email.

I can confirm that I have now sent this across to Conor Donaghy who will respond on or before 19.12.2024.

Kind Regards



Jordan Houghton
Developer Engineer
Developer Services & Metering
Customer Services
T: 01925 429091
unitedutilities.com

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----- Original Message -----

From: Calum Reford [calum@inspiredesigngroup.co.uk]

Sent: 12/12/2024 10:56

To: seweradoptions@uuplc.co.uk

Cc: elliot@btparchitects.co.uk; richard@builtdevelopments.co.uk; planning.liaison@uuplc.co.uk

Subject: UU Ref: DC/24/1872 - Land At Sutherland Road (North Of Our Lady And St Paul's Rc Primary School)

Good Morning,

I am writing to you on behalf of Built Developments Ltd., who have applied to Rochdale Borough Council for planning permission for the erection of 28 dwellings on land at Sutherland Road, Heywood, OL10 3PD. We are the consultants who has prepared the drainage strategy for the proposed development.

We have been advised by the Local Planning Authority and Lead Local Flood Authority to discuss the drainage strategy with you in order to understand if the current proposed system for **Site 1** could be adopted by UU should the site be taken forward. The proposed system includes the following:

1. Soakaways under private drives with gullies and pipes to collect surface water runoff from adopted highway and residential roofs.
2. We will also include permeable paving to the private drives to provide some above-ground SUDS solutions and treatment in accordance with CIRIA C753 guidance.

It is proposed that drainage for Site 2 will be private surface water drainage, which will be revised to soakaways to remove any discharge of surface water to combined sewers.

I have attached a copy of the proposed Drainage Strategy to this email. Please do not hesitate to get in touch with me on the below details to discuss this matter further, and we look forward to hearing from you at the earliest opportunity.

Kind regards,

Calum Reford, BSc (Hons), MSc.

Senior Planning Consultant



T: 01246 864467

E: Calum@inspiredesigngroup.co.uk

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