

Surface Water Drainage Scheme

(Submitted in Discharge of Condition 8)

Site: Renshaw House, Hyde Grove, Manchester M13 9LQ

Planning Permission: Renshaw House – PBSA (76 units)

Applicant: Harvale 2 Ltd

Drainage Engineer: JCC Consulting Engineers

Ground Investigation: Solmek Ltd

1. Purpose of This Submission

This Surface Water Drainage Scheme is submitted to discharge **Condition 8** of the planning permission.

The purpose of this submission is to confirm how surface water from the development will be managed in a sustainable manner, informed by **site-specific ground investigation and infiltration testing**, and in accordance with the **approved Drainage Strategy and drawings** submitted at planning stage.

This document builds upon the approved strategy and updates it where necessary to reflect confirmed ground conditions.

2. Planning Condition Context

Condition 8 requires:

“A surface water drainage scheme for the site, based on sustainable drainage principles, shall be submitted to and approved in writing by the Local Planning Authority.”

Reason for the condition:

“To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution, pursuant to policies within the NPPF and NPPG and Manchester Core Strategy (2012) policies EN08 and EN14.”

This submission directly addresses the above by:

- Applying the SuDS hierarchy correctly
- Demonstrating why infiltration is not viable at this site
- Confirming controlled discharge and attenuation measures
- Ensuring flood risk and pollution risk are properly managed

3. Approved Drainage Strategy (Planning Baseline)

A comprehensive **Drainage Strategy** was approved as part of the planning permission, prepared by **Burrows Graham Ltd** (Document Ref: 30094-BGL-XX-XX-RP-C-00002, Version 4).

That strategy establishes the following key principles:

- The site is located within **Flood Zone 1**
- The development is classed as **very low flood risk**
- Surface water is to be managed in line with the SuDS hierarchy
- Attenuation and controlled discharge to the local combined sewer are proposed
- A 50% betterment on brownfield runoff rates is achieved

This approved Drainage Strategy remains the basis of the drainage approach and is included as **Appendix A** to this submission

4. Site Investigation and Infiltration Testing

Following planning approval, a site investigation and soakaway testing exercise was undertaken by **Solmek Ltd** to confirm whether infiltration-based drainage would be feasible.

Testing Methodology

- Soakaway tests were carried out in boreholes BH02, BH04 and BH05
- Testing was undertaken broadly in accordance with **BRE Digest 365 (2016)**
- Tests were conducted to appropriate depths and durations

Results

Across all boreholes tested:

- No measurable infiltration was recorded
- Calculated soil infiltration rate was **0.00×10^{-6} m/s**
- Ground conditions comprise **low-permeability cohesive clay soils**

Solmek conclude that infiltration drainage (e.g. soakaways) is **not suitable** for the site.

The soakaway test results and calculations are included in full at **Appendix B**

5. SuDS Hierarchy Assessment

The SuDS hierarchy has been revisited using the confirmed site investigation data.

Infiltration

- Tested on site
- Proven not viable due to zero infiltration rates

Attenuation with Controlled Discharge

- Appropriate and achievable
- Supported by the approved Drainage Strategy
- Provides flood risk betterment and pollution control

The drainage solution therefore correctly moves down the SuDS hierarchy in accordance with national guidance.

6. Proposed Surface Water Drainage Strategy

The surface water drainage strategy for the development is as follows:

- Surface water runoff from roofs and hardstanding areas is collected via a piped system
- Runoff is attenuated on site using a combination of:
 - Green roofs
 - Permeable paving
 - Below-ground attenuation storage
- Discharge is restricted via a flow control device
- Surface water discharges to the local combined sewer at a controlled rate

The strategy ensures no increase in flood risk on or off site.

7. Discharge Rates and Flood Risk Management

In accordance with the approved Drainage Strategy:

- The site is treated as brownfield
- Existing brownfield runoff rates have been assessed
- A **50% betterment** is achieved, resulting in a restricted discharge rate of **6.3 l/s**

Hydraulic modelling demonstrates:

- No flooding for events up to the 1 in 30 year storm
- No off-site flood risk for the 1 in 100 year storm plus 30% climate change

These calculations are included within the approved Drainage Strategy documentation.

8. Water Quality and Pollution Control

Water quality has been addressed through:

- Use of permeable paving where applicable
- Incorporation of appropriate drainage components
- Controlled discharge arrangements

These measures ensure compliance with policy requirements relating to pollution prevention and water quality protection.

9. Approved Drainage Drawing

The approved **Proposed Surface Water Drainage Strategy drawing** illustrates:

- Surface water pipe routes
- Attenuation tank location
- Flow control arrangement
- Connection to the existing combined sewer

This drawing forms part of the approved planning submission and is included as **Appendix C** to this document.

10. Ongoing Design Coordination

Further coordination is ongoing with the project architect and drainage engineer to finalise:

- SVP locations
- Pop-up and connection positions
- Detailed construction levels

These refinements will not alter the approved drainage principles, attenuation volumes or discharge rates set out in this submission.

11. Compliance Statement

This Surface Water Drainage Scheme:

- Is based on site-specific investigation and testing

- Applies sustainable drainage principles correctly
- Manages flood risk and pollution effectively
- Complies with the **NPPF**, **NPPG** and **Manchester Core Strategy policies EN08 and EN14**

It therefore fully satisfies the requirements and reason for **Condition 8**.

12. Conclusion

The proposed surface water drainage scheme represents the most appropriate and sustainable solution for the site, having regard to confirmed ground conditions and the approved planning strategy.

The applicant respectfully requests that **Condition 8 be discharged**.

Appendices

Appendix A – Approved Drainage Strategy (Burrows Graham Ltd, Rev 4)

Appendix B – Solmek Ltd Soakaway Test Results and Calculations

Appendix C – Approved Proposed Surface Water Drainage Strategy Drawing

APPENDIX A

**Renshaw House,
Manchester**

Drainage Strategy

for

MIA JAMES
CONSTRUCTION & INTERIORS

Ref: 30094-BGL-XX-XX-RP-C-00002

Version 4
6th November 2024

DOCUMENT CONTROL SHEET

Issued by: Burrows Graham Limited
5 Ambassador Place
Stockport Road
Altrincham
WA15 8DB

Tel: +44 (0)161 804 8046

Client : Mia James Construction & Interiors

Project: Renshaw House, Manchester

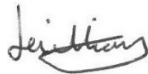
Document No: 30094-BGL-XX-XX-RP-C-00002

Title: Drainage Strategy

Status: FOR REVIEW

Date: 22.01.2024

Document Production Record

Version Number:	4	Name	Signature
Prepared		Jack Lee	
Checked		Jack Williams	
Approved		Jack Williams	

Document Revision Record

Version Number	Date	Revision Details
1	22.01.2023	DRAFT FOR COMMENT
2	12.04.2024	DRAFT FOR COMMENT – UPDATED DEVELOPMENT INFORMATION
3	16.05.2024	UPDATED SITE LAYOUT
4	06.11.2024	UPDATED SITE LAYOUT

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1.0 - PROJECT BACKGROUND

1.1 - Appointment

Burrows Graham Limited have been commissioned by 'Mia James Construction & Interiors' (referred to as 'the applicant' hereafter) to undertake a drainage strategy of suitable scope to support a planning application for a proposed Student Residential building on the junction of Plymouth Grove and Hyde Grove, Manchester.

1.2 - Aim of study

This Drainage Strategy has been developed in due cognisance of all relevant available policy information. It is anticipated that this report will satisfy the requirements of the National Planning Policy Framework (NPPF) and all relevant flood risk planning policies.

1.3 - Relevant policy and strategy documents

A full planning application is being submitted on behalf of the applicant for the 0.14ha site at the junction of Hyde Grove and Plymouth Grove Street.

The development will be a re-purpose of the existing site for a Purpose-Built Student Accommodation (PBSA) providing a high-quality development. Renshaw House is on the existing site which will need to be demolished and the PBSA erected in its place.

The proposed development comprises a 4-floor (5-storey) building with; en-suite bedrooms, kitchen and dining spaces, a communal social space, vehicular access, disabled access, bike storage, courtyard and public amenity areas, plant and servicing and a social space with frontage on to Hyde Grove.

There are 76 proposed studio units and each has a shower, toilet, and sink.

The proposed development will utilise green roofs, permeable paving and is surrounded on two sides by soft landscaping.

The development can be classed as:

- 'Very low risk' in accordance with the 'gov.uk' website for Flood risk from surface water and Flood risk from rivers of the sea.
- 'Less vulnerable' in accordance with guidance set out on the 'gov.uk' website, namely 'Table 2: Flood vulnerability classification'.
- 'Not within a Critical Drainage Catchment' as defined in the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA Critical Drainage Areas.



Figure 1 – Development Ground Floor Plans – P09 (APPENDIX A)

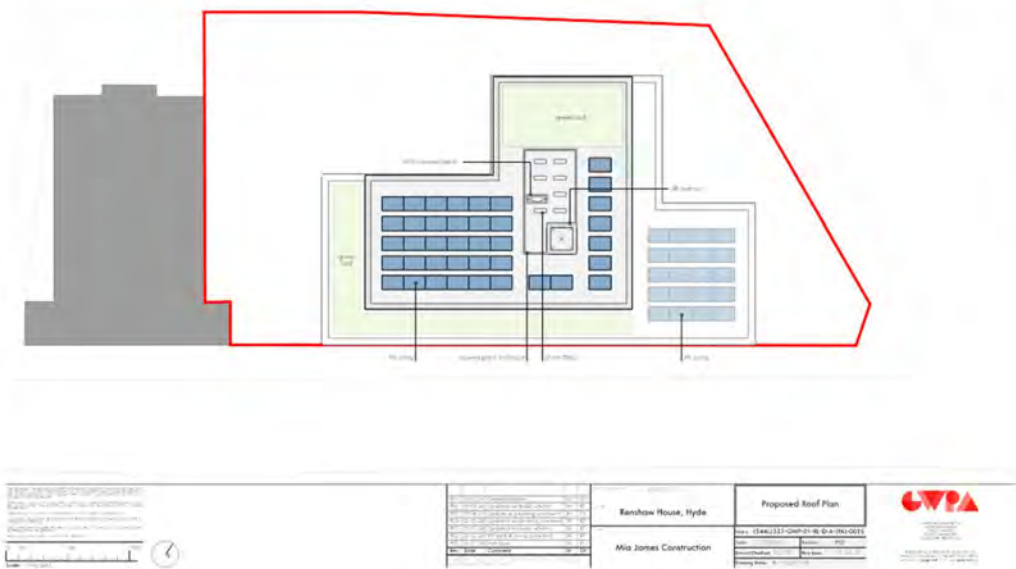


Figure 2 - Development Roof Plan - P07 (APPENDIX A)

2.0- SITE DETAILS

2.1- Site description

Table 1 - Site characteristics

Site address	Renshaw House, Manchester, Hyde Grove, Brunswick, Chorlton-on-Medlock, Manchester M13 9LQ
Grid reference	SJ 85330 96380
Area (hectares)	The site boundary has been measured to be 0.14 hectares.
Usage	PBSA
Surroundings	The site is located in south-east Manchester. - To the north-east, the boundary is defined by Plymouth Grove, A5184 and beyond the A-road there is a number of residential plots for c. 400m. - To the south-east the boundary is defined by Hyde Grove where the development will be accessed. Beyond Hyde Grove there are a number of apartment blocks and Swinton Grove Park is c.120m away. - To the south-west, the boundary is defined by Hyde Grove Chapel 'The Old Church'. - To the west is Manchester Blood Donor Centre, beyond this is Upper Brook Street, A34 which leads north to Manchester Ring Road. - To the north-west is also Manchester Blood Donor Centre, Manchester Central Ambulance Centre and their ancillary carpark. - The wider landscape comprises of commercial and residential building, mainly hardstanding roads with scattered soft landscaping.
Topography	Site levels are generally flat, all the levels within the existing grass area to the north-east of the site are within the 42.00m to 42.40m AOD range. The site itself is slightly elevated from its surroundings as the footpaths to the north and south-east are around 42.90mAOD. A copy of the topographical survey has been included in APPENDIX B of this report.



Figure 3 - Site Location Plan - Google Earth Image 2024

2.2- Existing drainage

The United Utilities Sewer Records have been displayed in APPENDIX C of this report as part of this report. In proximity to the development there are only Combined Public Sewers, to the north, in Plymouth Grove and to the east in Hyde Grove.

The Combined Sewer in;

- Plymouth Grove, to the north, takes sewage from east to west under Plymouth Grove then north up Leigh Street to the wider UU network.
- Hyde Grove, to the east, takes sewage south away from Plymouth Grove, under Manchester NHS blood donor car park into the A34, Upper Brook Street to the wider UU network. The head of this run is west of the proposed development, set back from the junction of Hyde Grove and Plymouth Road.

From UU records there is no indication of invert levels however it is assumed these can be connected via gravity connections.

There is a trunk main under Plymouth Grove and the connecting distribution main in Hyde Grove which has a stub into the proposed development with a stop tap adjacent to the Old Church.

2.4 - Geology and hydrogeology

Details below are based on publicly available information at the time of writing this FRA.

The following information has been taken from publicly available information as there hasn't been a ground investigation to date. The British Geological Survey (BGS), GeoIndex Onshore data shows the site is underlain by Sherwood Sandstone Group which may occur as dene sand or extremely weak sandstone, often to depths of tens of meters. The superficial engineering geology is fine layered till. This is firm to very stiff or hard slightly gravelly sandy clay with interbeds of laminated clay/silt and beds/lenses of sand and gravel. Excavations likely

to require immediate support due to water-bearing layers/lenses of silt, sand and gravel. Engineering fill is suitable as general cohesive fill depending on plasticity and water content. Generally, should be placed as soon as possible after excavation and subject to minimum construction traffic when wet. Site Investigation recommended to determine deposit thickness and lithological variation, including the presence of laminated silts and clays and water-bearing sand and gravel layers.

The bedrock engineering geology is Sandstone and Conglomerate/Breccia 8:1. Described as very weak to very strong coarse-grained conglomerate or breccia, comprising rounded or angular clasts of gravel-size or larger in a finer indurated or cemented matrix. May weather to silty, sandy gravels, cobbles or boulders depending on inherent clast size. Permeabilities are variable but may be low to very high flow through matrix and discontinuities. Site investigations are required to confirm whether infiltration at this site is viable, based on the superficial engineering geology it does not appear likely.

2.5- Flood Risk Assessment

Refer to the Flood Risk Assessment, document reference 30094-BGL-XX-XX-RP-D-00001 which has been included in the wider planning application.

3.0– SURFACE WATER DRAINAGE STRATEGY

3.1 – Disposal of surface water

The method for removal of surface water from the site has been selected in accordance with the hierarchy outlined in Building Regulations Part H as summarised below:

- Infiltration to the ground,
- Discharge to a watercourse,
- Connection to a surface water sewer,
- Connection to a combined sewer.

The site is brownfield and based on aerial imagery approximately 65% is built up and hardstanding whereas the remaining 35% is soft landscaped area. An outline assessment of the existing brownfield rates can be estimated using the modified rational method, this is shown below in section '3.6 – Discharge rates'.

3.2 – Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) will be utilised in line with The SuDS Manual (C753) guidance and aim to minimise the impact a development has on the run-off quantity and quality and maximise amenity and biodiversity opportunities.

The management train approach is a fundamental principle of SuDS, it aims to primarily reduce pollution, flow rates and volume of run-off from the site. The main objective is to treat the run-off as close to the source as possible and it is imperative that **at least two** of the following should be included within the drainage strategy.

- **Prevention** – The use of good site design and rainwater re-use measures to prevent run-off.
- **Source Control** – Controlling the run-off as close to source as possible by using; green roofs, permeable pavements and soakaways.
- **Site Control** – Use of water management techniques within local area, i.e. detention basins and geo-cellular storage.
- **Regional Control** – Management of water from a number of sites in a specific location, i.e. balancing ponds and wetlands.

The drainage strategy for this development will incorporate **Source Control**; green roofs and permeable paving and **Site Control**; flow control.

Details of how the SuDS hierarchy have been reviewed are shown in the table below.

Table 2 – Detailed SuDS Hierarchy review

Order of Priority	Sustainable Drainage Measures	Suitability (Y/N)	Comments
1	Store rainwater for later use	N	Discounted – no requirement for any irrigation within the proposed development.
2	Use infiltration techniques, such as porous surfaces in non-clay areas	N	Discounted – the underlying soil characteristics inhibit using infiltration as a method of disposal i.e. soakaways. Borehole records show a record of firm to very stiff or hard slightly gravelly sandy clay with interbeds of laminated clay/silt and beds/lenses of sand and gravel. Site investigation is required to confirm but unlikely based on lithology.
3	Attenuate rainwater in ponds or open water features for gradual release	N	Discounted – spatial constraints. Filtration and attenuation provided elsewhere – see below.
4	Implement green roofs for water retention	Y	Green roofs to be provided where possible.
5	Attenuate rainwater beneath permeable surfaces such as car parks	Y	Attenuation has been proposed within the granular sub-base, which is to be drained via the surface water network.
6	Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Should the attenuation volumes suggested in #4 and/or the volume of the granular sub-base in #5 not be adequate underground storage may be required.
7	Discharge rainwater direct to a watercourse	N	Discounted – all flows are controlled at source and outfall into the local UU sewer network.
8	Discharge rainwater to a surface water sewer/drain	N	There are no local separate foul or surface water UU sewers, only a combined sewer which will the site will discharge to.
9	Discharge rainwater to the combined sewer	Y	There are no local foul and surface water UU sewers, only a combined sewer which the site will discharge to. Water will discharge to local UU sewers after the flows being controlled on site and surface water passed through a by-pass separator to remove pollutants.

3.3 – General strategy

For details of the outline drainage proposals for the site, reference should be made to drawing (ref: 30094-BGL-XX-XX-DR-S-00250), which has been included in APPENDIX D of this report.

3.4 – Total site area and impermeable areas

The total drained impermeable area of the proposed development has been measured to be 0.14 hectares.

3.5 – Climate Change

In line with the latest Department for Environment Food & Rural Affairs guidance¹ and the Manchester City, Salford and Trafford Councils Level 1 SFRA, a 30% central allowance has been made as there is no recommendation to use an upper end allowance.

3.6 – Discharge rates

The site is considered to be a brownfield development, based on aerial imagery approximately 65% is built up and hardstanding whereas the remaining 40% is soft landscaped area. An outline assessment of the existing brownfield rates can be estimated using the modified rational method, this is shown below.

Total site area = 0.14ha

65% hardstanding = 0.091ha. For comparison the hard standing area being developed is 0.09ha.

The brownfield run-off based on a standard rainfall intensity of 50mm/h ($50 \times 2.78 \times 0.091$) is 12.6l/s. Applying a 50% brownfield betterment, in accordance with LFRM policy 6, yields a restricted overall design rate of 6.3l/s.

It is anticipated there will be one combined outfall on site with surface water restricted and a non-return valve prior to the relatively short combined run into the local UU sewer.

3.7 – Attenuation storage

In order to achieve the restriction in peak rate of surface water run-off from the developed site as described above, attenuation storage will be required in order to temporarily store the residual volume of surface water for rainfall events resulting in a peak run-off rate over and above 6.3l/s.

Attenuation is to be designed to ensure that there is no surface water flooding on site for rainfall events up to and including the 1 in 30-year storm event. The attenuation storage will be designed to ensure that surface water run-off for storm events up to and including the 100-year storm plus a 30% allowance will not cause a risk of flooding to properties or increase the flood risk outside of the site.

A 30% climate change allowance is proposed in accordance with DEFRA which is based upon the central allowance for a development with an expected design life into 2070s.

Attenuation will be achieved by implementing green roofs, storing rainwater beneath permeable surfaces such as car parks and within sealed tanks beneath the ground for gradual release.

A hydraulic modelling exercise of the proposed drainage system has been undertaken and the results have been included in APPENDIX E of this report.

3.8 – Water quality

Water quality has been considered and the following measures have been included within the surface water drainage proposals:

- All drainage from car park areas, which are considered low risk will pass through either a Class 1 bypass separator or permeable paving prior to discharging to the local combined sewer.

¹ [Climate change allowances for peak rainfall in England \(data.gov.uk\)](https://data.gov.uk/dataset/14444/Climate-change-allowances-for-peak-rainfall-in-England)

- Silt will be prevented from entering the system by the use of channels with silt traps and catch pits where required.

3.9 – Maintenance

Reference should be made to the Drainage Inspection and Maintenance Schedule in Appendix **Error! Reference source not found.**, which includes required actions and typical frequencies for all drainage infrastructure serving the development.

The drainage will be managed and maintained by an appointed Management Company.

4.0 – Foul water drainage strategy

The only sewer in proximity of the development is a combined United Utilities sewer, therefore the foul shall discharge to this.

The strategy is to combine with surface water on site in a short, combined run with no return valves prior to discharging to the local foul sewer in Hyde Grove.

The foul flows will outfall at an unrestricted rate into this combined sewer and the rate of discharge is to be agreed with UU.

At this stage, an assessment of the anticipated average foul flow from the PBSA has been carried out in accordance with guidance set out in Flows and Loads – 4 (British Water 2013), which stipulates a figure of 100litres/unit/dwelling/day for Students (Accommodation Only). It should be noted that the average foul flows from the residential towers have been increased by 10% to account for student amenity space.

Table 3 - Foul drainage discharge rate

No. dwellings	Foul discharge per day	Foul discharge flow rate
76	8360	0.10 l/s

5.0 - MITIGATION / MANAGEMENT OF FLOOD RISK

5.1– Access and egress

Access to and egress from the site will be provided by one access of Hyde Grove. The whole site is within flood zone 1 therefore safe means of access / egress is available to the site at all times.

5.2 - Drainage & exceedance flow routes

The proposed surface water drainage system will be designed in accordance with the drainage strategy set out in Section 5 of this report. This will ensure that there is no increase in flood risk to the site or elsewhere in the local catchment for all storm events up to and including the 100-year storm plus 30% climate change.

It should be noted that if storm events in excess of the 100-year storm plus 30% climate change or blockages occur, this will result in flood water arising from the site drainage system. If the site drainage system were to flood, it is considered that any surface water arising from the site drainage system would be contained within the overall site boundary.

6.0 – CONCLUSION

This Flood Risk Assessment and Drainage Strategy has concluded that the development is appropriate and can be occupied safely subject to implementation of the flood risk mitigation described in this report being carried out.

APPENDIX A

DEVELOPMENT SITE, GROUND FLOOR PLAN AND ROOF PLANS

KEY

- Studio Bedroom - 2no.
- EA Study Bedroom - 2no.
- Social space - 235m² (2.97m² per bed)
- Circulation Core
- Plant
- Cleaners Store
- Circulation
- Bins
- Cycles Store
- Administration
- Existing Trees
- Root Protection Zone
- Proposed Trees

TOTAL BEDS - 4no

Cycle Parking

Internal secure cycle spaces (double stacked)	36
External enclosed secure cycle spaces (double stacked)	32
Internal secure 'Sheffield Hoop' spaces	4
Internal secure 'EA Cargo bike' spaces	2
External 'Sheffield Hoops' visitor spaces	6
TOTAL Cycle spaces	80



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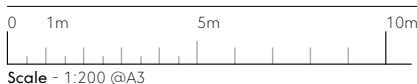
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P09	30.10.24	General update	JW	RT
P08	10.09.24	Updated as Studio scheme	TA	RT
P07	09.08.24	Update as planning comments	JH	TA
P06	08.05.24	Update to suit tree survey	TA	RT
P05	02.05.24	Updated as planning comment	TA	RT
P04	27.03.24	Doors updated to suit levels	TA	RT
P03	21.03.24	Updated to cluster scheme	TA	RT
P02	23.02.24	Cycle parking updated	TA	RT
Rev	Date	Comment	Dr	Ch

GWP Job Reference	(544)2337
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Job Title	Renshaw House, Hyde
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Client

Mia James Construction

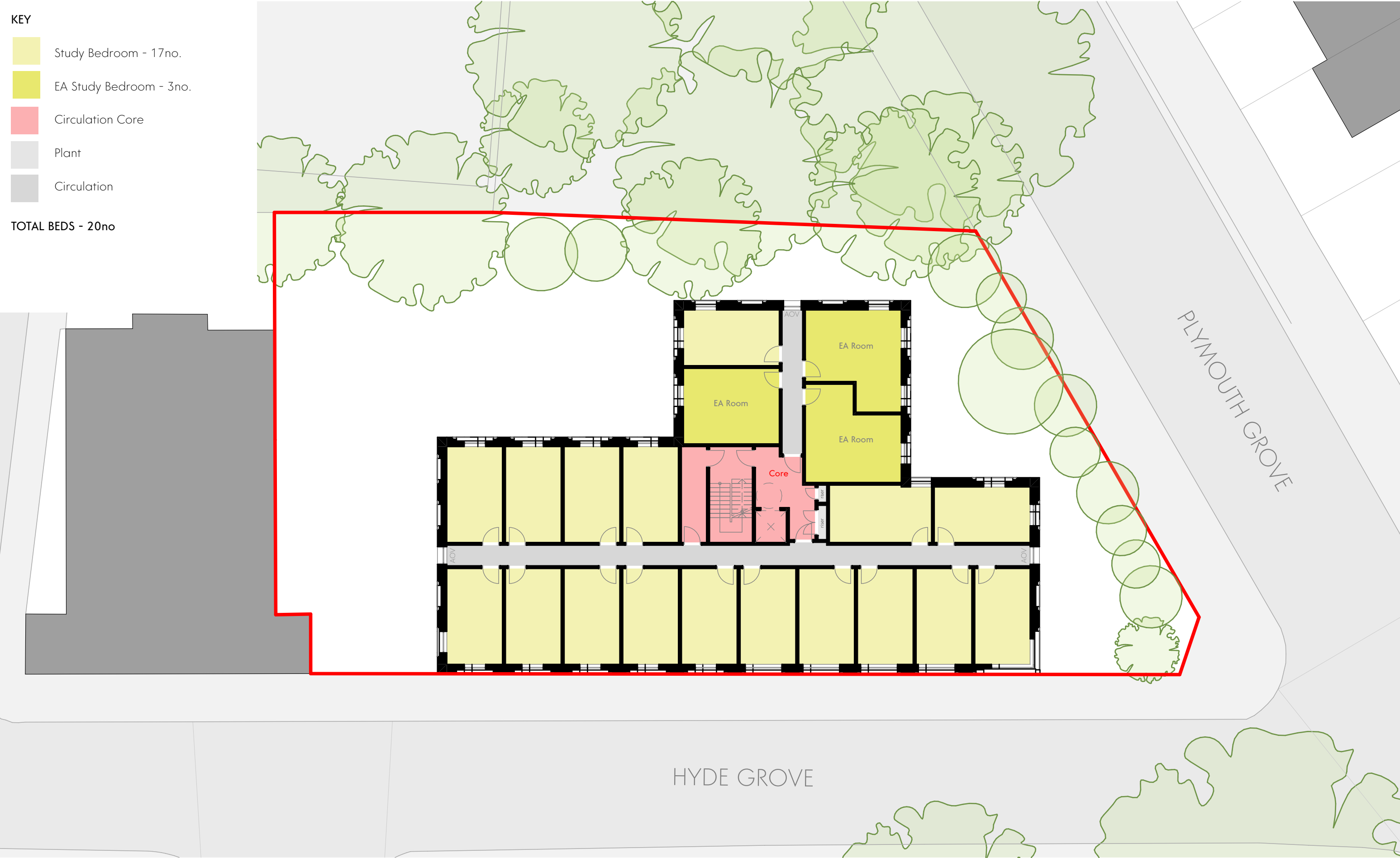
Proposed Ground Floor Plan

Name (544)2337-GWP-01-GF-D-A-(PA)-0009			
Scale 1:200@A3		Revision P09	
Drawn/Checked MH / TA		First Issue 23.02.24	
Drawing Status A - Approval			



CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane, Leeds LS8 1PQ
+44(0)113 266 6044 (t) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com



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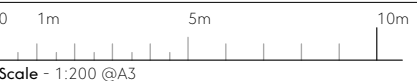
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P06	30.10.24	General update	JW	RT	
P05	10.09.24	Updated as Studio scheme	TA	RT	
P04	09.08.24	Update as planning comments	JH	TA	
P03	02.05.24	Updated as planning comment	TA	RT	
P02	21.03.24	Updated to cluster scheme	TA	RT	
P01	15.02.24	First Issue	TA	RT	
Rev	Date	Comment	Dr	Ch	
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GWP Job Reference	(544)2337
Job Title	Renshaw House, Hyde
Client	Mia James Construction

Proposed First Floor Plan	
Name	(544)2337-GWP-01-01-D-A-(PA)-0010
Scale	1:200@A3
Revision	P06
Drawn/Checked	MH / TA
First Issue	15.02.24
Drawing Status	A - Approval



CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane, Leeds LS8 1PQ
+44(0)113 266 6044 (f) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com



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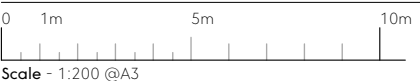
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P07	30.10.24	General update	JW	RT	
P06	10.09.24	Updated as Studio scheme	TA	RT	
P05	09.08.24	Update as planning comments	JH	TA	
P04	02.05.24	Updated as planning comment	TA	RT	
P03	21.03.24	Updated to cluster scheme	TA	RT	
P02	23.02.24	PV added, terrace omitted	TA	RT	
P01	15.02.24	First Issue	TA	RT	
Rev	Date	Comment	Dr	Ch	
/Volumes/Studio/CAD/5442337-Renshaw House - Manchester/A_Architects/GWP/Model/Renshaw House - Manchester - (544)2337-GWP-01-XX-M3-A-RenshawHouse-StudioReducedHeightOption2-P10.pln					

GWP Job Reference (544)2337

Job Title Renshaw House, Hyde

Client Mia James Construction

Proposed Roof Plan

Name	(544)2337-GWP-01-RL-D-A-(PA)-0015		
Scale	1:200@A3	Revision	P07
Drawn/Checked	TA / RT	First Issue	16.02.24
Drawing Status	A - Approval		



CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane, Leeds LS8 1PQ
+44(0)113 266 6044 (f) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com

APPENDIX B

TOPOGRAPHICAL SURVEY



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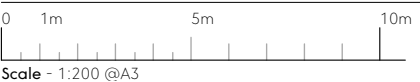
All drawings and specifications should be read in conjunction with the project health and safety plan; any possible conflicts should be presented to the Planning Coordinator.

All work to be carried out in accordance with current Building Regulations.

Contractors must verify all dimensions at the job before commencing any work or making shop drawings!

Written dimensions should be taken. Do not scale off drawing. Do not take digital dimensions from this drawing.

Any discrepancies to be reported to the Architect.



P07	30.10.24	General update	JW	RT	
P06	10.09.24	Updated as Studio scheme	TA	RT	
P05	09.08.24	Update as planning comments	JH	TA	
P04	02.05.24	Updated as planning comment	TA	RT	
P03	21.03.24	Updated to cluster scheme	TA	RT	
P02	23.02.24	PV added, terrace omitted	TA	RT	
P01	15.02.24	First Issue	TA	RT	
Rev	Date	Comment	Dr	Ch	
/Volumes/Studio/CAD/5442337-Renshaw House - Manchester/A_Architects/GWP/Model/Renshaw House - Manchester - (544)2337-GWP-01-XX-M3-A-RenshawHouse-StudioReducedHeightOption2-P10.pln					

GWP Job Reference (544)2337

Job Title Renshaw House, Hyde

Client Mia James Construction

Proposed Roof Plan

Name	(544)2337-GWP-01-RL-D-A-(PA)-0015		
Scale	1:200@A3	Revision	P07
Drawn/Checked	TA / RT	First Issue	16.02.24
Drawing Status	A - Approval		

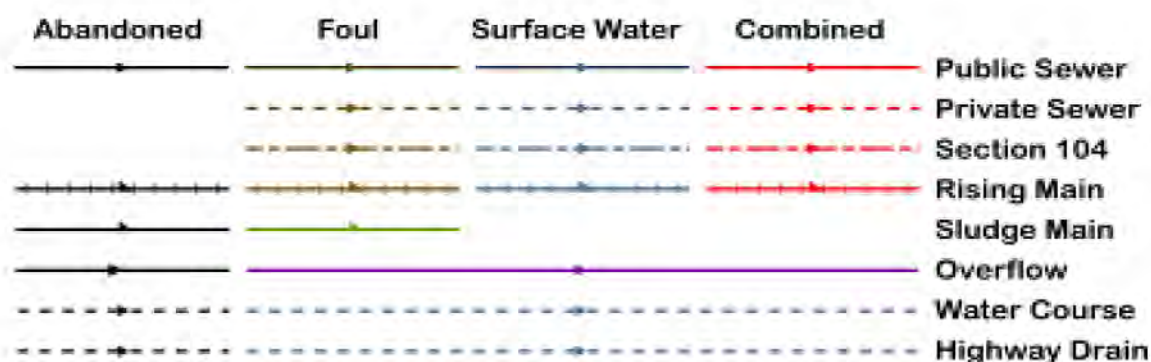


CHARTERED ARCHITECTS
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SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

Bracken House, Lidgett Lane, Leeds LS8 1PQ
+44(0)113 266 6044 (f) | +44(0)113 268 1859 (f)
architecture@gwp-arch.com | www.gwp-arch.com

APPENDIX C
UTILITIES SURVEY

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	



Scale: 1:1250
Date: 22/02/2024

SEWER RECORDS



Water for the North West

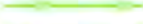
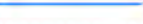
Address or Site Reference: 231008

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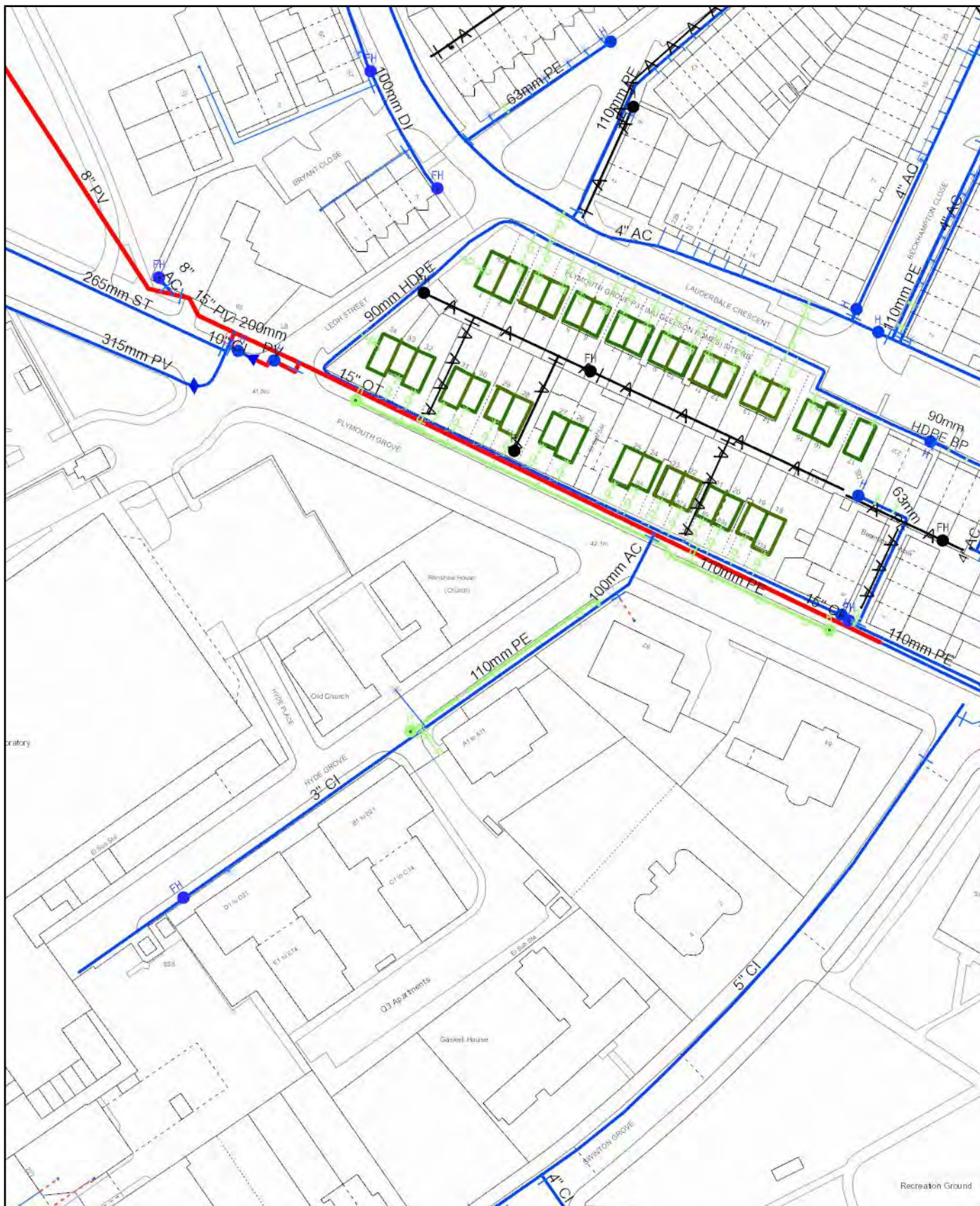
The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Clean Water Symbolology

Proposed	Abandoned	Live	
			Distribution Main
			Trunk Main
			Comms Pipe
			Private Pipe
			Concessionary Service
			Raw Water
			LDTM Raw Water
			LDTM Treated Water
			Air Valve
			AC Valve, open
			AC Valve, closed
			CC Valve, open
			CC Valve, closed
			Non Return Valve
			Pressure Management Valve
			OMS Valve
			Stop Tap
			Flow Meter
			Domestic Meter
			Commercial Meter
			Pump
			Hydrant
			Fire Hydrant
			Anode
			Chlorination Point
			De-chlorination Point
			Strainer Point
			Access Point
			Hatch Box
			IP Point
			Sampling Station
			Logger Box
			Bore Hole
			Inlet Point
			Bulk Supply Point
			End Cap
			Site Termination
			Change of Characteristic
			Condition Report
			<u>Property Types</u>
			Water Tower
			Valve House
			Booster Pumping Station
			Intake Pumping Station
			Water Treatment Works
			Supply Reservoir
			Service Reservoir
			Impounding Reservoir
			Pipe Bridge

Symbology for proposed assets is the same as above, but shown in **green**
 Symbology for abandoned assets is the same as above, but shown in **black**



Scale: 1:1250
Date: 22/02/2024

WATER MAINS RECORDS

Address or Site Reference: 231008
Printed by: Property Searches

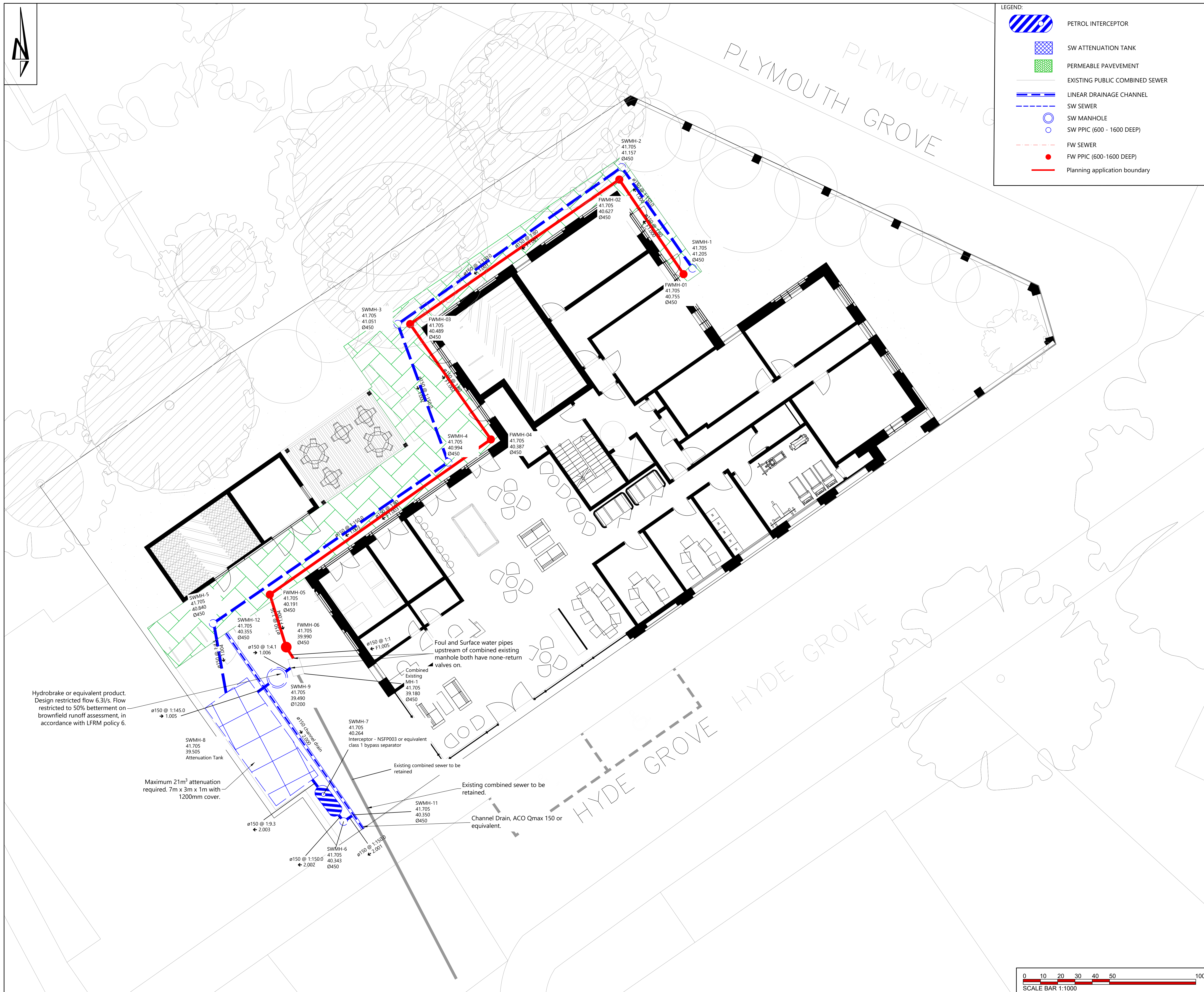
 **United Utilities**
Water for the North West

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APPENDIX D

DRAINAGE STRATEGY



THIS DRAWING IS THE COPYRIGHT OF BURROWS GRAHAM LIMITED.	
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION	
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:	
<u>CONSTRUCTION</u>	
<u>MAINTENANCE</u>	
<u>DEMOLITION</u>	
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT	

GENERAL NOTES: _____ level.

1. This drawing shall be read in conjunction with all the relevant architects, engineers' and service engineers drawings & specifications.
2. The Contractor shall follow the U.O.N on the drawing. Do not scale off the drawing.
3. The Contractor shall follow the U.O.N on the drawings for the work on formwork, excavations etc. and to be the design responsibility of the Contractor.
4. The Contractor shall allow for the protection, temporary shoring and bracing of the existing structures works as necessary, to all existing structures.
5. The Contractor shall be responsible for dealing with surface water run-off into excavations and from excavations by means of pumps, drains, ditches and dewatering as appropriate, in order to keep the excavation as reasonably dry as possible during the construction works.
6. The Contractor is responsible for obtaining all the necessary permits for the excavation works.
7. All private drainage within the site to comply with the requirements of the relevant British/European standards. The minimum EN 858 (BS EN 858: 2005, BS EN 858:1991, BS8580:04 + B4 and BS EN 124, 147 and BS5911) Building Reg Part H.
8. All public drainage within the site to comply with the requirements of the adopting authority. If in doubt, the Contractor shall refer to the local authority.
9. All pipework within chambers are to be laid soft to BS EN 101. All chamber inlet levels are for the outgoing pipe. Backdrop drains and downpipes are connected to softfill to sloped with the backdrop / roofing access level specified.
10. All drainage within the site to be the outgoing pipe, pipe to be softfill level, sump level specified against the backdrop. Catchpits are to be built with a 300 SPM.
11. Any gradients of drains indicated are indicative only and the Contractor shall confirm the indicated specified levels for each chamber (U.O.N).
12. The covered levels of the access points are provisional and subject to a detailed site investigation of the ground levels.
13. All drainage within the site shall be in accordance with the design of above ground flow and surface water drainage connections ("pop-ups") are indicative only. Setting out and confirmation of the drainage connections is to be the responsibility of the Architect. Contractor to confirm requirement prior to construction.
14. If of PCC manholes varies with pipe size, number on cover and depth etc. Minimum sizes are shown on drawing. Separators to be installed in accordance with the requirement of the manufacturer. Allowance to be made for a 400mm x 300mm double cover and frames on the chambers.
15. In situ concrete grades to be stated on the drawings. Design chemical admixtures for precast concrete products shall be C44 unless agreed otherwise.
16. All separators shall be in accordance with Building Regulations Part H3 and with BS EN 858 and be of the type of C2 marked as shown on drawing. All alarm system is to be in accordance with Client's requirements. Separators to be installed in accordance with manufacturer's instructions / requirements (venting, protection, etc.).
17. All ground below pipes/GPR tanks shall be installed in accordance with the manufacturer's instructions / requirements. Separators shall be provided with sufficient concrete surrounding to ensure the separator has a wall thickness adequate to resist the highest ground water level which could be encountered at their location.
18. All existing drainage/structures to be abandoned and the backdrop and the drainage to be excavated shall be backfilled with a suitable granular material to the required level. Alternatively, deep drains may be cleaned and grouted with 1:10 cementitious grout, with structures broken down to 1m below proposed finished ground level and infilled with a suitable granular material.
19. All drains to be removed from site and abandoned and replaced with a suitable granular material bag at a depth of 1.0m below proposed finished ground level.
20. Where utility/drainage trenches exist, cross over drains, manholes, etc. shall be protected by an impermeable barrier to prevent groundwater infiltrating into the drainage trench.
21. Design assumes that no sewerage authority sewers or other drainage systems require modification, diversion or abandonment (U.O.N on the drawings).
22. All manholes less than 1.5m deep are considered as none man entry shall be maintained from ground level.
23. Upon completion of the works, the Contractor shall clean all drainage by jetting, removing all debris from the line and the system to be in CCTV surveyed. No debris shall be permitted to enter the existing drainage system.
24. No deep rooting trees/vegetation should be planted within 5.0m of any drainage works.
25. The storage and installation of all proprietary drainage items used are to be strictly in accordance with the manufacturers instructions / requirements.
26. Any works within the public highway are restricted to highway authority requirements. All relevant permissions must be sought by the Contractor prior to the works being undertaken.
27. Statutory Undertakers information, where shown, is indicative only based on supplied records. The Contractor shall verify the depth position and nature of the services as necessary in order to construct the works.
28. Drained channels are to be ACO Qmax in service yards and ACO Multidrain in car parks, or similar approved. Channels are to be sized by the supplier and approved by the Engineer in writing prior to ordering. Drained channels to be installed in accordance with the manufacturers' requirements. Design of channels shall be based on a 1 in 10 year storm return period, 15 minute duration. Outlet units on channel drains to include tilt traps.
29. All ground level and channel connections shall be 01020 U.O.N. Watersoil stack connections shall be 01020 U.O.N. All site drainage shall be installed to ground, including any large scale access fittings in accordance with Building Regulations.
30. All drainage within the site shall be indicated. Locations shall be confirmed by others.
31. Below ground drainage connections to be provided to the property boundary.
32. 01510mm with concrete bed and surround
33. Green roof drainage system on separate roof
34. S40037-GW-01-RL-D-A-(PA) 001, Proposed Roof Drainage, TPO membrane drains positively into main runs that are shown.

P03	06.11.24	JDL	Issued for Information	JW
P02	16.05.24	JDL	Issued for Information	JW
P01	22.03.24	JDL	Issued for Information	JW
REV	DATE	BY	DESCRIPTION	CHKD

Burrows
Graham

CLIENT



PROJECT _____

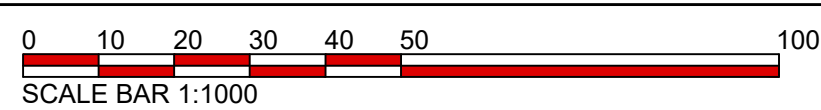
RENSHAW HOUSE

DRAWING TITLE

Proposed Surface Water Drainage Strategy

BGL PROJECT NUMBER 30094	DRAWING STATUS PRELIMINARY	OFFICE NORTH	
SCALE @ A1 1:100	DATE 22 03 2024	DRAWN BY JDL	CHECKED BY JW

DRAWING No	REV
30094-BGL-XX-XX-DR-C-00250	P03



APPENDIX E

HYDRAULIC CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	20	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	15.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.016	15.00	41.705	450	0.500
2	0.010	15.00	41.705	450	0.548
3	0.017	15.00	41.705	450	0.654
4	0.022	15.00	41.705	450	0.711
5	0.011	15.00	41.705	450	0.865
6			41.705	450	1.362
7	0.007	15.00	41.705		1.441
8			41.705	450	2.200
9			41.705	1200	2.215
Combined Existing MH-1			41.705	450	2.525
11			41.705	450	1.355
12	0.005	15.00	41.705	450	1.350

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	7.151	0.600	41.205	41.157	0.048	150.0	150	15.15	50.0
1.001	2	3	15.837	0.600	41.157	41.051	0.106	150.0	150	15.47	50.0
1.002	3	4	8.519	0.600	41.051	40.994	0.057	150.0	150	15.64	50.0
1.003	4	5	13.669	0.600	40.994	40.903	0.091	150.0	150	15.92	50.0
1.004	5	8	6.019	0.600	40.840	39.505	1.335	4.5	150	15.94	50.0
2.000	12	11	10.617	0.600	40.355	40.350	0.005	2123.4	150	15.84	50.0
2.001	11	6	1.101	0.600	40.350	40.343	0.007	150.0	150	15.87	50.0
2.002	6	7	1.956	0.600	40.343	40.330	0.013	150.0	150	15.91	50.0
2.003	7	8	7.094	0.600	40.264	39.505	0.759	9.3	150	15.94	50.0
1.005	8	9	2.175	0.600	39.505	39.490	0.015	145.0	150	15.99	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	0.818	14.5	2.2	0.350	0.398	0.016	0.0	40	0.592
1.001	0.818	14.5	3.5	0.398	0.504	0.026	0.0	51	0.678
1.002	0.818	14.5	5.9	0.504	0.561	0.043	0.0	67	0.776
1.003	0.818	14.5	8.8	0.561	0.652	0.065	0.0	85	0.858
1.004	4.779	84.4	10.3	0.715	2.050	0.076	0.0	35	3.263
2.000	0.210	3.7	0.7	1.200	1.205	0.005	0.0	44	0.160
2.001	0.818	14.5	0.7	1.205	1.212	0.005	0.0	23	0.421
2.002	0.818	14.5	0.7	1.212	1.225	0.005	0.0	23	0.421
2.003	3.315	58.6	1.6	1.291	2.050	0.012	0.0	17	1.456
1.005	0.832	14.7	11.9	2.050	2.065	0.088	0.0	103	0.926

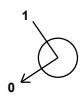
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.006	5.038	89.0	11.9	2.065	2.375	0.088	0.0	37	3.537

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	7.151	150.0	150	Circular	41.705	41.205	0.350	41.705	41.157	0.398
1.001	15.837	150.0	150	Circular	41.705	41.157	0.398	41.705	41.051	0.504
1.002	8.519	150.0	150	Circular	41.705	41.051	0.504	41.705	40.994	0.561
1.003	13.669	150.0	150	Circular	41.705	40.994	0.561	41.705	40.903	0.652
1.004	6.019	4.5	150	Circular	41.705	40.840	0.715	41.705	39.505	2.050
2.000	10.617	2123.4	150	Circular	41.705	40.355	1.200	41.705	40.350	1.205
2.001	1.101	150.0	150	Circular	41.705	40.350	1.205	41.705	40.343	1.212
2.002	1.956	150.0	150	Circular	41.705	40.343	1.212	41.705	40.330	1.225
2.003	7.094	9.3	150	Circular	41.705	40.264	1.291	41.705	39.505	2.050
1.005	2.175	145.0	150	Circular	41.705	39.505	2.050	41.705	39.490	2.065
1.006	1.258	4.1	150	Circular	41.705	39.490	2.065	41.705	39.180	2.375

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
1.002	3	450	Manhole	Adoptable	4		450	Manhole	Adoptable
1.003	4	450	Manhole	Adoptable	5		450	Manhole	Adoptable
1.004	5	450	Manhole	Adoptable	8		450	Manhole	Adoptable
2.000	12	450	Manhole	Adoptable	11		450	Manhole	Adoptable
2.001	11	450	Manhole	Adoptable	6		450	Manhole	Adoptable
2.002	6	450	Manhole	Adoptable	7			Junction	
2.003	7		Junction		8		450	Manhole	Adoptable
1.005	8	450	Manhole	Adoptable	9		1200	Manhole	Adoptable
1.006	9	1200	Manhole	Adoptable	Combined Existing MH-1		450	Manhole	Adoptable

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	41.705	0.500	450				
2	41.705	0.548	450		0	1.000	41.205
					1	1.000	41.157
					0	1.001	41.157
3	41.705	0.654	450		1	1.001	41.051
					0	1.002	41.051

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
4	41.705	0.711	450		1	1.002	40.994	150
				0	1.003	40.994	150	
5	41.705	0.865	450		1	1.003	40.903	150
				0	1.004	40.840	150	
6	41.705	1.362	450		1	2.001	40.343	150
				0	2.002	40.343	150	
7	41.705	1.441			1	2.002	40.330	150
				0	2.003	40.264	150	
8	41.705	2.200	450		1	2.003	39.505	150
				2	1.004	39.505	150	
				0	1.005	39.505	150	
9	41.705	2.215	1200		1	1.005	39.490	150
				0	1.006	39.490	150	
Combined Existing MH-1	41.705	2.525	450		1	1.006	39.180	150
11	41.705	1.355	450		1	2.000	40.350	150
				0	2.001	40.350	150	
12	41.705	1.350	450					
				0	2.000	40.355	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	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

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

Node 9 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.006	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0101-6300-2215-6300
Invert Level (m)	39.490	Min Outlet Diameter (m)	0.150
Design Depth (m)	2.215	Min Node Diameter (mm)	1200
Design Flow (l/s)	6.3		

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	39.180
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	80

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	1.000	20.0	0.0	1.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	21	41.234	0.029	1.2	0.0240	0.0000	OK
30 minute winter	2	23	41.194	0.037	1.9	0.0186	0.0000	OK
30 minute winter	3	23	41.100	0.049	3.2	0.0339	0.0000	OK
30 minute winter	4	24	41.056	0.062	4.8	0.0478	0.0000	OK
30 minute winter	5	24	40.866	0.026	5.6	0.0105	0.0000	OK
30 minute winter	6	26	40.361	0.018	0.4	0.0028	0.0000	OK
30 minute winter	7	26	40.277	0.013	0.9	0.0013	0.0000	OK
30 minute winter	8	30	39.640	0.135	6.5	2.5707	0.0000	OK
30 minute winter	9	31	39.637	0.147	4.4	0.1666	0.0000	OK
15 minute summer	Combined Existing MH-1	1	39.180	0.000	3.9	0.0000	0.0000	OK
30 minute winter	11	25	40.369	0.019	0.4	0.0030	0.0000	OK
30 minute winter	12	22	40.387	0.032	0.4	0.0075	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	1.2	0.421	0.083	0.0205	
30 minute winter	2	1.001	3	1.9	0.462	0.131	0.0662	
30 minute winter	3	1.002	4	3.2	0.540	0.221	0.0506	
30 minute winter	4	1.003	5	4.8	0.722	0.332	0.0909	
30 minute winter	5	1.004	8	5.6	1.793	0.066	0.0550	
30 minute winter	6	2.002	7	0.4	0.353	0.028	0.0022	
30 minute winter	7	2.003	8	0.9	0.600	0.015	0.0612	
30 minute winter	8	1.005	9	4.4	0.354	0.297	0.0372	
30 minute winter	9	Hydro-Brake®	Combined Existing MH-1	4.3				7.4
30 minute winter	11	2.001	6	0.4	0.331	0.028	0.0013	
30 minute winter	12	2.000	11	0.4	0.204	0.108	0.0213	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	22	41.254	0.049	3.0	0.0397	0.0000	OK
30 minute winter	2	24	41.216	0.059	4.7	0.0297	0.0000	OK
30 minute winter	3	23	41.139	0.088	7.9	0.0604	0.0000	OK
30 minute winter	4	23	41.105	0.111	11.9	0.0859	0.0000	OK
30 minute winter	5	23	40.881	0.041	13.8	0.0165	0.0000	OK
30 minute winter	6	26	40.369	0.026	0.9	0.0042	0.0000	OK
30 minute winter	7	24	40.284	0.020	2.2	0.0019	0.0000	OK
30 minute winter	8	34	40.017	0.512	16.0	9.7932	0.0000	SURCHARGED
30 minute winter	9	34	40.012	0.522	5.8	0.5909	0.0000	SURCHARGED
15 minute summer	Combined Existing MH-1	1	39.180	0.000	5.2	0.0000	0.0000	OK
30 minute winter	11	26	40.378	0.028	0.9	0.0045	0.0000	OK
30 minute winter	12	26	40.400	0.045	0.9	0.0105	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	3.0	0.533	0.208	0.0403	
30 minute winter	2	1.001	3	4.7	0.555	0.325	0.1352	
30 minute winter	3	1.002	4	7.9	0.638	0.546	0.1051	
30 minute winter	4	1.003	5	11.9	0.893	0.822	0.1818	
30 minute winter	5	1.004	8	13.8	1.894	0.163	0.0646	
30 minute winter	6	2.002	7	0.9	0.447	0.062	0.0039	
30 minute winter	7	2.003	8	2.2	0.625	0.038	0.0673	
30 minute winter	8	1.005	9	5.8	0.386	0.392	0.0383	
30 minute winter	9	Hydro-Brake®	Combined Existing MH-1	5.2				18.2
30 minute winter	11	2.001	6	0.9	0.411	0.062	0.0024	
30 minute winter	12	2.000	11	0.9	0.272	0.243	0.0358	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	23	41.262	0.057	4.0	0.0470	0.0000	OK
30 minute winter	2	23	41.226	0.069	6.3	0.0349	0.0000	OK
30 minute winter	3	24	41.180	0.129	10.5	0.0886	0.0000	OK
30 minute winter	4	24	41.149	0.155	15.5	0.1199	0.0000	SURCHARGED
30 minute winter	5	24	40.887	0.047	18.0	0.0189	0.0000	OK
60 minute winter	6	57	40.637	0.294	3.8	0.0468	0.0000	SURCHARGED
60 minute winter	7	57	40.637	0.373	4.6	0.0362	0.0000	SURCHARGED
60 minute winter	8	57	40.637	1.132	17.6	13.0050	0.0000	SURCHARGED
60 minute winter	9	57	40.634	1.144	8.1	1.2933	0.0000	SURCHARGED
15 minute summer	Combined Existing MH-1	1	39.180	0.000	5.2	0.0000	0.0000	OK
60 minute winter	11	58	40.639	0.289	3.0	0.0459	0.0000	SURCHARGED
60 minute winter	12	57	40.637	0.282	2.3	0.0664	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	4.0	0.569	0.277	0.0503	
30 minute winter	2	1.001	3	6.3	0.569	0.436	0.1895	
30 minute winter	3	1.002	4	10.3	0.644	0.715	0.1435	
30 minute winter	4	1.003	5	15.5	0.940	1.075	0.2198	
30 minute winter	5	1.004	8	18.0	1.991	0.214	0.0671	
60 minute winter	6	2.002	7	-3.8	0.460	-0.263	0.0344	
60 minute winter	7	2.003	8	-3.8	0.625	-0.065	0.1249	
60 minute winter	8	1.005	9	8.1	0.458	0.548	0.0383	
60 minute winter	9	Hydro-Brake®	Combined Existing MH-1	5.2				29.8
60 minute winter	11	2.001	6	-3.0	0.422	-0.204	0.0194	
60 minute winter	12	2.000	11	-1.7	0.282	-0.459	0.1869	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	56	41.413	0.208	4.3	0.1703	0.0000	FLOOD RISK
60 minute winter	2	56	41.412	0.255	6.8	0.1295	0.0000	FLOOD RISK
60 minute winter	3	56	41.410	0.359	11.2	0.2471	0.0000	FLOOD RISK
60 minute winter	4	56	41.407	0.413	16.9	0.3195	0.0000	FLOOD RISK
60 minute winter	5	57	41.396	0.556	19.6	0.2241	0.0000	SURCHARGED
60 minute winter	6	56	41.391	1.048	10.7	0.1667	0.0000	SURCHARGED
60 minute winter	7	57	41.390	1.126	12.3	0.1092	0.0000	SURCHARGED
60 minute winter	8	57	41.388	1.883	22.7	13.1245	0.0000	SURCHARGED
60 minute winter	9	57	41.383	1.893	7.7	2.1415	0.0000	SURCHARGED
15 minute summer	Combined Existing MH-1	1	39.180	0.000	5.2	0.0000	0.0000	OK
60 minute winter	11	57	41.394	1.044	9.0	0.1660	0.0000	SURCHARGED
60 minute winter	12	56	41.392	1.037	7.4	0.2437	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	1	1.000	2	4.3	0.577	0.298	0.1259	
60 minute winter	2	1.001	3	6.7	0.567	0.466	0.2788	
60 minute winter	3	1.002	4	11.2	0.644	0.774	0.1500	
60 minute winter	4	1.003	5	16.9	0.975	1.166	0.2406	
60 minute winter	5	1.004	8	19.6	1.838	0.232	0.1060	
60 minute winter	6	2.002	7	-10.7	-0.608	-0.740	0.0344	
60 minute winter	7	2.003	8	-10.6	0.625	-0.180	0.1249	
60 minute winter	8	1.005	9	7.7	0.439	0.525	0.0383	
60 minute winter	9	Hydro-Brake®	Combined Existing MH-1	5.9				38.8
60 minute winter	11	2.001	6	-9.0	-0.509	-0.620	0.0194	
60 minute winter	12	2.000	11	-6.1	-0.349	-1.657	0.1869	

APPENDIX F

DRAINAGE INSPECTION & MAINTENANCE SCHEDULE

Maintenance Schedule	Required Action	Typical Frequency
Below Ground Drainage Pipes, Manholes, etc		
Regular Maintenance	Lift covers and inspect manholes for evidence of debris and silt deposits and evidence of blockages (standing water). Carry out CCTV survey if required	Quarterly
Remedial Actions	High pressure jetting and/or remove minor blockages and silt build up	As required – 20% loss of pipe cross-section
	Replace broken access covers, remove major blockages, repair structurally defective pipework	As required
Flow control chamber		
Regular Maintenance	Lift covers and inspect chamber for evidence of debris and silt deposits and evidence of blockages. Test bypass door operating correctly.	Quarterly
Remedial Actions	High pressure jetting and or remove minor blockages and silt build up	As required
	Replace broken access covers, remove major blockages, repair/replace defective flow control devices	As required
Linear channel drains and gullies		
Regular Maintenance	Lift access covers and inspect for silt/debris accumulation	Quarterly
Remedial Actions	Replace broken access covers, gratings	Annually
	High pressure jetting and/or remove minor blockages and silt build up	As required
Rainwater pipes		
Regular Maintenance	Inspect rainwater goods for evidence of leaking pipework	Monthly (or as required)
Occasional Maintenance	Remove rodding eyes and carry out high pressure jetting to remove any debris	Quarterly
Remedial Actions	Replace cracked / leaking pipework	As required
Attenuation Tank (Maintenance activities recommended by the manufacturer should be added to this schedule where not included)		
Regular maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Six monthly
	Change the filter media	As recommended by manufacturer
Remedial actions	Replace malfunctioning parts or structures	As required

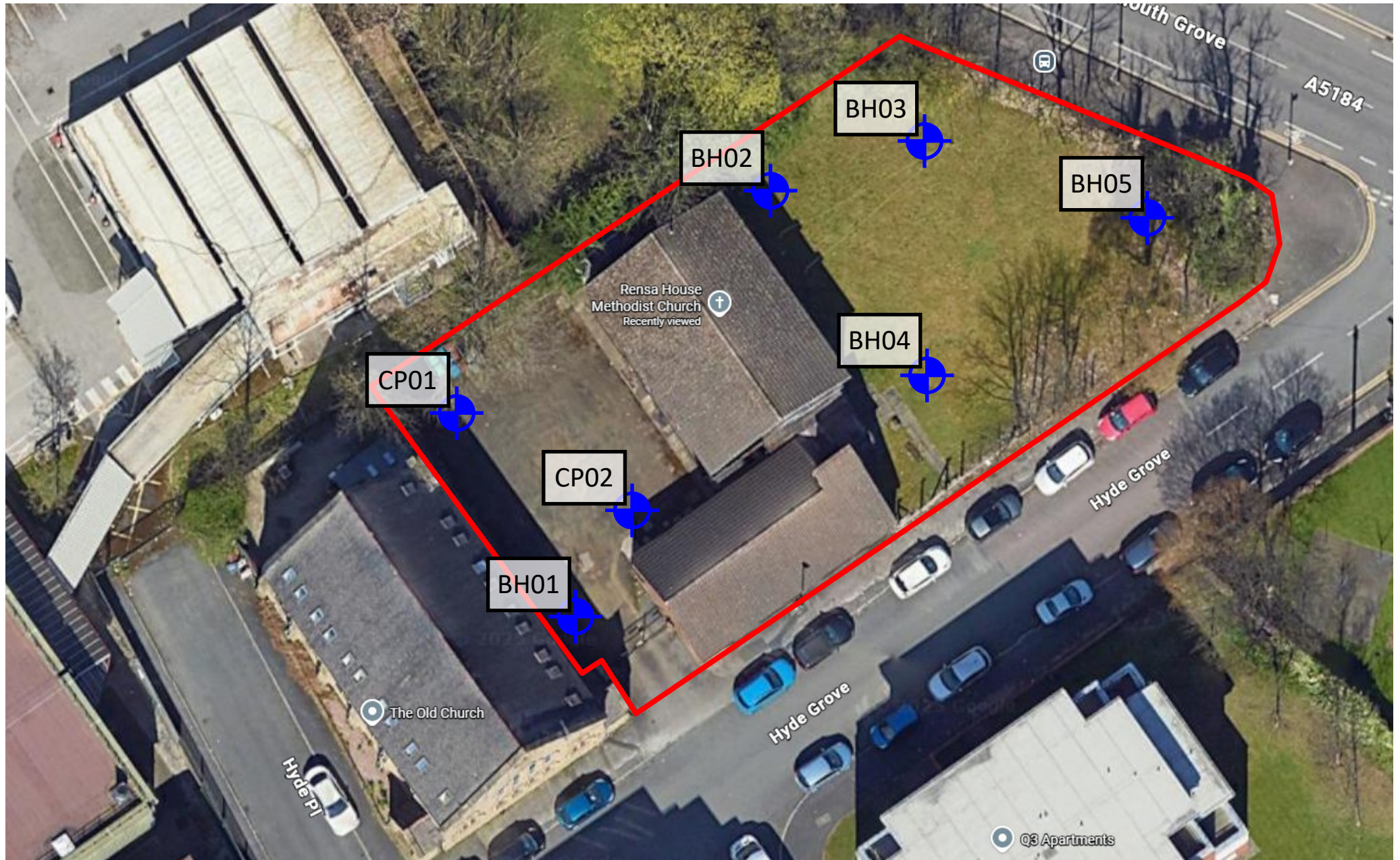


Maintenance Schedule	Required Action	Typical Frequency
Monitoring	Inspect for evidence of poor performance	Six monthly
	Inspect sediment accumulation rates and filter media, and establish appropriate replacement frequencies.	Monthly during first half of the year, then every six months

For specialist parts such as petrol interceptor follow supplier guidelines for maintenance.

APPENDIX B

Exploratory Position Plan

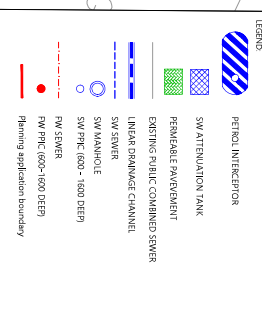


SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2016					
BRE Digest 365, Figure 2, Page 5					
Site:		99 Plymouth Grove, Manchester			
Job No:		NE-26-004			
Hole No:	BH02	Test No:	1		
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (m)	Size of Borehole	Diameter (m) =	0.10	
0	1.50		Eff. Depth (m) =	4.50	
0.5	1.50		Radius (m) =	0.05	
1	1.50				
2	1.50	Depth at start of test (m) =		1.500	
3	1.50	Depth at end of test (m) =		1.500	
4	1.50	75% level (m) =		1.500	
5	1.50	50% level (m) =		1.500	
6	1.50	25% level (m) =		1.500	
7	1.50				
8	1.50	Base area of hole (m ²) =		0.00785	
9	1.50	V _{p75-25} (m ³) =		0.0000	
10	1.50	a _{0.50} (m ²) =		1.4216	
15	1.50				
20	1.50	TAKE VALUES FROM THE GRAPH:			
25	1.50	tp 75 (min) =		0.00	
30	1.50	tp 25 (min) =		180.00	
40	1.50				
50	1.50	Soil infiltration rate, f, (m/s) =		0.00E+00	normal test
60	1.50				
90	1.50				
120	1.50	Input by:	AG	Date:	19/01/2026
180	1.50	Checked by:	MA	Date:	19/01/2026
Time (mins)					
Notes:					

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2016					
BRE Digest 365, Figure 2, Page 5					
Site:	99 Plymouth Grove, Manchester				
Job No:	NE-26-004				
Hole No:	BH04	Test No:	1		
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (m)	Size of Borehole	Diameter (m) =	0.10	
0	1.40		Eff. Depth (m) =	4.60	
0.5	1.40		Radius (m) =	0.05	
1	1.40				
2	1.40	Depth at start of test (m) =		1.400	
3	1.40	Depth at end of test (m) =		1.400	
4	1.40	75% level (m) =		1.400	
5	1.40	50% level (m) =		1.400	
6	1.40	25% level (m) =		1.400	
7	1.40				
8	1.40	Base area of hole (m ²) =		0.00785	
9	1.40	V _{p75-25} (m ³) =		0.0000	
10	1.40	a _{n50} (m ²) =		1.4530	
15	1.40				
20	1.40	TAKE VALUES FROM THE GRAPH:			
25	1.40	tp 75 (min) =		0.00	
30	1.40	tp 25 (min) =		180.00	
40	1.40				
50	1.40	Soil infiltration rate, f, (m/s) =		0.00E+00	normal test
60	1.40				
90	1.40				
120	1.40	Input by:	AG	Date:	19/01/2026
180	1.40	Checked by:	MA	Date:	19/01/2026
Time (mins)					
Notes:					

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2016					
BRE Digest 365, Figure 2, Page 5					
Site:		99 Plymouth Grove, Manchester			
Job No:		NE-26-004			
Hole No:	BH05	Test No:	1		
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (m)	Size of Borehole	Diameter (m) =	0.10	
0	1.00		Eff. Depth (m) =	5.00	
0.5	1.00		Radius (m) =	0.05	
1	1.00				
2	1.00	Depth at start of test (m) =		1.000	
3	1.00	Depth at end of test (m) =		1.000	
4	1.00	75% level (m) =		1.000	
5	1.00	50% level (m) =		1.000	
6	1.00	25% level (m) =		1.000	
7	1.00				
8	1.00	Base area of hole (m ²) =		0.00785	
9	1.00	V _{p75-25} (m ³) =		0.0000	
10	1.00	a _{n50} (m ²) =		1.5787	
15	1.00				
20	1.00	TAKE VALUES FROM THE GRAPH:			
25	1.00	tp 75 (min) =		0.00	
30	1.00	tp 25 (min) =		180.00	
40	1.00				
50	1.00	Soil infiltration rate, f, (m/s) =		0.00E+00	normal test
60	1.00				
90	1.00				
120	1.00	Input by:	AG	Date:	19/01/2026
180	1.00	Checked by:	MA	Date:	19/01/2026
Time (mins)					
Notes:					

APPENDIX C

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