



Benton Street, Moston

DRAINAGE STRATEGY REPORT



5th May 2023

Benton Street, Moston

Drainage Strategy Report

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Benton Street, Moston

Drainage Strategy Report

One Manchester - Benton Street, Moston



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Alan Johnston Partnership Ltd.

Company No. 13204766

Benton Street, Moston

Drainage Strategy Report

1.0 INTRODUCTION

This drainage strategy report has been prepared on behalf of One Manchester in connection with a planning application for the construction of 5 properties as well as green spaces and an access road along Benton Street as part of a larger residential development throughout Moston.

The purpose of this report is to present the surface water and foul water outline drainage strategies for the site which have been developed by the Alan Johnston Partnership. To demonstrate how the specific drainage requirements are to be met, the report should be read in conjunction with the relevant drawings and supporting information, included within the appendices.

The drainage strategies outlined within this report, have been prepared in accordance with BS EN 752:2017 (Drain and sewer systems outside buildings), Sewers for Adoption, Building Regulations Approved Document H (Drainage and waste disposal), the Planning Practice Guidance and the National Planning Policy Framework document (Department for Communities and Local Government, March 2014).

The site is located within Flood Zone 1, with a total site area under 1.0ha. Therefore, in accordance with DEFRA guidance, a Flood Risk Assessment (FRA) is not required.



2.0 SITE DESCRIPTION

The site is situated on a plot of greenfield land off the southern most point of Benton Street in Moston, Manchester and is located at National Grid reference SD 86944 01405. The site location is illustrated in Appendix A and the extent of the area to which the application relates is shown on the enclosed aerial photo, attached in Appendix B.

The existing site covers a total area of 0.164ha with the proposed development area covering the entire site. The site currently comprises of open green space and an access path to get to the rear of some of the surrounding properties.

The site generally falls from east to west, with levels falling from approximately 86.54mAOD where the site boundary meets the main road to approximately 84.38mAOD in the west of the site. An aerial photo is included in Appendix B to illustrate the site at the present day and the existing topography is indicated on the drainage record information attached in Appendix C.



3.0 PROPOSED DEVELOPMENT

The proposed development is to construct 5 properties along with associated gardens, greenspace and parking bays. This also includes an access road which will tie into Benton Street as well as some small areas of public greenspace.

To enable a viable scheme, the proposed site levels are constrained by surrounding properties and highways. The proposed site plan indicating the proposed building extension is attached in Appendix D.



4.0 ASSESSMENT OF FLOOD RISK

Even though a Flood Risk Assessment is not required under the Planning Practice Guidance and National Planning Policy Framework, a small site-specific flood risk assessment has been completed below.

4.1 Flooding from Rivers

The Flood Risk map is included as Appendix E. As can be seen from the Flood Risk map, all three sites are located within Flood Zone 1 and therefore, the sites are all located in Flood Zone 1 with a chance of flooding of less than 0.1% (or 1 in 1000).

The nearest watercourse is the Rochdale Canal, which is located approximately 1.10km south of the site. As such, the risk of flooding to the new development from rivers is considered to be low.

4.2 Flooding from the Sea

The sites are not at risk of flooding from the sea. The lowest level across the site is approximately 84.38mAOD, i.e. well above tidal flood levels.

4.3 Flooding from Land

Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding.

The Surface Water Flooding map is included in Appendix E. It can be seen from the map that the site is classified as having a very low risk of surface water flooding. Therefore, the risk of flooding from overland flows due to surface water flooding is considered to be low.

4.4 Flooding from Groundwater

As can be seen on the hydrogeological maps from the British Geological Survey, the site is located in an area classified as having medium-low risk from groundwater flooding. There is also no indication as to historic flooding within the site boundary as shown on the Environment Agency Historic Flood Map.

As such, it is envisaged that the proposed site has a low risk of flooding from groundwater but this should be confirmed via an intrusive site investigation.

4.5 Flooding from Sewers

As can be seen from the Public Sewer Map, attached in Appendix F, there are no public sewers located within the proposed site. Due north west of site is a 300mm public combined water sewer travelling westbound then northbound along Benton Street.

Current available information indicate that there are no private sewers within the proposed site boundary. This should be confirmed via a CCTV survey prior to the commencement of works. Should any private sewers be discovered is it likely that they are to be abandoned.

As all of the public sewers are located outside of the site and are not being affected by the proposed works, it is envisaged that no public sewer diversions or reduced easement agreements will be required with United Utilities.

4.6 Flooding from Reservoirs, Canals and Other Artificial Sources

The Reservoir Flood Risk map is included in Appendix E. It can be seen from the map that the site is not at risk of flooding from reservoirs. The closest open waterbody is the Boggart Hole Boating Lane which is located approximately 1.01km north of the site and the nearest reservoir is the Heaton Park reservoir which is located approximately 5.17km north-west of the site.

Therefore, the site is considered to be at low risk of flooding from reservoirs, canals and other artificial sources.



5.0 PROPOSED DEVELOPMENT

5.1 Effect of Proposed Development

As previously outlined in Section 2.0, the existing site covers a total area of 0.164ha. The pre and post development impermeable areas for the 0.164ha development area have been assessed and are indicated on the attached drawing in Appendix G. The comparison between the pre and post development impermeable areas is also summarised below;

Total Development Area (ha)	Pre-Development Impermeable Area (ha)	Post Development Impermeable Area (ha)
0.164	0.009	0.107

As can be seen the proposed development will increase the overall impermeable areas across the site and therefore will result in an increase in the;

- ◆ Volume of surface water ponding on the site

- ◆ Volume of surface water runoff leaving the site or discharging into surrounding areas
- ◆ Peak discharge rate from the site

As such, drainage systems will need to be redesigned to sufficiently drain the foul and surface water flows arising from the proposed development. Where possible, any existing drainage networks should be utilised. Appropriate design and construction of these systems as set out in Section 5.3 should ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

5.2 Existing Drainage Systems

As can be seen from the Public Sewer Map, attached in Appendix F, there are no public sewers located within the proposed site. The only nearby public sewers is a 300mm combined water sewer travelling westbound then northbound along Benton Street.

Current available information indicate that there are no private sewers within the proposed site boundary. This should be confirmed via a CCTV survey prior to the commencement of works. Should any private sewers be discovered it is likely that they are to be abandoned.

As all of the public sewers are located outside of the site and are not being affected by the proposed works, it is envisaged that no public sewer diversions or reduced easement agreements will be required with United Utilities.

5.3 Proposed Drainage Strategy

As outlined above in Section 5.1, site-wide drainage systems are required to drain the foul and surface water flows arising from the proposed development. The proposed drainage systems must ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

5.3.1 Surface Water Drainage

The Planning Policy Guidance and the CIRIA SuDS Manual detail that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

- ◆ into the ground (infiltration);
- ◆ to a surface water body;
- ◆ to a surface water sewer, highway drain, or another drainage system;
- ◆ to a combined sewer.

Considering the hierarchy above, the surface water network for the 0.164ha developed area of the site should infiltrate where possible. Although there has not been a full site investigation, the British Geological Records indicate that the superficial deposits on site are that of Devensian Till. This would indicate that the ground is made up of a mixture of sand, boulders and an abundance of clay.

Also given the fact that the site contains limited communal spaces, with land either being building footprint, private garden or private driveways, there is no practical space to put in any soakaways. From both these points it can be concluded that infiltration will not be suitable for the proposed development.

As the possibility of infiltration has been ruled out, the intention for the development would be to discharge to watercourse/surface water body. As indicated in Section 4.1, the nearest watercourse is the Rochdale Canal, which is located approximately 1.01km south of the site. Given the distance across various plots of developed third party land, it has been deemed impractical to discharge to watercourse.

As such, the only practical solution for discharge of the surface water is to discharge to a public sewer. As indicated within Section 5.2, there are no private sewers within the site boundary connected to the public sewers. There are also no surface water sewers near the proposed site. Therefore, it is envisioned that a new connection to the 300mm combined water sewer along Benton Street mentioned in Section 5.2 will be used as the proposed outfall for the development.

While every effort to use the existing systems should be made, the drainage systems should be designed to suit the proposed site layout and topography which aims to provide an efficient design.

In line with Sewers for Adoption (7th Edition), the requirements for the design of a new surface water drainage systems are as follows:

- ◆ Below ground piped drainage to be sized to accommodate the 1 in 2-year (50% AEP) design storm without surcharge.
- ◆ System to be designed not to flood any part of the site in a 1 in 30-year (3% AEP) design storm.
- ◆ For events in exceedance of the 1 in 30-year design storm and up to and including the 1 in 100-year event, site drainage and topography should be designed where practicable to route surface water run-off away from buildings to safe above-ground storage areas on site, thereby preventing this run-off from leaving the site and increasing flood risk elsewhere.

For each design case described above, the design storm is the critical storm duration for the site conditions. In the case of the 1 in 100-year design storm, a 45% increase in the peak rainfall intensity is applied to allow for the estimated worst-case impacts of climate change. This is in accordance with advice, issued by the Environment Agency, which updates previous climate change allowances outlined in the National Planning Policy Framework.

Suitable systems of below ground drainage will be required to contain as a minimum requirement, the 1 in 30-year event. Additionally, any surface water run-off from events that exceed the design capacity of the new drainage system, up to and including the 1 in 100-year (+45%) event, will be retained on-site in safe storage areas.

In compliance with Section 3.4.1 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA User Guide, it is envisaged that as the existing site is greenfield, Domett Street, Moston Manchester City Council will require the proposed surface water runoff rates to be restricted to achieve the same greenfield run off rates.

Given the size of the proposed site, an assessment of the existing greenfield surface water run off rate is not required as the existing run off rate will be well below 5.0 L/s including for the 1-in-100 year storm event.

The 5.0 L/s discharge restriction is generally accepted as the minimum discharge rate to avoid the need for very small orifices, which due to their minimal size are prone to blockage. The 5.0 L/s discharge rate is in compliance with the Environment Agency document; 'Rainfall runoff management for developers', Report SC030219.

This is further supported by United Utilities, as the guidance notes within the United Utilities Section 104 adoption agreement states that for any flow control device, "The minimum acceptable orifice size is 100mm." and to achieve this minimum orifice diameter a maximum discharge rate of 5.0 L/s is required.

Given the compliance with both Manchester City Council and United Utilities guidelines, it is anticipated that the proposed drainage strategy will be accepted.

As seen in from the Outline Drainage Strategy Drawing attached in Appendix H, it is anticipated that the attenuation storage will be provided within the surface water drainage network itself and porosity within the porous parking bays sub base, with a vortex flow control device used to restrict the discharge rate to the required 5.0 L/s discharge rate, as indicated above.

The surface water drainage calculations have also been included within Appendix H and as can be seen the proposed surface water drainage and attenuation storage prevent any flooding for all rainfall events up to and including the 1 in 100 year + 45% climate change event and also meet the required 5.0 L/s discharge restriction. This is summarised in the table below.

Rainfall Return Period (years)	Discharge Rate (L/s)
1 Year	4.4
2 Year (Qbar)	4.7
30 Year	5.0
100 Year	5.0

As can be seen from the Outline Drainage Strategy Drawing attached in Appendix H, the surface water drainage collects the runoff from the site area via areas of porous paving, gullies and rainwater downpipes and conveys the surface water runoff to the east of the proposed site.

Here surface water is attenuated by 825mm concrete pipes and 2700mm diameter manholes as so to not need an attenuation tank. This has been done in order to allow the drainage within the highways to be adoptable by United Utilities under a section 104 agreement. As such the part of the network designed to be adopted has been designed to fully attenuate runoff during the 1 in 100 year +45% climate change event with no surcharge within the private network. The feasibility of this will need to be discussed and agreed with United Utilities prior to the commencement of any works.

Runoff is then passed through a vortex flow control device prior to discharging into a proposed combined water manhole and subsequently the public combined water sewers. The current proposed connection point is into United Utilities manhole UUMH9501. The vortex flow control device restricts the runoff to the required 5.0 L/s discharge rate, for all rainfall events up to and including the 1 in 100 year +45% climate change event.

It should be noted that the proposed surface water drainage network provides sufficient storage to prevent any flooding for all rainfall events up to and including the 1 in 100 year +45% climate change event and therefore the exceedance flow paths are for use in exceptional circumstances only.

The surface water drainage strategy and discharge rate should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.

5.3.2 SuDS Summary

As outlined below, all other SuDS techniques have been considered for this development;

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	✗	Not suitable due to minimal roof area available.
Rainwater Harvesting	✓	Water butts added to RWP in each plot
Basins & Ponds	✗	Unsuitable due to lack of available space.
Filter Strips & Swales	✗	Unsuitable due to lack of available space.
Bio-retention Areas	✗	Unsuitable due to lack of available space.
Infiltration Techniques	✗	Unsuitable due existing impermeable strata.
Permeable Surfaces	✓	Suitable given available car parking spaces.
Tanked/Piped Systems	✓	Suitable and incorporated.

Green roof areas have been considered but due to the minimal roof area available the use of a green roof has been discounted. Rainwater harvesting was also considered but due to a lack of greywater demand it has been deemed as impractical to include a rainwater harvesting system.

Due to the lack of available space across the site, the use of detention basins and/or ponds has also been discounted. Filter drains/strips, swales and bio-retention areas have also been deemed as impractical due to the lack of available space within the site.

As previously discussed in Section 5.3.1 infiltration is deemed as not feasible across the site and therefore the use of infiltration SuDS techniques is not possible. Non-infiltration (tanked) permeable surfaces such as permeable paving have also been considered and have been included. This provides the added benefit of additional attenuation storage.

Oversized pipes have also been incorporated to provide the necessary attenuation for attenuating surface water during peak storm events without including a below ground storage tank. This has been done to allow for the sewers within the highway areas to be adoptable by United Utilities under a section 104 agreement.

The use of specific SuDS techniques across the site will be confirmed during the later stages of the design process but where possible, the above SuDS summary should be adhered to as close as reasonably possible.

5.3.4 Foul Water Drainage

Foul water drainage disposal is set out in Part H of the Building Regulations in order of priority the preferred methods are;

1. Public sewer
2. Septic tank
3. Cesspool

The foul water system shall be designed in accordance with;

- ◆ BS EN 752:2017 (Drain and sewer systems outside buildings)
- ◆ Sewers for Adoption (7th Edition)
- ◆ National Planning Policy Framework document (Department for Communities and Local Government, March 2012).
- ◆ Planning Practice Guidance
- ◆ BS EN 12056-2:2000 (Drainage systems inside buildings)
- ◆ Building Regulations Approved Document H, Drainage and waste disposal. (Office of the Deputy Prime Minister, December 2015).

As can be seen from the Outline Drainage Strategy Drawing attached in Appendix J, the proposed foul water drainage will collect the runoff from the new proposed buildings and conveys the foul water to the east of the proposed site.

Here foul water discharges into the proposed combined water sewer mentioned in section 5.3.1 before outfalling into the public combined water sewers via UUMH9404. Similar to the surface water, the foul drainage within the highways is anticipated to be adopted by United Utilities in a Section 104 agreement. It is anticipated that the foul water can discharge into the existing private sewer at unrestricted rates.

The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.



6.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SUDS techniques in accordance with the CIRIA SUDS Manual C753. The surface water run-off from the proposed development is restricted using a vortex flow control device and the attenuated run-off is stored using a below ground cellular attenuation tank.

It is envisaged that the following components have been or will be included within the drainage strategy for the proposed development:

- ◆ Inspection chambers, manholes and catchpits.
- ◆ Pipes.
- ◆ Drainage channels and gullies.
- ◆ Vortex flow control device.
- ◆ Porous/permeable paving.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

It is assumed that the proposed drainage will remain private and therefore maintenance of the surface and foul water drainage systems will be the responsibility of One Manchester or an on-site facilities management team and therefore a copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

As such, the maintenance of the specified SuDS should be included within the developments Operation and Maintenance Manual and should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

6.1 General Maintenance & Inspection Requirements

- ◆ No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.
- ◆ Maintenance/inspection work shall be carried out in a safe/planned manner.
- ◆ All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.
- ◆ Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.
- ◆ Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.
- ◆ It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- ◆ Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;
 - Rodding - Manual/Mechanical with flexible rods.
 - Jetting - High pressure water jetting.
 - Plunging.

6.2 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually.

- ◆ Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
- ◆ Accumulated deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall.
- ◆ Main and branch drains shall be cleared as required and flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- ◆ Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

6.3 Pipes

Regular inspection and maintenance are important to identify areas which may have become obstructed/clogged and may not be draining correctly, as failure to do so would expose the development to a greater level of flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, where used the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes. The below table sets out the maintenance schedule for the pipe components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required take remedial action.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection should be provided as post construction CCTV survey.	N/A
	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

6.4 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below table sets out the maintenance schedule for the drainage channel and gullies components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

6.5 Vortex Flow Control Device

Regular inspection and maintenance is important to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, where used the manufacturer's recommendations should be followed.

- ◆ Normally, little maintenance is required as there are generally a vortex flow control device has no moving parts.
- ◆ If blockages occur they tend to do so at the intake of the vortex flow control device.
- ◆ Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.
- ◆ The smaller type conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

- ◆ Following installation of the vortex flow control device it is vitally important that any extraneous material i.e. Building materials are removed from the unit and the chamber.
- ◆ After the system is made live, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should be supplied by the Main Contractor, where the construction of the drainage varies from the design construction status drawings.

6.6 Porous/Permeable Paving

The maintenance requirements for permeable/porous paving is covered under the previous pavements section within the CIRIA SUDS Manual C753. As such, the maintenance requirements for permeable/porous tarmac are outlined within Table 20.15 of the CIRIA SUDS Manual C753. An extract of that table is given below to set out the maintenance schedule for the permeable/porous tarmac component of the proposed drainage systems.

TABLE 20.15 Operation and maintenance requirements for pervious pavements		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should be supplied by the Main Contractor, where the construction of the drainage varies from the design construction status drawings.

7.0 CONCLUSIONS

- ◆ The site is located within Flood Zone 1 with a low probability of flooding from all sources.
- ◆ Information from the British Geological Surveys and the proposed site layout indicates that infiltration is not suitable.
- ◆ Due to the distance across developed third-party land, discharging the surface water from the site to the nearest watercourse has been deemed as impractical. This and the lack of public surface water sewers within and surrounding the proposed site results in the only practical option for the disposal of the surface water runoff from the proposed development is to discharge into the public combined water sewers adjacent to the site boundary.
- ◆ The surface water discharge rate is to be restricted to 5.0 L/s to comply with LLFA requirements and Untied Utilities guidelines. The proposed surface water drainage design meets these criteria and also ensures there is no flooding for all rainfall events up to and including the 1 in 100 year +45% climate change design storm.
- ◆ The runoff is to be restricted using a vortex flow control device and the surcharged runoff is attenuated using the proposed oversized pipes and manholes within surface water drainage network beneath the proposed highways.
- ◆ The foul and surface water networks are to discharge into United Utilities public combined water manhole UUMH9404 prior to passing through a new proposed combined water manhole. The foul, surface and combined water drainage underneath the highways are to be adopted by United Utilities via a Section 104 agreement. Foul and surface water drainage within property boundaries is to remain private.



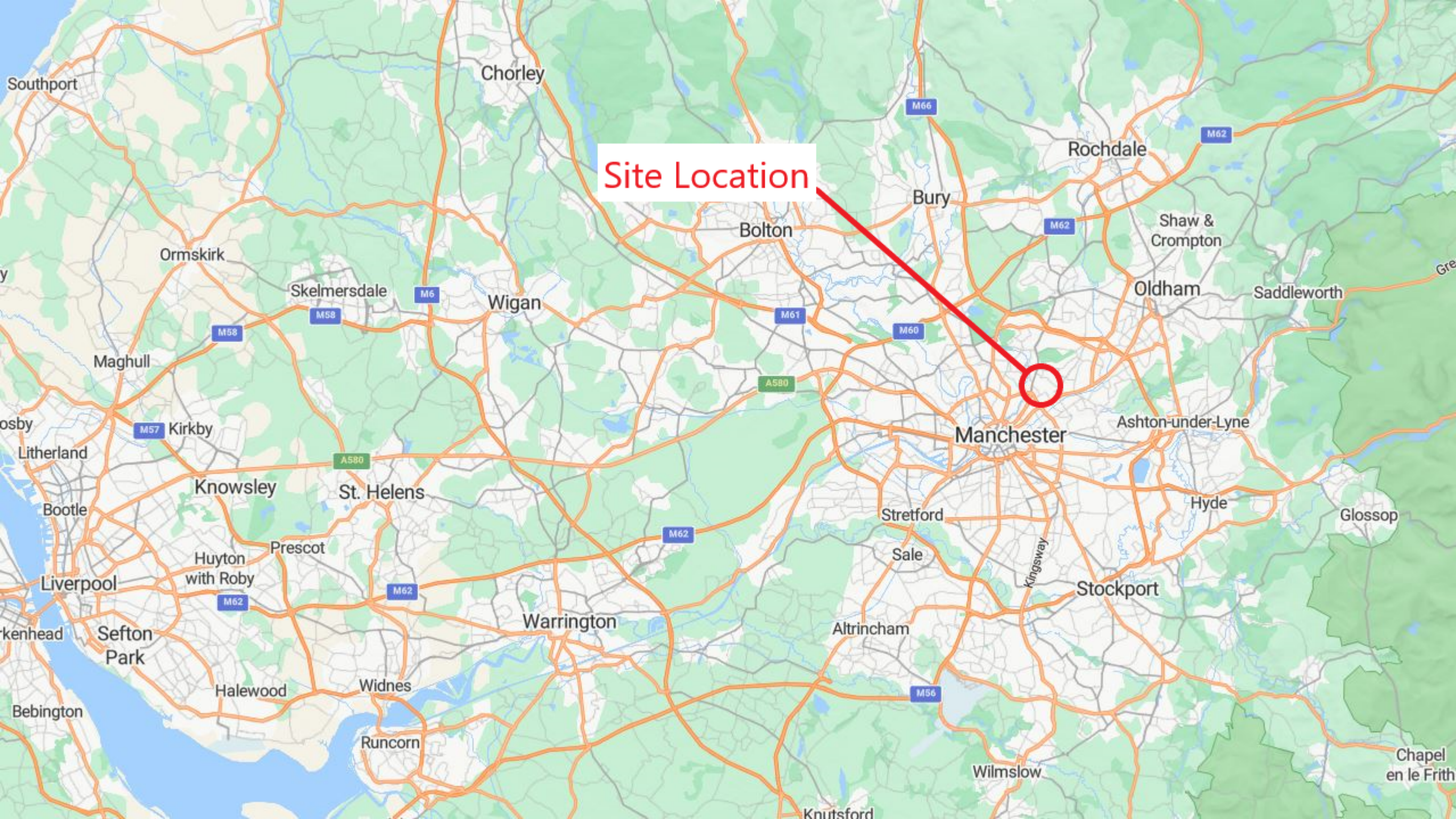
8.0 RECOMMENDATIONS

- ◆ An intrusive site investigation should be conducted to confirm the possibility of discharging surface water via infiltration can be fully ruled out.
- ◆ The surface water drainage strategy and discharge rates should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.
- ◆ The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with Manchester City Council and United Utilities prior to the commencement of any works.

- ◆ The section 104 agreement should be confirmed via more detailed discussions with United Utilities prior to the commencement of any works.
- ◆ The invert level of the existing public combined water manhole (UUMH9404) should be confirmed via a CCTV survey prior to construction.



Appendix A – Site Location Plan



Site Location

Appendix B – Aerial Photo



Appendix C – Topography

Appendix D – Proposed Site Plan



05 Proposed Site Plan
1 : 200

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Do not scale from this drawing. Do not take measurements from the CAD base. Any discrepancies are to be reported to the architect for clarification.

All dimensions are to be checked on site prior to construction, manufacture of any components and ordering of materials and equipment.

All materials and workmanship to be in accordance with the current British Standards and codes of practice.

Schedule of Accommodation

3B5P Houses	2no.	102m2
2B3P Houses	3no.	70m2

TOTAL 05no

Layout subject to confirmation of red line boundary, all statutory approvals including highways, planning and building regulations, relevant surveys and reports such as topographical, ecology, trees, ground investigation and flood risk.

*Boundary subject to confirmation from client

7	26.05.23	JW	Proposed boundary treatment revised following client comments to show brick wall with railings
6	28.03.23	JW	Drawing package updated to show secure timber bike stores following client feedback
5	22.03.23	HG	Drawing package updated following DTMO5
4	21.02.23	HG	Rear boundary wall height amended to 2100mm
3	21.10.23	HG	Schedules added in line with client comments
2	17.02.23	JW	Layout ammended following client commetns/feedback. Units updated in line with Mcr NDSS
1	04.06.21	AP	GIA amended to corresponde with the Manchester's emerging space standards
Rev	Date	Int	Description



CLIENT:

One Manchester

PROJECT:

P500 - Benton Street, Moston

DESCRIPTION:

Proposed Site Plan

PURPOSE OF ISSUE:

Planning

DRAWN BY:	CHECKED	DATE:	SCALE @ A2:
JW	VS	15/06/21	1 : 200

JOB NO:	STATUS CODE:	DRAWING NO:	REV
4243	S2	105	7

FILE IDENTIFIER:

BS-BTP-00-SP-DR-A-4243_105.7

Elizabeth House 486 Didsbury Road Heaton Mersey Stockport SK4 3BS
0161 443 1221 info@bernardtaylor.co.uk www.btparchitects.co.uk

Appendix E – Flood Risk Maps

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
386935/401404

Created
26 Jun 2023 15:47

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)

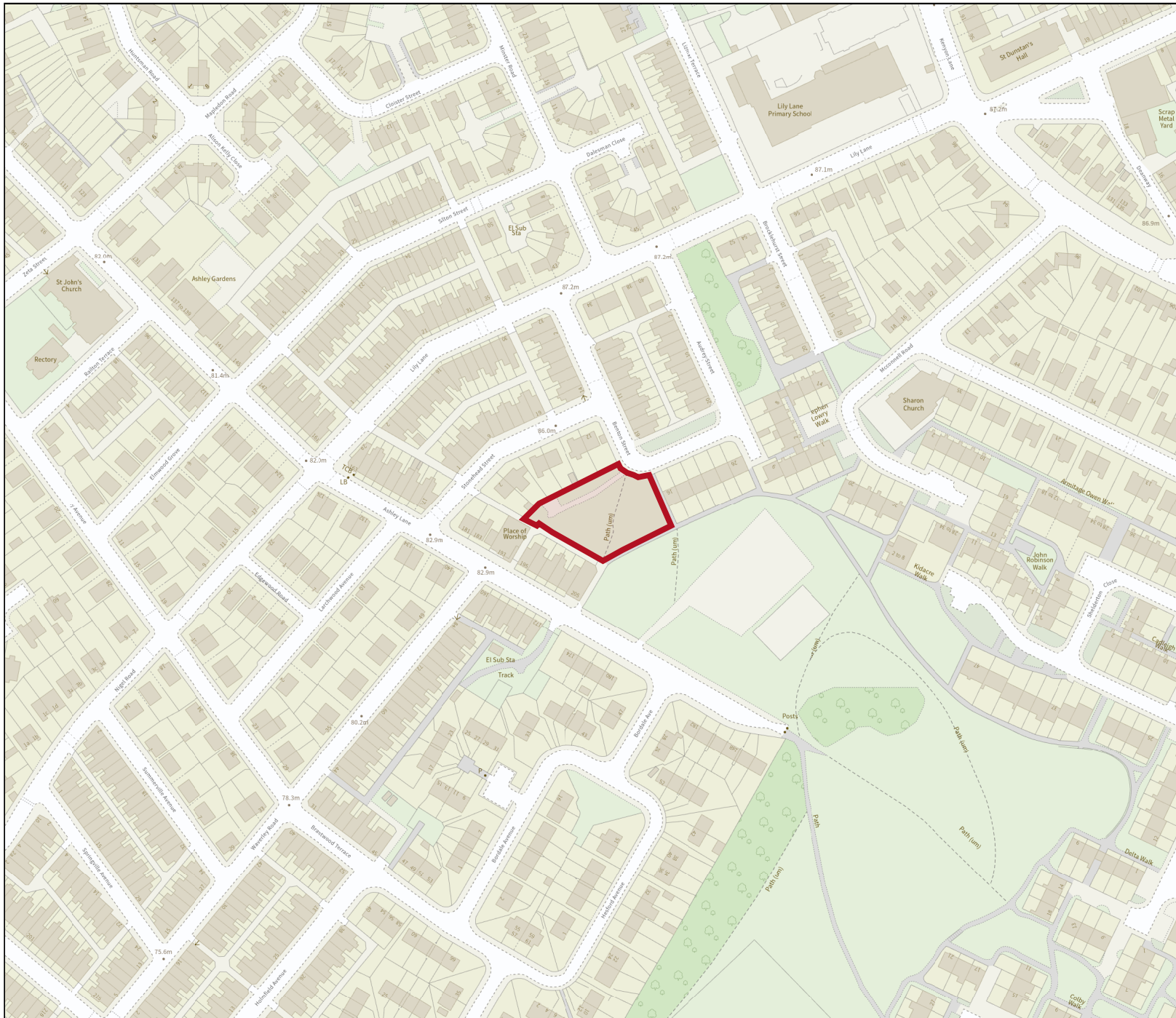
Notes

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
<Unspecified>

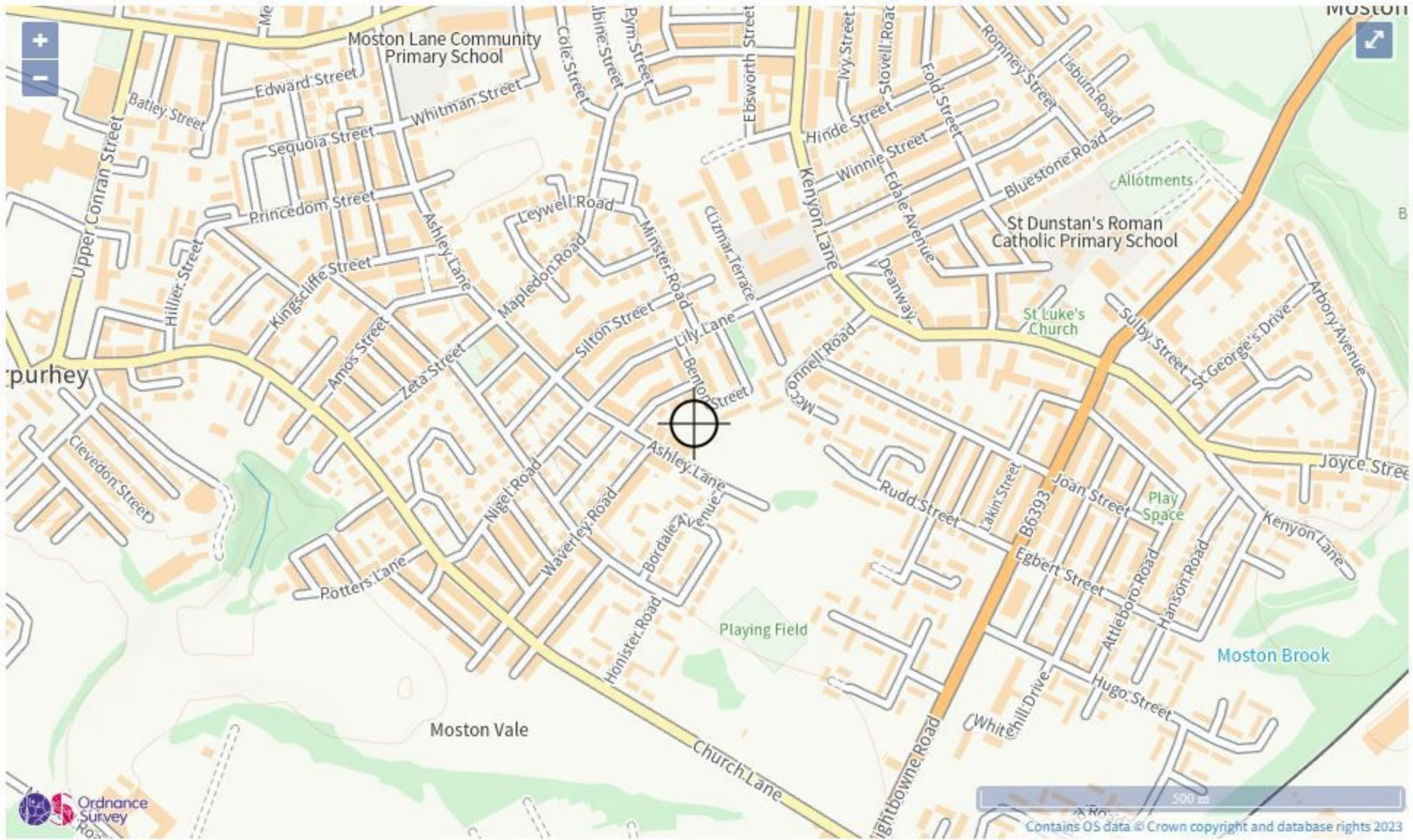
Location (easting/northing)
386935/401404

Scale
1:2500

Created
26 Jun 2023 15:47

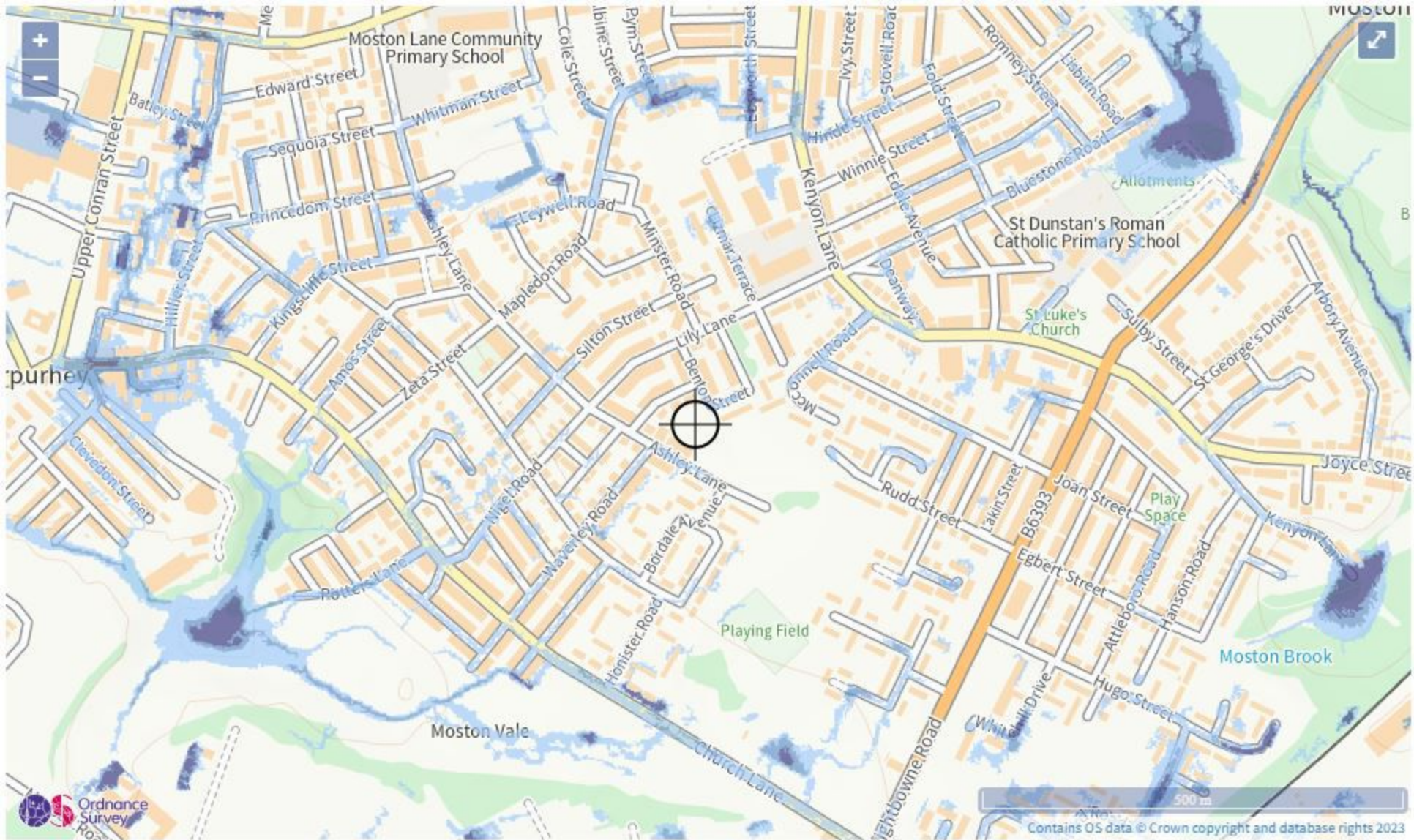
-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area


0 20 40 60m



Extent of flooding from rivers or the sea

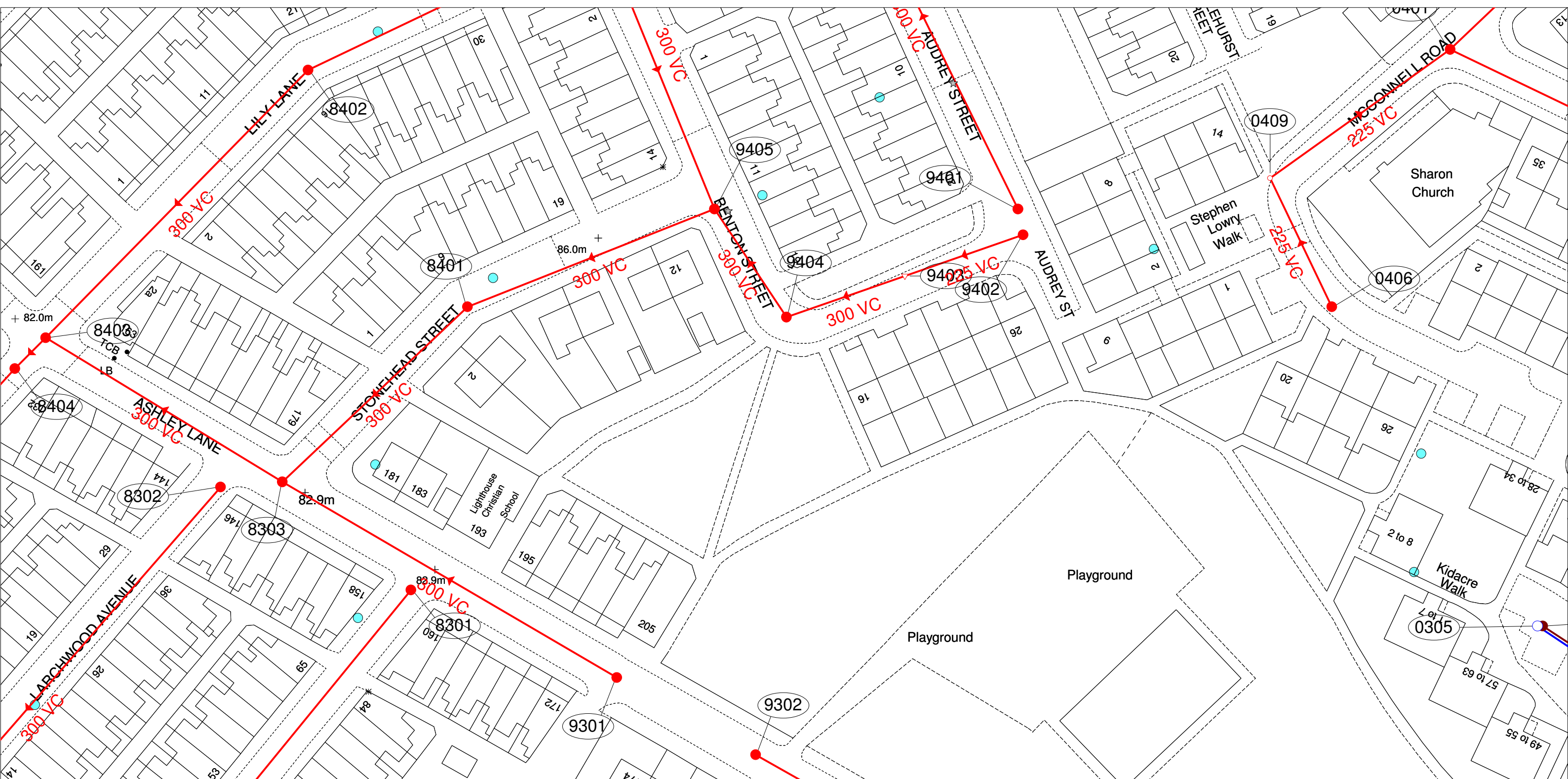
● High ● Medium ● Low ● Very low ⊕ Location you selected



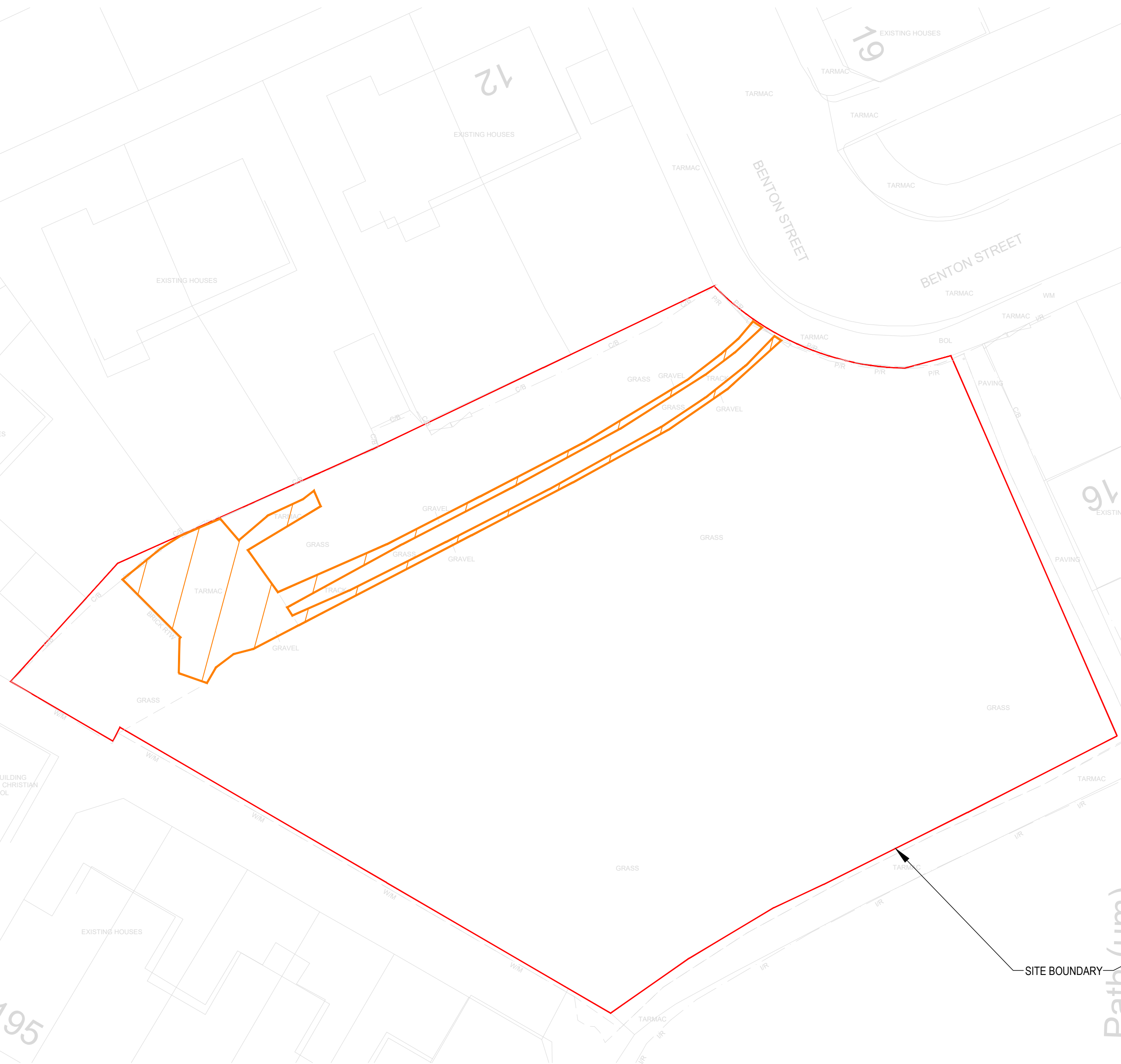
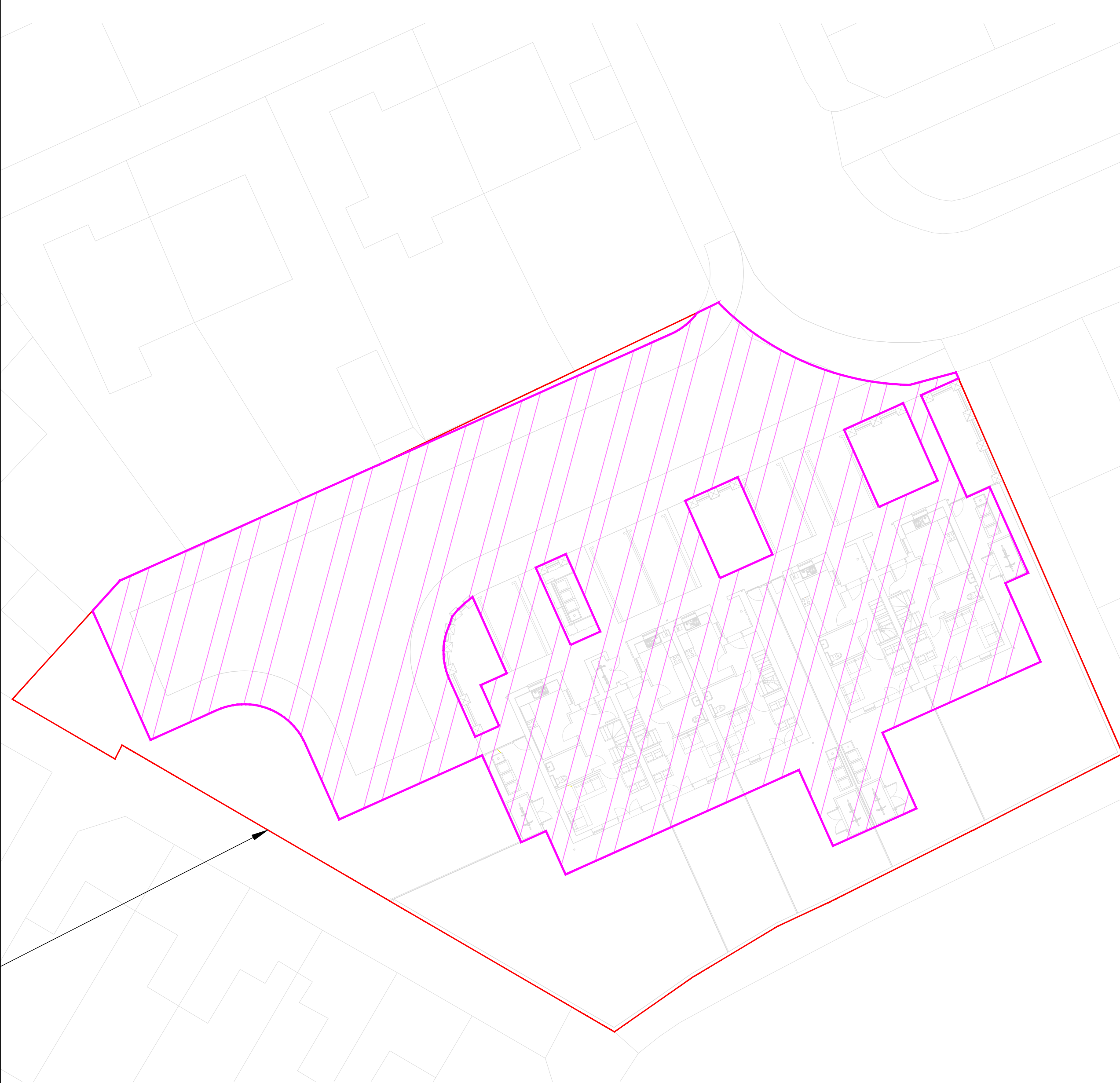
Extent of flooding from surface water

High Medium Low Very low Location you selected

Appendix F – Public Sewer Map & CCTV Survey



Appendix G – Pre & Post Development Impermeable Areas Drawing



AJP consulting engineers
est. 1978
0151 227 1462 info@ajpltd.co.uk 91 Dale Street, Liverpool, L2 2ET

Appendix H – Outline Drainage Strategy Drawing & SW Calcs

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.087	4-8	0.019

Total Area Contributing (ha) = 0.106

Total Pipe Volume (m³) = 20.455

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	28.693	0.480	59.8	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	13.797	0.170	81.0	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	31.415	0.525	59.8	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	6.813	0.250	27.2	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	8.501	0.020	425.1	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.004	26.702	0.070	381.5	0.030	0.00	0.0	0.600	o	825	Pipe/Conduit	
S1.005	4.003	0.085	47.1	0.023	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	7.903	0.400	19.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.37	85.610	0.015	0.0	0.0	0.0	1.30	23.0	2.0
S1.001	50.00	5.57	85.130	0.027	0.0	0.0	0.0	1.12	19.8	3.7
S2.000	50.00	5.40	85.485	0.012	0.0	0.0	0.0	1.30	23.0	1.6
S1.002	50.00	5.63	84.960	0.053	0.0	0.0	0.0	1.94	34.3	7.2
S1.003	50.00	5.73	83.975	0.053	0.0	0.0	0.0	1.43	766.4	7.2
S1.004	50.00	6.02	83.955	0.083	0.0	0.0	0.0	1.51	809.4	11.2
S1.005	50.00	6.07	83.885	0.106	0.0	0.0	0.0	1.47	26.0	14.4
S1.006	50.00	6.13	83.800	0.106	0.0	0.0	0.0	2.28	40.2	14.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW01	86.400	0.790	Open Manhole	600	S1.000	85.610	150				
SSW02	86.400	1.270	Open Manhole	600	S1.001	85.130	150	S1.000	85.130	150	
SSW03	86.400	0.915	Open Manhole	1200	S2.000	85.485	150				
SSW04	86.400	1.440	Open Manhole	1200	S1.002	84.960	150	S1.001	84.960	150	
								S2.000	84.960	150	
SSW05	86.000	2.025	Open Manhole	2700	S1.003	83.975	825	S1.002	84.709	150	59
SSW06	86.000	2.045	Open Manhole	2700	S1.004	83.955	825	S1.003	83.955	825	
SSW07	86.300	2.415	Open Manhole	2700	S1.005	83.885	150	S1.004	83.885	825	
SCW01	86.480	2.680	Open Manhole	1200	S1.006	83.800	150	S1.005	83.800	150	
SUU9404	86.690	3.290	Open Manhole	1200		OUTFALL		S1.006	83.400	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SSW01	386962.224	401402.008	386962.224	401402.008	Required	
SSW02	386935.860	401390.684	386935.860	401390.684	Required	
SSW03	386958.902	401416.107	386958.902	401416.107	Required	
SSW04	386930.226	401403.278	386930.226	401403.278	Required	
SSW05	386924.007	401400.496	386924.007	401400.496	Required	
SSW06	386920.536	401408.256	386920.536	401408.256	Required	
SSW07	386944.916	401419.146	386944.916	401419.146	Required	
SCW01	386948.564	401420.795	386948.564	401420.795	Required	
SUU9404	386952.461	401427.670			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	SSW01	86.400	85.610	0.640	Open Manhole	600
S1.001	o	150	SSW02	86.400	85.130	1.120	Open Manhole	600
S2.000	o	150	SSW03	86.400	85.485	0.765	Open Manhole	1200
S1.002	o	150	SSW04	86.400	84.960	1.290	Open Manhole	1200
S1.003	o	825	SSW05	86.000	83.975	1.200	Open Manhole	2700
S1.004	o	825	SSW06	86.000	83.955	1.220	Open Manhole	2700
S1.005	o	150	SSW07	86.300	83.885	2.265	Open Manhole	2700
S1.006	o	150	SCW01	86.480	83.800	2.530	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	28.693	59.8	SSW02	86.400	85.130	1.120	Open Manhole	600
S1.001	13.797	81.0	SSW04	86.400	84.960	1.290	Open Manhole	1200
S2.000	31.415	59.8	SSW04	86.400	84.960	1.290	Open Manhole	1200
S1.002	6.813	27.2	SSW05	86.000	84.709	1.141	Open Manhole	2700
S1.003	8.501	425.1	SSW06	86.000	83.955	1.220	Open Manhole	2700
S1.004	26.702	381.5	SSW07	86.300	83.885	1.590	Open Manhole	2700
S1.005	4.003	47.1	SCW01	86.480	83.800	2.530	Open Manhole	1200
S1.006	7.903	19.8	SUU9404	86.690	83.400	3.140	Open Manhole	1200

Free Flowing Outfall Details for Storm

Outfall Pipe	Outfall Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
--------------	----------------	--------------	--------------	--------------	------------------	----------	--------

S1.006 SUU9404 86.690 83.400 84.240 1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.300	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SSW07, DS/PN: S1.005, Volume (m³): 26.7

Unit Reference	MD-SHE-0100-5000-1400-5000
Design Head (m)	1.400
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	83.885
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0	Kick-Flo®	0.855	4.0
Flush-Flo™	0.416	5.0	Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	0.800	4.3	2.000	5.9	4.000	8.2	7.000	10.7
0.200	4.6	1.000	4.3	2.200	6.2	4.500	8.6	7.500	11.0
0.300	4.9	1.200	4.7	2.400	6.4	5.000	9.1	8.000	11.4
0.400	5.0	1.400	5.0	2.600	6.7	5.500	9.5	8.500	11.7
0.500	5.0	1.600	5.3	3.000	7.1	6.000	9.9	9.000	12.0
0.600	4.9	1.800	5.6	3.500	7.7	6.500	10.3	9.500	12.3

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Storage Structures for Storm

Porous Car Park Manhole: SSW03, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.1
Membrane Percolation (mm/hr)	1000	Length (m)	14.5
Max Percolation (l/s)	20.5	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.050	Cap Volume Depth (m)	0.350

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.360 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

									Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)
S1.000	SSW01	15 Winter	1	+0%					85.639	-0.121	0.000
S1.001	SSW02	15 Winter	1	+0%					85.171	-0.109	0.000
S2.000	SSW03	15 Winter	1	+0%					85.509	-0.126	0.000
S1.002	SSW04	15 Winter	1	+0%					85.004	-0.106	0.000
S1.003	SSW05	30 Winter	1	+0%	100/60 Winter				84.067	-0.733	0.000
S1.004	SSW06	30 Winter	1	+0%	100/60 Winter				84.066	-0.714	0.000
S1.005	SSW07	30 Winter	1	+0%	1/15 Summer				84.064	0.029	0.000
S1.006	SCW01	30 Winter	1	+0%					83.835	-0.115	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
S1.000	SSW01	0.08		1.8	OK
S1.001	SSW02	0.17		3.0	OK
S2.000	SSW03	0.05		1.2	OK
S1.002	SSW04	0.18		5.3	OK
S1.003	SSW05	0.01		4.1	OK
S1.004	SSW06	0.01		5.8	OK
S1.005	SSW07	0.24		4.4	SURCHARGED
S1.006	SCW01	0.13		4.4	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.360 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

									Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)
S1.000	SSW01	15 Winter	2	+0%					85.643	-0.117	0.000
S1.001	SSW02	15 Winter	2	+0%					85.178	-0.103	0.000
S2.000	SSW03	15 Winter	2	+0%					85.514	-0.121	0.000
S1.002	SSW04	15 Winter	2	+0%					85.011	-0.099	0.000
S1.003	SSW05	30 Winter	2	+0%	100/60 Winter				84.114	-0.686	0.000
S1.004	SSW06	30 Winter	2	+0%	100/60 Winter				84.113	-0.667	0.000
S1.005	SSW07	30 Winter	2	+0%	1/15 Summer				84.113	0.078	0.000
S1.006	SCW01	30 Winter	2	+0%					83.836	-0.114	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
S1.000	SSW01	0.10		2.3	OK
S1.001	SSW02	0.21		3.9	OK
S2.000	SSW03	0.08		1.7	OK
S1.002	SSW04	0.25		7.4	OK
S1.003	SSW05	0.02		5.4	OK
S1.004	SSW06	0.01		7.1	OK
S1.005	SSW07	0.26		4.7	SURCHARGED
S1.006	SCW01	0.13		4.7	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.360 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

									Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)
S1.000	SSW01	15 Winter	30	+0%					85.656	-0.104	0.000
S1.001	SSW02	15 Winter	30	+0%					85.201	-0.079	0.000
S2.000	SSW03	15 Winter	30	+0%					85.525	-0.110	0.000
S1.002	SSW04	15 Winter	30	+0%					85.040	-0.070	0.000
S1.003	SSW05	60 Winter	30	+0%	100/60 Winter				84.307	-0.493	0.000
S1.004	SSW06	30 Winter	30	+0%	100/60 Winter				84.307	-0.473	0.000
S1.005	SSW07	30 Winter	30	+0%	1/15 Summer				84.307	0.272	0.000
S1.006	SCW01	60 Summer	30	+0%					83.838	-0.112	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
S1.000	SSW01	0.20		4.4	OK
S1.001	SSW02	0.45		8.1	OK
S2.000	SSW03	0.16		3.5	OK
S1.002	SSW04	0.54		15.8	OK
S1.003	SSW05	0.02		6.6	OK
S1.004	SSW06	0.02		11.6	OK
S1.005	SSW07	0.27		5.0	SURCHARGED
S1.006	SCW01	0.14		5.0	OK

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XP Solutions	Network 2019.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.360 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
S1.000	SSW01	15 Winter	100	+45%					85.674	-0.086
S1.001	SSW02	15 Winter	100	+45%					85.237	-0.043
S2.000	SSW03	15 Winter	100	+45%					85.541	-0.094
S1.002	SSW04	15 Winter	100	+45%					85.094	-0.015
S1.003	SSW05	60 Winter	100	+45%	100/60 Winter				84.873	0.073
S1.004	SSW06	60 Winter	100	+45%	100/60 Winter				84.873	0.093
S1.005	SSW07	60 Winter	100	+45%	1/15 Summer				84.873	0.838
S1.006	SCW01	360 Winter	100	+45%					83.838	-0.112

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Cap. (l/s)	Flow (l/s)	Overflow (l/s)		
S1.000	SSW01	0.000	0.37	8.2		OK	
S1.001	SSW02	0.000	0.83	15.1		OK	
S2.000	SSW03	0.000	0.29	6.5		OK	
S1.002	SSW04	0.000	1.00	29.1		OK	
S1.003	SSW05	0.000	0.04	12.3		SURCHARGED	
S1.004	SSW06	0.000	0.02	14.3		SURCHARGED	
S1.005	SSW07	0.000	0.27	5.0		SURCHARGED	
S1.006	SCW01	0.000	0.14	5.0		OK	