raymentstructures

Project_
Rainshore House
Norden, Rochdale

Title_
Surface Water Management Report

Project No_
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1. Introduction

Rayment Structures has prepared this surface water management report, in support of a detailed drainage design, for a new development at Rainshore House, Over Town Lane, Rochdale, OL12 7TQ (hereafter referred to as 'the Site').

The report describes and demonstrates how the surface water run-off rate and volume from the Site will be managed to adhere to National and local planning policies, regulations, and relevant design guidance, which include:

- National Planning Policy Framework, December 2024 (updated February 2025), Paragraphs 162-163 and 182.
- National Planning Practice Guidance, released in March 2014 and updated in August 2022.
- National Standards for Sustainable Drainage Systems (SuDS) set out by the Department for Environment, Food & Rural Affairs (DEFRA) (2011).
- CIRIA (2010) Planning for SuDS – Making it Happen C687.
- CIRIA SuDS Manual C753 (2015).

And local policies including:

- Bury, Rochdale an Oldham, Strategic Flood Risk Assessment – Level 2 SFRA (November 2009);
- Greater Manchester Surface Water Management Plan – Stage 1 (January 2012);
- Greater Manchester Strategic Flood Risk Assessment Framework (September 2018);
- Rochdale Borough's Strategy for Flood Risk Management 2014-2024;
- Rochdale Adopted Core Strategy (October 2016);

Subsequently, Rochdale Metropolitan Borough Council, acting as Lead Local Flood Authority (LLFA), need to be satisfied that the design and drainage principles of the proposed development:

- will address the surface water management and risk of flooding within the site;
- will ensure that the drainage is managed and maintained for its lifetime to prevent flooding;
- and will ensure that the development will not increase the risk of flooding to neighbouring land and property.

2. National / Local Policies and Water Management Guidance

2.1. National Planning Policy Framework (NPPF) and National Planning Practice Guidance (NPPG)

The NPPF (December 2024 – updated February 2025) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. This document is used to form this surface water management report, with particular attention to Paragraphs 162-163 (Planning for Climate Change) and Paragraph 182 (Sustainable Drainage).

NPPG, Paragraph 055 (Reference ID:7-055-20220825) states that sustainable drainage systems (SuDS) are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible, where they provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban run-off at source; and to combine water management with green space with benefits for amenity, recreation, and wildlife.

Further to this NPPG, Paragraph 056 (Reference ID:7-056-20220825) states that the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable which (in order) are into the ground (infiltration); to a surface water body; to a surface water sewer, highway drain, or another drainage system; to a combined sewer.

2.2. Flood and Water Management Act

The Flood and Water Management Act (FWMA) received royal assent in April 2010, aiming to create a simpler and more effective means of managing flood risk and coastal erosion. The FWMA incorporates and implements some of the recommendations from the Pitt Review (2008), following the severe flooding that affected a large area of the UK in 2007. The FWMA also places several new duties and responsibilities on LLFAs regarding the management of local flood risk, to: Develop, maintain, apply, and monitor a Local Flood Risk Management Strategy; Approve, adopt, and maintain Sustainable Drainage Systems (SuDS) (yet to be implemented); Establish and maintain a flood risk Asset Register; Investigate incidents of flooding (where appropriate) and publish the findings in a report; Ensure delivery of effective and joined up management of flood risk.

3. Site Setting and Description

3.1. Site Location

The Site is in a rural area of Rainshore, is approximately 5 km north-west of Rochdale town centre, and is bound undeveloped land leading to Greenbooth Reservoir to the north, fields and woodland leading to Greenbooth road and Edenfield Road to the east and south, respectively, and Over Town Lane to the west.

The postcode at the Site is OL12 7TQ, with the co-ordinates at the centre of the Site being - E: 385280, N: 415075.

3.2. Existing Site and Topography

The Site, in a pre-development state, consists of a detached residential dwelling to the centre, an outbuilding and garage to the north, garden areas to the east, and driveway areas to the west. Refer to Appendix A for details.

The Site is currently developed, and therefore the purpose of this report, is deemed to be **'Brownfield Site'.**

In terms of topography, the Site falls towards the south-east boundary with the levels ranging from approximately 222.39m AOD (north-west) to approximately 217.62m AOD (south-east)

3.3. Proposed Development

The proposed site plan is shown in Appendix B, with a full description of the Site being provided by the Architect.

In brief, and relation to this report, the proposal is to convert the existing buildings, with an extension to the outbuilding to the north, a new MUGA pitch to the east, parking areas to the south, and reformed access with parking to the west.

3.4. Ground Conditions

Ground investigations were carried out by 'Soiltehnics' in March 2026. As detailed in Appendix C, the ground at the Site predominately consists of clay (Devensian Til) from a depth of 0.20m bgl to at least 4.50m bgl.

3.5. Waterbodies

The nearest waterbody to the Site is Greenbooth Reservoir approximately 250m to the north, with the overflow from the reservoir flowing approximately 50m to the east of the Site.

3.6. Existing Drainage / Sewers

The United Utilities asset plan in Appendix D shows the nearest sewers are a 225mm foul water sewer directly north of the Site, and a 225m surface water sewer approximately 20m north-east of the Site.

Drainage surveys within the Site (see Appendix D also) shows that a 150mm drainage network takes the surface water run-off from the existing detached dwelling, and flows to the south-west boundary. Surface water run-off from other areas of the Site is believed to discharge to ground.

3.7. Development Areas

The Site has an overall area of approximately 4,210m² / 0.421 ha.

The Site, in a pre-development state has developed areas equating to approximately 1,350m² / 0.135 ha, and therefore for the greenfield run-off calculations, the Site has an Urban Factor of 0.32.

The only drainage network taking surface water off the Site is the network serving the detached dwelling. The detached dwelling has an area of approximately 250m² / 0.025 ha. Therefore, for the pre-development calculations, the Site had a positive surface water run-off area of 0.025 ha.

The Site, in a post development state, will have development areas equating to 1,800m² / 0.180 ha.

4. National Standards for SuDS (July 2025)

4.1. SuDS Principles

The principles which underpin the standards and the approach that surface water management schemes shall follow are as follows:

'Principle 1

Surface water drainage systems shall be designed, constructed, maintained and operated following a natural approach to managing water. This should mimic natural drainage, manage surface runoff at or close to the surface and as close to its source as practicable. This approach should also control the flow of runoff and provide a range of additional benefits. It contrasts with traditional drainage techniques, which are based on underground pipes to convey runoff away from the development as quickly as possible. By following this natural approach, surface water shall be utilised as a resource on site with multiple benefits to the environment and society, helping to combat climate change, meet future water needs and protect receiving waters and their associated ecology.

Principle 2

The most effective surface water drainage systems use a series of different drainage features, operating as close to the source of runoff as practicable. These should work as a SuDS management train to control flow rates and reduce volumes of runoff, providing water quality benefits and opportunities to encourage biodiversity and amenity.

Principle 3

This is referred to as the 'SuDS Approach' throughout the standards and is defined as:

- mimicking natural drainage systems and delivering surface water management that recognises the value of rainfall and runoff as a resource
- managing surface water flooding and the rates and volumes of runoff from developments now and in the future
- contributing to cleansing diffuse particulate and chemical substances that may be found in surface water runoff
- using drainage features in combination as a management train, which integrates these throughout the development and its landscape to help create healthy and resilient spaces for people and habitats for wildlife
- managing runoff close to its source, prioritising features that lie on the surface and incorporate vegetation
- meeting the requirements for delivering multiple benefit SuDS over the lifetime of the development by planning for a changing climate and ensuring long-term maintenance
- being sustainable, considering both construction and long-term maintenance and the additional environmental and social benefits afforded by the system.

Principle 4

Surface water management should be considered at the very earliest stages of site appraisal, planning and design to support and be integrated with:

- the existing topography, hydrology and watercourses on the site
- the water supply strategy
- the layout of the roads, buildings and public open spaces
- any remediation strategy needed for land contamination associated with existing or previous land uses
- any biodiversity, amenity and green infrastructure delivery strategy
- climate resilience options for the development

Principle 5

Planning of a new site layout should be informed by the requirements of the surface water management systems to both effectively drain and ensure all areas of the site are served by SuDS where possible. Opportunities should be maximised to help cleanse runoff prior to discharge to the water environment of diffuse particulate and chemical substances that may have been entrained. Consideration of the presence of any existing watercourses, ditches and other drainage features, both within and adjoining the site, should inform proposals. By doing so, biodiversity, amenity and cost-effectiveness can be maximised. This should be done by using areas of land throughout the development for a range of multifunctional purposes in addition to surface water management (for example, landscaping, recreational areas, streets and rainwater harvesting).

Principle 6

Conveyance systems should follow the natural drainage routes through the site, resulting in exceedance routes doing the same. This ensures exceedance flows can be captured further downstream and minimises the risk to buildings and people. The design process should include professional planning, urban design, landscape and ecology considerations delivered in an integrated and co-ordinated way. This will deliver the greatest amenity and biodiversity outcomes from these standards.

Principle 7

Development design should take account of existing flood risk policies in local plans, alongside local flood risk management strategies (LFRMS), the relevant local authority adopted SuDS guidance, any flood risk assessments, surface water management plans, the flood risk management plan and the river basin management plan (RBMP).

Principle 8

Early engagement with the local planning authority (LPA) should be undertaken to agree design, construction, operation and maintenance considerations to support an efficient application process. The LPA should be able to direct the applicant to relevant local plans, strategies and guidance'.

4.2. SuDS Standards

The standards for the surface water management are as follows:

'Standard 1 - Run-Off Destination

A 'SuDS approach' shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.

Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- *priority 1: collected for non-potable use*
- *priority 2: infiltrated to ground*
- *priority 3: discharged to an above ground surface water body*
- *priority 4: discharged to a surface water sewer, or another piped surface water drainage system*
- *priority 5: discharged to a combined sewer*

To utilise a lesser priority final destination, appropriate evidence shall be provided that demonstrates all higher priority final destinations have been utilised to the maximum extent practicable. Higher cost alone shall not be a reason to utilise lower priority final destinations.

Where more than one final destination is utilised, each final destination's ability to accept runoff shall be maximised in order of priority.

Standard 2 - Management of Everyday Rainfall (Interception)

Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems.

Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed alongside and in support of the management of runoff quality (standard 4) and the delivery of amenity and biodiversity benefits (standards 5 and 6).

Standard 3 - Management of Extreme Rainfall and Flooding

A 'SuDS approach' shall be adopted to address the management of development runoff during extreme rainfall, including allowances for climate change and urban creep to:

- *protect people and property on the development from flooding of the surface water drainage system*
- *mitigate any increased flood risk to people and property adjacent to or downstream of the development*
- *protect the receiving water body from morphological damage or minimise the impact on sewer capacity*

When discharging to an infiltration feature, the system shall be appropriately sized to accommodate the design event based on ground conditions and contributing areas.

When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff (rate and volume) for the 1% annual exceedance probability (AEP) event shall be controlled to ensure the runoff from the development does not increase flood risk elsewhere.

When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff rate for the 50% AEP event shall be controlled to ensure development runoff from an event of this magnitude has no negative impact.

Any flooding from the surface water drainage system for events up to the 1% AEP event shall be managed within the development.

Any flooding from off-site sources for the 1% AEP event should be managed on site or safely routed through the site, ensuring any downstream risks are not increased compared to the pre-development scenario.

The risks (both on and off the development) associated with flooding from the surface water drainage system for exceedance events greater than the 1% AEP event shall be appropriately managed.

Standard 4 – Water Quality

Apply a 'SuDS approach' that protects surface waters, groundwater and coastal waters by managing the quality of the surface water runoff to adequately address water quality risks from the development.

The proposed SuDS management train(s) shall be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters, reflecting industry recognised guidance or other quantitative assessment as agreed with the approving body and permitting requirements

Standard 5 – Amenity

SuDS approach' shall be adopted that maximises benefits for amenity through the creation of multi-functional places and landscapes.

Standard 6 – Biodiversity

A 'SuDS approach' shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.

The surface water drainage system shall add biodiversity value by:

- *creating diverse, self-sustaining, resilient local ecosystems which contribute to net gains in biodiversity*
- *supporting and promoting natural local habitat and species, for example, through local nature recovery strategies (LNRS)*
- *contributing to the delivery of local biodiversity strategies*
- *contributing to habitat connectivity*

Standard 7: Design of Drainage for Construction, Operation, Maintenance, Decommissioning and Structural Integrity

A 'SuDS approach' shall be adopted to ensure that surface water drainage systems are designed so they can be easily and safely constructed, operated and maintained taking account of the need to minimise negative impacts on natural resources and the environment.

The designer shall provide a management and maintenance plan that supports the design objectives detailed in standards 1 to 6 and ensures the performance of the surface water drainage system with regards to runoff destinations, everyday and extreme rainfall, water quality, amenity and biodiversity is maintained throughout the lifetime of the development.

Surface water drainage design shall examine for the likelihood and consequences of potential failure scenarios that may occur during the operation phase and safely manage the associated risks.

The surface water drainage system shall be designed to ensure structural integrity of all components under anticipated loading conditions for the design life of the development so that it does not affect the structural integrity of any existing or proposed components within, or adjacent to, the development'.

All standards are to be considered in the surface water management design where possible.

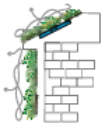
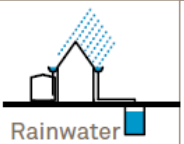
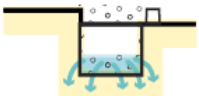
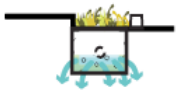
5. Surface Water Run-Off Destination

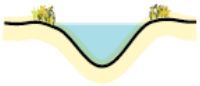
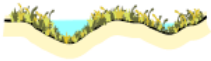
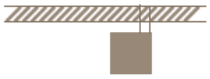
The destination of the surface water run-off from the Site, in a post development state, has been assessed against the prioritisation set by the Approved Document H (2010). The feasibility of the surface water run-off to the priority receptors are as follows:

Run-Off Destination	Feasible / Required?	Description
Discharge to Ground	No	Ground investigation found that the Site predominately consists of clay (Devensian Til) from a depth of 0.20m bgl to at least 4.50m bgl. Clay is known to have an exceptionally low or no infiltration value, and therefore, due to the ground conditions, discharge to ground is not feasible.
Discharge to Surface Water Body	No	There is an overflow from Greenbooth Reservoir approximately 50m to the east of the Site. However, this is not a main waterbody, it is within private 3rd party land, and forms part of critical infrastructure which is to be kept in current condition. Therefore, discharge to a waterbody is not feasible.
Discharge to Surface Water Sewer	No	There is a 225mm surface water approximately 20m to the north-east of the Site. However, due to the topography of the Site, discharge to the surface water sewer can't be achieved by gravity. Also, the sewer is within private 3rd party land, and forms part of critical infrastructure which is to be kept in current condition. Therefore, discharge to a surface water sewer is not feasible.
Discharge to Highway Drain or Other	**Yes**	As the ground is not suitable for infiltration, and discharge to a waterbody and surface water is not feasible, the only alternative is to discharge to the existing 150mm surface water drainage network that takes the surface water from the existing detached dwelling, and flows to the south-west of the Site. **Discharging to the existing network with a restricted rate not exceeding the pre-development rates will replicate the current surface water flows from the Site, will replicate the pre-development surface water discharge destination, and consequently will not increase flood risk elsewhere.**
Combined Water Sewer	No	There are no combined water sewers near the Site, and therefore this is not a feasible surface water discharge destination.

6. SuDS Feasibility

To reduce the surface water run-off from the Site in a post development state, SuDS methods are to be introduced to the design. SuDS methods that could potentially be used are detailed below:

	Description	Setting	Required area
 Green roofs	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.
 Rainwater harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an overground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (underground or above ground).
 Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependant on runoff volumes and soils.
Filter Strip	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Open space	Minimum length 5 metres.
Permeable paving	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street/open space	Can typically drain double its area.
 Bioretention area	A vegetated area with gravel and sand layers below designed to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street/open space	Typically surface area is 5-10% of drained area with storage below.

	Description	Setting	Required area
Swale	Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street/open space	Account for width to allow safe maintenancce typically 2-3 metres wide.
Hardscape storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Open space	Could be above or below ground and sized to storage need.
 Pond / Basin	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open space	Dependant on runoff volumes and soils.
 Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open space	Typically 5-15% of drainage area to provide good treatment.
 Underground storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open space	Dependant on runoff volumes and soils.

The feasibility of the above SuDS methods for the Site is summarised in the table below:

SuDS Method	Feasible Use	Description
Living Roofs	No	The converted buildings and extension to the outbuilding roofs are pitched, and therefore living roofs are not feasible.
Rainwater Harvesting	**Potential**	As the Site consists of an existing dwelling, it is believed that the Site is already connected to the water mains, and therefore not practical to harvest water for internal re-use. However, water butts could be installed at a rainwater pipes, where the water can be collected and re-used for irrigation the landscape areas.
Soakaway	No	Ground investigation found that the Site predominately consists of clay (Devensian Til) from a depth of 0.20m bgl to at least 4.50m bgl. Clay is known to have an exceptionally low or no infiltration value, and therefore, due to the ground conditions, discharge to ground is not feasible.
Filter Strips	**Yes**	Filter drain systems can be formed along the edge of the access / footpath areas, and will consist of a 300x300mm, 20mm no fine granular filled trench housing a perforated pipe.

		The surface water run-off from the access / footpath areas will discharge onto the filter drain, will not infiltrate directly to ground (formation in clay strata), but will be convey the surface water to the main network via a perforated pipe. Filter drains and will reduce run-off rates and act as a pollutant control.
Permeable Surfacing	**Yes**	Permeable surfacing systems can be formed in parking and access areas to the west of the Site. The surface water will not discharge directly to ground (formation in made ground strata) but will be conveyed via a perforated pipe from the sub-base of the paving, and into the main drainage network. Permeable surfacing will reduce the surface water run-off rate from the external areas and will act as a pollutant control. Note that the parking areas to the south of the Site will be formed of no-dig cellular units filled with gravel and grass, which are built directly onto existing soils. The surface water will continue to discharge off the Site at a natural / greenfield rate in these areas, and will not be included in the surface water management calculations.
Swale / Bioretention area / Ponds	No	The external area of the Site is to be used for landscaping (consisting of trees and new planting), with no suitable areas for these SuDS features.
Hardscape Storage	No	Surface water run-off from the external areas will discharge to the filter drain and permeable surfacing systems. Therefore, there is no requirements for hardscape storage.
Underground Storage	**Yes**	The surface water run-off from the Site will be restricted. Therefore, there will be a requirement to have underground storage for storm events up to 1 in 30-year; and to suitably sized so that the volume of water during the 1 in 100-year storm event is kept a minimum at surface level, where it can be contained on the Site.

7. Development Greenfield Run-Off Rate and Volumes

To minimise the surface water run-off from the Site, it is preferred that the post development surface water run-off be restricted to the equivalent greenfield run-off rates and volume where possible.

7.1. Greenfield Run-Off Rate

The Flood Estimation Handbook (FEH) is often used for the calculation of the greenfield run-off rate, however, relevant documents state that to calculate the greenfield run-off rates on small catchments less than 25km², the IH 124 QBAR equation (and the equation for the instantaneous time to peak for the unit hydrograph approach) is to be used. The IH method is based on the Flood Studies Report (FSR) approach and is developed for use on catchments less than 25km². It yields the Mean Annual Maximum Flood (QBAR). This reference also recommends the use Ciria C753 Table 24.2 to generate Growth Factors. These are used to convert QBAR to different return periods for different regions in the UK.

The input variables to establish QBAR are:

Return Period (years)	Results based on a range of return periods and the specified RP;
Area	Catchment Area (ha) which is adjusted to km2 for use in the equation;
SAAR	Average annual rainfall in mm (1941-1970) from FSR figure II.3.1;
Soil	Procedure Volume 3. Soil classes 1 to 5 have Soil Index values of 0.15, 0.3, 0.4, 0.45 and 0.5 respectively;
Urban	Proportion of area urbanised expressed as a decimal;
Region Number	Region number of the catchment based on FSR Figure I.2.4.

QBAR(l/s)

The output variables to establish QBAR are calculated using the following formula (equation yields m³/s):

$$\textbf{QBAR} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

The IH 124 Variables (taken from FSR) that are specific to this site are as follows:

Area	=	50.00 ha
SAAR	=	1160
Soil	=	0.450
Urban Factor	=	0.32
Region Number	=	10

Based on these variables, and the calculation results provided by the MicroDrainage computer software (Appendix E), the QBAR for a 50.00ha catchment area is:

QBAR = 596.3 l/s

This figure is for the catchment area of 50.00 ha, and is to be reduced to reflect the surface water management area (0.180 ha) of the Site. Therefore, the QBAR (greenfield run-off) for development area has been calculated to be:

QBAR = **2.15 l/s (11.93 l/s/ha)**

Ciria C753 Table 24.2 identifies the growth factors for each of the storm events, based on the known QBAR figure. The growth factors from the table vary depending on the site location. In this case hydrometric area (Region Number) is 10.

Based on the figures shown in the table, the growth factors, and the greenfield run-off rates for each of the storm events for the surface water management areas of the Site are as follows:

Storm Event	**QBAR**	**Growth Factor Region 10 (C753 Table 24.2)**	**Greenfield Run-off Rate**
Q_2	2.15 l/s	0.93	**2.0 l/s**
Q_{30}	2.15 l/s	1.70	**3.7 l/s**
Q_{100}	2.15 l/s	2.08	**4.4 l/s**

Note: Greenfield rates are rounded up to single decimal place to adhere to MicroDrainage calculations.

7.2. Greenfield Run-Off Volume

The greenfield run-off volume for the 100-year, 6-hour storm event has also been calculated in the MicroDrainage software using the data from the FEH 2022 (shown as 2013 in calculations), with the results shown in Appendix E.

The FEH 2022 data and variables used to calculate the greenfield run-off volume at the Site location area as follows:

Site Location = GB 385280 415075 SD 85280 15075

Area = 0.180 ha

SAAR = 1160

CWI = 123.723

SPR Host = 47.000

URBTEXT = 0.32

Based on these calculation results (Appendix E), the greenfield run-off volume for the surface water management area of the Site is:

$Q_{100\ (6\text{-}Hour)}$ = 61.48m³ (442.50m³/ha)

8. Pre-Development Surface Water Run-Off Rates and Volume

The pre-development surface water run-off from the existing detached dwelling are to be calculated, so that the post development rates do not exceed to positively drained areas of the pre-development site.

The calculations to determine the pre-development surface water run-off rates and volume are based on the pre-development surface water run-off area of 0.025 ha, which is the existing detached dwelling area only, where the surface water run-off from this area discharges to an existing 150mm surface water sewer that flows to the south-west boundary.

The rainfall data used for the calculation is FEH 2022 (shown as FEH 2013 in calculations), with the results simulated / calculated in the MicroDrainage computer software (see Appendix F).

Based on the catchment area, FEH 2022 data and computer software results, the pre-development surface water run-off rates are as follows:

Q_2 = 2.8 l/s (15-minute storm duration)

Q_{30} = 6.9 l/s (15-minute storm duration)

Q_{100} = 8.6 l/s (15-minute storm duration)

Based on the FEH 2022 data and computer software results, the pre-development surface water run-off volume is as follows:

Q_{100} = 15.68m³ (360-minute storm duration)

9. Climate Change

The NPPF makes it a planning requirement to account for climate change in the proposed design. The recommended allowances are taken from the Environment Agency guidance summarised in Figure 1 below.

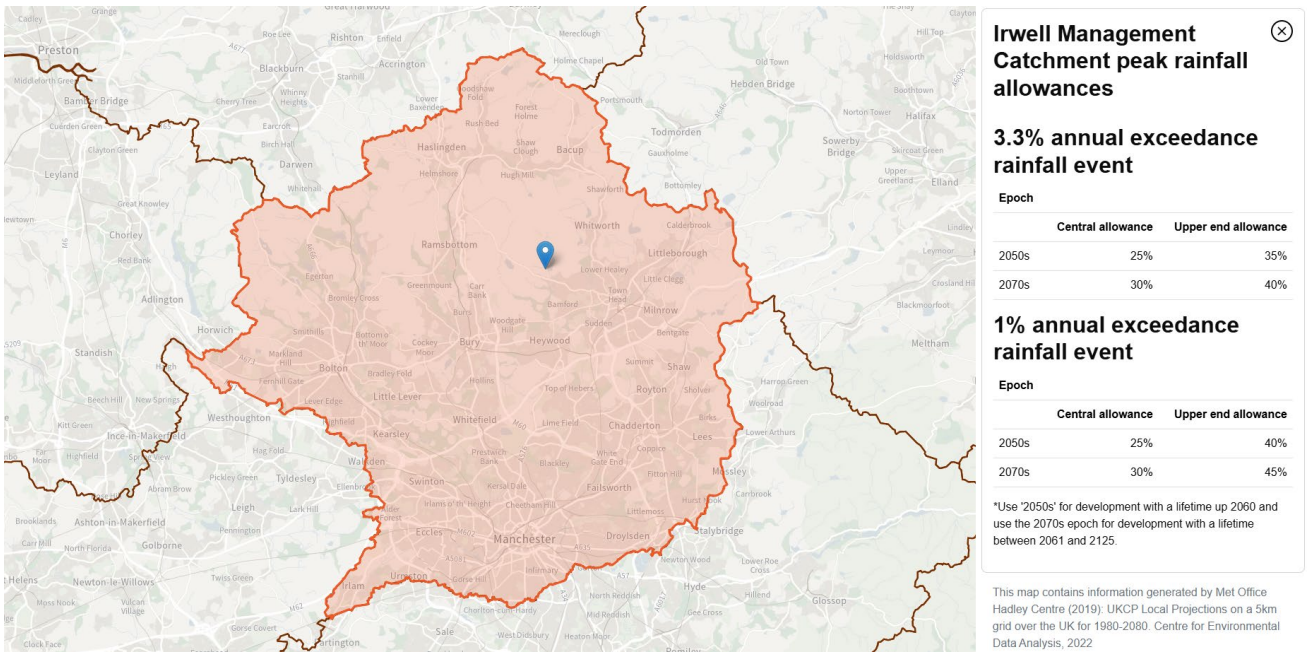


Figure 1 - DEFRAs – Climate Change Allowances

The lifetime of the Site is likely to be beyond 2061, and therefore the Epoch 2070's is to be used with Upper End Allowance. Therefore, the climate change allowance for the surface water run-off will be **40%** and **45%** for the 30-year and 100-year storm respectively.

10. Drainage Networks and Surface Water Management Calculation

10.1. Surface Water Network Calculations

The calculations to determine the post development surface water run-off rates, volumes and required attenuation, are based on the post development surface water run-off area of 0.180 ha, and the rainfall data given by the FEH 2022 (shown as 2013 in MicroDrainage calculations), and a run-off coefficient (Cv) of 1.0.

10.2. Surface Water Drainage Network

As shown on the below ground drainage layout in Appendix G, the proposed surface water network will consist of 150mm to 300mm diameter pipes, 150mm perforated pipes, 460mm inspection and silt trap chambers, filer drains, permeable surfacing, a flow control chamber containing a hydro-brake, and an attenuation tank in the form of cellular units.

The surface water run-off from the dwelling roof areas will discharge to the main network via existing rainwater pipes, and new rainwater pipes with trapped rainwater gullies (containing first 5mm of water) the surface water run-off from the access and parking areas will discharge to the main network via the permeable surfacing system, and the surface water run-off from the access / footpath areas will discharge to the main network vial filter drains and channel drains with sumps (also containing first 5mm of water).

The surface water network will flow to the south-west of the Site, where the surface water will flow through the flow control chamber prior to discharge to the existing 150mm surface water drainage network. Surface water is to be restricted by the flow control prior to the discharge to the surface water sewer, with restricted surface water surcharging the network and being attenuated within the tank in the form of cellular units and permeable paving sub-base.

10.3. Surface Water Run-Off Rate

For the surface water run-off from the Site, in a post-development state, to be at the greenfield run-off rate, they are to be restricted to 2.0 l/s for the 1 in 2-year storm event, 3.7 l/s for the 1 in 30-year storm event including 40% allowance, and 4.4 l/s for the 1 in 100-year storm event including 45% allowance.

For the surface water run-off from the Site, in a post-development state, to be a reduction of the pre-development rates from the existing detached dwelling, they are to be restricted to no more than 2.8 l/s for the 1 in 2-year storm event, 6.9 l/s for the 1 in 30-year storm event including 40% allowance; and 8.6 l/s for the 1 in 100-year storm event including 45% allowance.

To ensure that the surface water run-off rates due not exceed the pre-development surface water run-off discharging off the Site via an existing network, and do not exceed the greenfield run-off volume, the rates are to be restricted to a peak rate of **2.8 l/s.**

As shown in the surface water network calculations (via MicroDrainage) in Appendix G, if the hydro-brake opening is set at 77mm, with a design head of 1.20m and a design flow of 2.8 l/s, the maximum surface water run-off rates for each storm event will be as follows:

Q_2	-	**2.7 l/s**	-	240-minute summer storm duration
$Q_{30 + CC}$	-	**2.7 l/s**	-	240-minute winter storm duration
$Q_{100 + CC}$	-	**2.8 l/s**	-	360-minute winter storm duration

A summary of the post development surface water run-off rates compared to the greenfield and pre-development rates are as follows:

Greenfield Rate to Post Development Rate

Storm	-	**Greenfield**	-	**Post Dev**	-	**Difference**
Q_2	-	2.0 l/s	-	2.7 l/s	-	Increase
$Q_{30 + CC}$	-	3.7 l/s	-	2.7 l/s	-	Reduction
$Q_{100 + CC}$	-	4.4 l/s	-	2.8 l/s	-	Reduction

Pre-Development Rate to Post Development Rate

Storm	-	**Pre-Dev**	-	**Post Dev**	-	**Difference**
Q_2	-	2.8 l/s	-	2.7 l/s	-	Reduction
$Q_{30 + CC}$	-	6.9 l/s	-	2.7 l/s	-	Reduction
$Q_{100 + CC}$	-	8.6 l/s	-	2.8 l/s	-	Reduction

The calculations show that the surface water run-off rates exceed the 2-year greenfield rate, but are a reduction of the 30-year and 100-year greenfield rates, and the 2-year to 100-year pre-development surface water run-off rates from the existing detached dwelling.

Therefore, the rates are deemed to be acceptable as they will replicate the pre-development 2-year storm rates within the existing network currently discharging the surface water off the Site.

10.4. Surface Water Run-Off Volume

The surface water run-off volumes for the post development site have also been calculated for 1 in 100-Year the 6-hour duration (Including CC), within the MicroDrainage computer software in Appendix H, based on the peak discharge rate, where:

$Q_{100\ (6\text{-hour})}$ = 2.8 l/s x (60 x 60 x 6) = 60,480 litres = 60.48m³

A summary of the post development surface water run-off volume compared to the greenfield a d pre-development volumes are as follows:

Greenfield Volume to Post Development Volume

Storm	-	**Greenfield**	-	**Post Dev**	-	**Difference**
Q_{100}	-	61.48m³	-	60.48m³	-	Equivalent

Pre-Development Volume to Post Development Volume

Storm	-	**Pre-Dev**	-	**Post Dev**	-	**Difference**
Q_{100}	-	15.68m³	-	60.48m³	-	Increase

The surface water run-off volume for the 100-year, 6-hour storm event is the equivalent to the greenfield volume and is therefore deemed to be acceptable.

The volume exceeds the pre-development volume from the detached dwelling, as the pre-development area is relatively small compared to the pre-development catchment area (0.025 ha compared to 0.180 ha). However, as the volume is no greater than the greenfield volume, and the rate at which the volume discharges the Site is a reduction of the greenfield and pre-development rates, the volume won't adversely increase flood risk elsewhere.

10.5. Surface Water Network and Attenuation Calculations

As stated above, the post development run-off rates are restricted, there will be a requirement for surface water attenuation.

Ciria SuDS Manual 2015, Paragraph 10.2.4 states that: '*Exceedance flows (i.e. flows in excess of those for which the system is designed) should be managed safely in above-ground space such that risks to people and property are acceptable'.*

Attenuation will be within the below ground attenuation tank in the form of cellular units.

As detailed in the MicroDrainage calculations (Appendix H) and below ground drainage layout (Appendix G), the attenuation volume and details for this SuDS method is as follows:

Cellular Units

Attenuation Tank Length	-	18.00m
Attenuation Tank Width	-	5.50m
Attenuation Tank Area	-	99.00m²
Attenuation Tank Depth	-	1.20m
Attenuation Tank Volume	-	118.80m³
Porosity	-	0.95
Attenuation Volume	-	112.86m³

The MicroDrainage calculations (Appendix H) show that with the proposed network and attention tank (in the form of cellular units), no flooding will occur for all storms up to and including the 100-year (including 45% CC).

Therefore, the attenuation volume is deemed to be acceptable, as it adheres to National Standards for SuDS (July 2025) – Standard 3, where no increase in flood risk to areas within or near the Site will occur.

11. Maintenance Requirements

Details of the maintenance required, and the parties to carry out the maintenance of all drainage aspects, to ensure that the network and SuDS methods are working affectively, and subsequently reducing the risk of flooding on the Site, are set out below.

11.1. Drainage Responsibilities

The management and maintenance of the surface water drainage networks and SuDS features within the Site boundary will be by contractors appointed by the estate managers of the Site, and will form part of the overall Site management strategy.

11.2. Operation and Frequency

The operation and frequency of the maintenance and management of the drainage and SuDS features are to be carried out as follows:

Drainage Networks, Cellular Units and Flow Control Chamber

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthlies
Debris removal from manholes (where may cause risk performance)	Monthly
Where rainfall into network from above, check surface or filter for blockage or silt, algae, or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Repair/check all inlets, outlets, and overflow pipes	As required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually and after large storms

Permeable Surfacing and Filter Drains

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthlies
Debris removal from on surface of permeable surfacing and filter drains or near system (where may cause risk performance)	Monthly
Rainfall infiltration into permeable surfacing and filter drains is ensured working effectively.	As required, but at least twice a year

11.3. Linked and Further Maintenance and Maintenance Activities

The maintenance of the drainage network and SuDS features are to be linked with the wider site maintenance plan for the Site. A log of all maintenance activities is to be kept and made available to the local planning authority (LPA) and / or the Lead Local Flood Authority (LLFA) on request.

12. Surface Water Exceedance Event

In the event of an extreme storm event greater than 100-year (including 45% CC) flooding of the drainage network could occur.

Surface water flow paths will follow existing and proposed ground topography, where the water will flow towards the south-east boundary, into the woodland area, and into the reservoir overflow watercourse.

Surface water will flow away from the buildings within the Site, and will not flow into neighbouring land or properties prior to discharge to the overflow watercourse.

Therefore, there will not be an increase in flood risk to any neighbouring properties in an extreme storm event.

13. Water Quality

The level of water treatment (for external areas subject to pollutants) is to be assessed against the details set out in Ciria SuDS Manual C753. Chapter 26 sets out the Pollution Hazard Indices for different land classifications, and how to calculate that against the SuDS mitigation indices to show suitable levels of treatment.

13.1. External Area Pollutant Hazard

C753 Table 26.2 Pollution Hazard Level	=	Low
C753 Table 26.2 Pollution Hazard Index:		
• Total Suspended Solid (TSS)	=	0.5
• Metals	=	0.4
• Hydrocarbons	=	0.04
Pollution Hazard Index	=	**1.30**

13.2. External Area Pollutant Mitigation

Mitigation Measures:

- **Permeable Surfacing**

Permeable Surfacing Pollutant Mitigation Indices

Total Suspended Solid (TSS)	=	0.7
Metals	=	0.6
Hydrocarbons	=	0.7
SuDS Mitigation Indices	=	**2.00**

The mitigation indices are greater than the pollution hazard index, and therefore suitable water quality is achieved.

Note: Surface water run-off from roof and footpath areas has very low pollutants, and will flow through trapped gullies, channel drains with sumps (containing first 5mm of water) and filter drains prior to discharge to main drainage network. Therefore, the surface water run-off from these areas will not affect the water quality.

14. Development Management and Construction Phase

All existing drainage networks (if found) within the Site are to be maintained during construction. The flow control and cellular units are to be the first part of the drainage network to be built. This will ensure that the surface water discharge at a reduced rate during all phases of the build.

14.1. Construction Environment Management Plan

Full details of the construction environment management plan (CEMP) are to be confirmed by the chosen contractor who has been appointed for the development. However, it will conform to the requirements of CIRIA 753 – The SuDS Manual – Chapter 31, and will include:

14.2. Construction Access

The main construction traffic will access the site from the western boundary (Over Town Lane). The set-up areas will be limited to avoid the attenuation tank, with protection measures (i.e. concrete slab) put over the installed attenuation tank to prevent damage during vehicle movements.

14.3. Sediments and Traps

Sediment basins and traps are to be installed before any site earthworks take place, with further sediment traps and silt fences being installed as the earthworks progress. This will keep sediment contained on site at appropriate locations.

14.4. Run-Off Control Measures

Run-off control measures are to be used in conjunction with sediment traps to divert water around planned earthworks areas to remove silts. Any surface water upstream of the site is to be diverted around the development areas, and to discharge to the existing surface water drainage network. The surface water run-off destination for the diverted surface water will continue as existing.

14.5. Main Surface Water Run-Off Systems

The flow control chamber and cellular units are to be built prior to any phase of construction of site. Temporary inlet and outlet protection measures and appropriate silt traps are to be installed to prevent silt ingress into the main drainage network.

14.6. Clearing and Earthworks

Clearing and earthworks will only start when adequate erosion and sediment control measures are in place. Once the development areas are cleared, earthworks will follow immediately to ensure that the ground cover can be re-established quickly. Adjacent land to that being developed will be left undisturbed for as long as possible.

14.7. Surface Stabilisation Measures

Surface stabilisation measures will be applied to completed areas, channels ditches and other disturbed areas after the land is cleared and profiled. Permanent stabilisation measures will be installed as soon as possible after final profiling.

14.8. Construction of Permeable Surfacing

Construction of the permeable surfacing is to be left to the later stages of construction. Unsuitable sediment is to be removed from surfacing prior to installation of sand binder layer and paving.

15. Conclusion / Summary

15.1. Discharge Destination

The ground is not suitable for infiltration, and discharge to a waterbody and surface water is not feasible. Therefore, the only alternative is to discharge to the existing 150mm surface water drainage network that takes the surface water from the existing detached dwelling, and flows to the south-west of the Site.

Discharging to the existing network with a restricted rate not exceeding the pre-development rates will replicate the current surface water flows from the Site, will replicate the pre-development surface water discharge destination, and consequently will not increase flood risk elsewhere.

15.2. Peak Flow Control

Surface water run-off rates exceed the 2-year greenfield rate, but are a reduction of the 30-year and 100-year greenfield rates, and the 2-year to 100-year pre-development surface water run-off rates from the existing detached dwelling. Therefore, the rates are deemed to be acceptable as they will replicate the pre-development 2-year storm rates within the existing network currently discharging the surface from the Site.

15.3. Volume Control

The surface water run-off volume for the 100-year, 6-hour storm event is the equivalent to the greenfield volume and is therefore deemed to be acceptable.

The volume exceeds the pre-development volume from the detached dwelling, as the pre-development area is relatively small compared to the pre-development catchment area (0.025 ha compared to 0.180 ha). However, as the volume is no greater than the greenfield volume, and the rate at which the volume discharges the Site is a reduction of the greenfield and pre-development rates, the volume won't adversely increase flood risk elsewhere.

15.4. Flood Risk within the Development

with the proposed network and attention tank (in the form of cellular units), no flooding will occur for all storms up to and including the 100-year (including CC). Therefore, the attenuation volume is deemed to be acceptable, as it adheres to National Standards for SuDS (July 2025) – Standard 3, where no increase in flood risk to areas within or near the Site will occur.

15.5. Management and Maintenance

The management and maintenance of the surface water drainage networks and SuDS features within the Site boundary will be by contractors appointed by the estate managers of the Site, and will form part of the overall Site management strategy.

15.6. Exceedance Event

Surface water flow paths will follow existing and proposed ground topography, where the water will flow towards the south-east boundary, into the woodland area, and into the reservoir overflow watercourse.

Surface water will flow away from the buildings within the Site, and will not flow into neighbouring land or properties prior to discharge to the overflow watercourse Therefore, there will not be an increase in flood risk to any neighbouring properties in an extreme storm event.

15.7. Water Quality

The level of water treatment is to be assessed against the details set out in Ciria SuDS Manual C753. Chapter 26 sets out the Pollution Hazard Indices for different land classifications, and how to calculate that against the SuDS mitigation indices to show suitable levels of treatment. The mitigation indices are greater than the pollution hazard index, and therefore suitable water quality is achieved.

Appendix A Topographical Survey

mcclure architects

GENERAL NOTES

1. Drawings & Specifications to be read in conjunction with information from all other design consultants and contractors.
2. All drawings in digital format are for reference only, paper copies are available on request.
3. Do not scale from this drawing except for Local Authority Planing purposes. Use figured dimensions only. Verify all dimensions on site.
4. All drawings issued prior to the relevant planning and building regulations have been obtained are to be deemed preliminary. Any works carried out using preliminary drawings are entirely at the clients risk. McClure Architects cannot be held responsible for additional works / expense incurred on this basis.
5. ©Copyright rests with McClure Architects. This drawing may not be reproduced wholly or in part without the express written permission of McClure Architects.

Rev.	Revision Note / Purpose	Date
-	-	-

TOPOGRAPHICAL SURVEY - 1:200 @ A1

Drawing Stage: **RIBA Stage 3 Drawings**						
Client: Private						
Project / Address: Rainshore House, Over Town Lane, Norden, Rochdale, OL12 7TQ						
Drawing: Topographical Survey						
Scale @ A1: 1:100		Drawn By: GK			Date: Jan 26	
Proj.	Role	Zone	Level	Type	No.	Rev.
552	A	XX	XX	DR	222	R00

mcclure architects
186, Lisburn Road, Belfast BT9 6AL T:02890 284413

Appendix B Proposed Site Plan

mccl archi

GENERAL NOTES

1. Drawings & Specifications to be read in conjunction with inforr other design consultants and contractors.
2. All drawings in digital format are for reference only, paper copi on request.
3. Do not scale from this drawing except for Local Authority Plani figured dimensions only. Verify all dimensions on site.
4. All drawings issued prior to the relevant planning and building been obtained are to be deemed preliminary. Any works carrie preliminary drawings are entirely at the clients risk. McClure Ar be held responsible for additional works / expense incurred or
5. ©Copyright rests with McClure Architects. This drawing may r wholly or in part without the express written permission of McC

Rev.	Revision Note / Purpose
01	Levels and ground materials updated

KEY:

- Site Boundary
- Soft landscape
- Porous Asphalt
- Cellular No-dig Paving System Grid (Bodpave or similar) with Gravel infill
- Cellular No-dig Paving System Grid (Bodpave or similar) with Grass infill
- Gravel surface retaining existing
- Retaining existing sandstone paving and making good where disturbed
- Tegula paving sets
- Permeable MUGA Ashpalt
- Existing trees (retained)
- Existing trees (removed)
- Proposed trees
- Existing hedges and planting (retained)
- Proposed hedges and planting

PROPOSED SITE PLAN - 1:200 @ A1

Drawing State
RIBA Stage 3 Drawings

Client
Private

Project / Address
Rainshore House,
Over Town Lane,
Norden,
Rochdale, OL12 7TQ

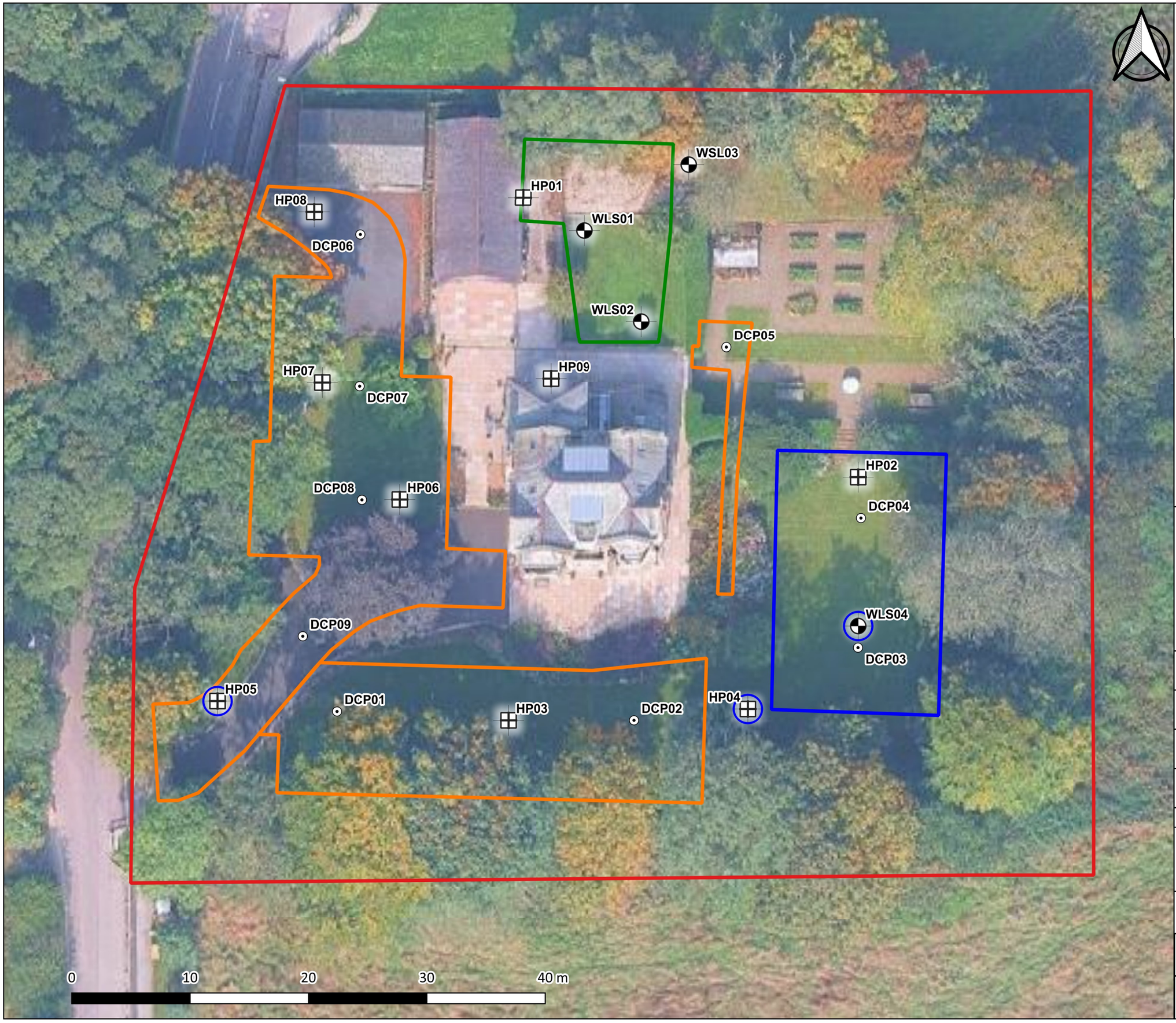
Drawing
Proposed Site Plan

Scale @ A1	Drawn By	Date
1:200	GK	Feb 26

Proj.	Role	Zone	Level	Type	No.
552	A	XX	XX	DR	122

mcclure archite
186, Lisburn Road, Belfast BT9 6AL T:028

Appendix C Ground Investigation Data



Key:

Site Features

- Site Boundary
- MUGA Boundary
- Building Extension Boundary
- Road/Parking Boundary

Exploratory Holes

- Windowless Sampling Borehole
- DCP
- Hand Pit
- Permeability Test

Notes

1) Base image provided by Google.

2) All drawn features are approximate.

Contains OS data © Crown copyright [and database right] [2026]
Map data © 2026 Google

REV	DATE	COMMENT ON VARIATION
A	March 2026	First issue

soiltechnics
environmental ▪ geotechnical ▪ building fabric

PROJECT
Rainshore House, Rochdale

TITLE
Exploratory Hole Location Plan

DRAWING No.
STY7409-D01-A

Rainshore House, Rochdale

STY7409

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environmental ▪ geotechnical ▪ building fabric

INSTALL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Grass onto brown gravelly slightly clayey fine SAND with frequent roots and rootlets. Gravel is fine to medium subangular sandstone and occassional brick. (TOPSOIL)	0.20										0.10		ES
	Firm grey mottled orangish brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular sandstone, mudstone and brick. (DEVENSIAN TILL)											0.80		D
	Stiff greyish brown slightly gravelly slightly sandy CLAY. Gravel is medium subangular sandstone and fine coal. (DEVENSIAN TILL)	1.00				S 1.20	(7) 17							
										PP 1.50	PP 159	1.50		D
										PP 1.80	PP 125			
						S 2.00	(9) 25							
										PP 2.30	PP 117			
	BOREHOLE TERMINATED AT 2.50m	2.50				S 2.50	(12) 48			PP 2.50	PP 125	2.50		D

DRAFT

Notes

Terminated due to SPT refusal.

Groundwater observations					
Strike (m)	5mins	10mins	15mins	20mins	Comments
No groundwater strike recorded					

Recovery details	
Range (m)	% Recv
1.20 - 2.00	100
2.00 - 2.50	100

Title Dynamic windowless sampling record		**Date(s)** 11/03/2026
Method Windowless Sampling	**Plant used** ARCHWAY DART	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Logged by** JT	**Revision**
Co-ordinates Not surveyed	**Status** DRAFT	**WLS01**

Rainshore House, Rochdale

STY7409

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INSTALL	STRATA: DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND	WATER STRIKES	SPT TESTING: TYPE / DEPTH (m)	SPT TESTING: RESULT	SPT TESTING: CASING DEPTH (m)	SPT TESTING: WATER LEVEL (m)	OTHER IN SITU TESTING: TYPE / DEPTH (m)	OTHER IN SITU TESTING: RESULT	SAMPLING: FROM (m)	SAMPLING: TO (m)	SAMPLING: TYPE
	Grass onto brown gravelly slightly clayey fine to medium SAND with frequent rootlets and roots. Gravel is fine to medium subangular sandstone and brick. (TOPSOIL)	0.30												
	Yellowish brown gravelly slightly clayey medium SAND with low cobble content. Gravel is fine to medium subangular brick. Cobbles are subangular brick. (MADE GROUND)	0.80										0.50		ES
	Firm yellowish brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular sandstone and fine coal. (DEVENSIAN TILL)					S 1.20	(0) 0					1.20		D
										PP 1.50	PP 75			
										PP 1.80	PP 92			
	Firm to stiff brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse subangular sandstone and mudstone. (DEVENSIAN TILL)	2.00				S 2.00	(8) 20							
										PP 2.50	PP 192			
										PP 2.80	PP 142			
						S 3.00	(6) 28							
										PP 3.50	PP 225	3.50		D
										PP 3.80	PP 209			
						S 4.00	(8) 21							
										PP 4.50	PP 104			
										PP 4.80	PP 92			
						S 5.00	(6) 15					5.00		D
	BOREHOLE TERMINATED AT 5.45m	5.45												

DRAFT

Notes

Terminated at scheduled depth.

Groundwater observations

Strike (m)	5mins	10mins	15mins	20mins	Comments

No groundwater strike recorded

Recovery details

Range (m)	% Recv
1.20 - 2.00	100
2.00 - 3.00	90
3.00 - 4.00	100
4.00 - 5.00	95

Title Dynamic windowless sampling record		**Date(s)** 11/03/2026
Method Windowless Sampling	**Plant used** ARCHWAY DART	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Logged by** JT	**Revision**
Co-ordinates Not surveyed	**Status** DRAFT	**WLS02**

Rainshore House, Rochdale

STY7409

soiltechnics

environmental ▪ geotechnical ▪ building fabric

INSTALL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Grass onto brown gravelly slightly clayey fine to medium SAND with frequent rootlets and roots. Gravel is fine to medium subangular sandstone. (TOPSOIL)	0.30												
	Soft yellowish brown sandy slightly gravelly CLAY with occasional roots. Gravel is fine subangular sandstone. (DEVENSIAN TILL)	0.70												
	Firm to stiff brown mottled yellowish brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular sandstone. (DEVENSIAN TILL)											1.00		D
						S 1.20	(6) 17							
										PP 1.50	PP 134			
	Stiff brown slightly gravelly slightly sandy CLAY with occassional beds of yellowish brown SAND up to 50mm in thickness. Gravel is fine subangular sandstone and mudstone. (DEVENSIAN TILL)	1.80												
						S 2.00	(4) 19					2.00		D
										PP 2.50	PP 225			
										PP 2.80	PP 217			
	Stiff brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular sandstone and mudstone. (DEVENSIAN TILL)	3.00				S 3.00	(6) 21							
										PP 3.50	PP 209			
										PP 3.80	PP 159			
						S 4.00	(6) 21					4.00		D
	BOREHOLE TERMINATED AT 4.50m	4.50				S 4.50	(22) 57			PP 4.50	PP 125			

DRAFT

Notes

Terminated due to SPT refusal.

Groundwater observations

Strike (m)	5mins	10mins	15mins	20mins	Comments

No groundwater strike recorded

Recovery details

Range (m)	% Recv
1.20 - 2.00	100
2.00 - 3.00	100
3.00 - 4.00	90
4.00 - 5.00	60

Title Dynamic windowless sampling record		**Date(s)** 11/03/2026
Method Windowless Sampling	**Plant used** ARCHWAY DART	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Logged by** JT	**Revision**
Co-ordinates Not surveyed	**Status** DRAFT	**WLS03**

Rainshore House, Rochdale

STY7409

soiltechnics

environmental ▪ geotechnical ▪ building fabric

INSTALL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (mOD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Grass onto soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is fine subangular sandstone. (TOPSOIL)											0.10		ES
	Soft becoming firm orangish brown mottled yellowish brown slightly gravelly slightly sandy CLAY. Gravel is fine subangular sandstone and mudstone. (DEVENSIAN TILL)	0.35								PP 0.60	PP 25	0.50		D
	Firm greyish brown slightly gravelly slightly sandy CLAY. Gravel is medium to coarse subangular sandstone and angular mudstone. (DEVENSIAN TILL)	1.10				S 1.20	(4) 12			PP 1.20	PP 54	1.00		D
										PP 1.80	PP 142	1.50		D
						S 2.00	(8) 21							
										PP 2.50	PP 146	2.50		D
										PP 2.80	PP 175			
						S 3.00	(11) 28							
										PP 3.50	PP 209			
										PP 3.80	PP 213			
	Stiff greyish brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular sandstone and mudstone. (DEVENSIAN TILL)	4.00				S 4.00	(9) 28							
										PP 4.50	PP 209	4.50		D
						S 5.00	(7) 22							
	BOREHOLE TERMINATED AT 5.45m	5.45												

DRAFT

Notes
Terminated at scheduled depth.

Groundwater observations

Strike (m)	5mins	10mins	15mins	20mins	Comments

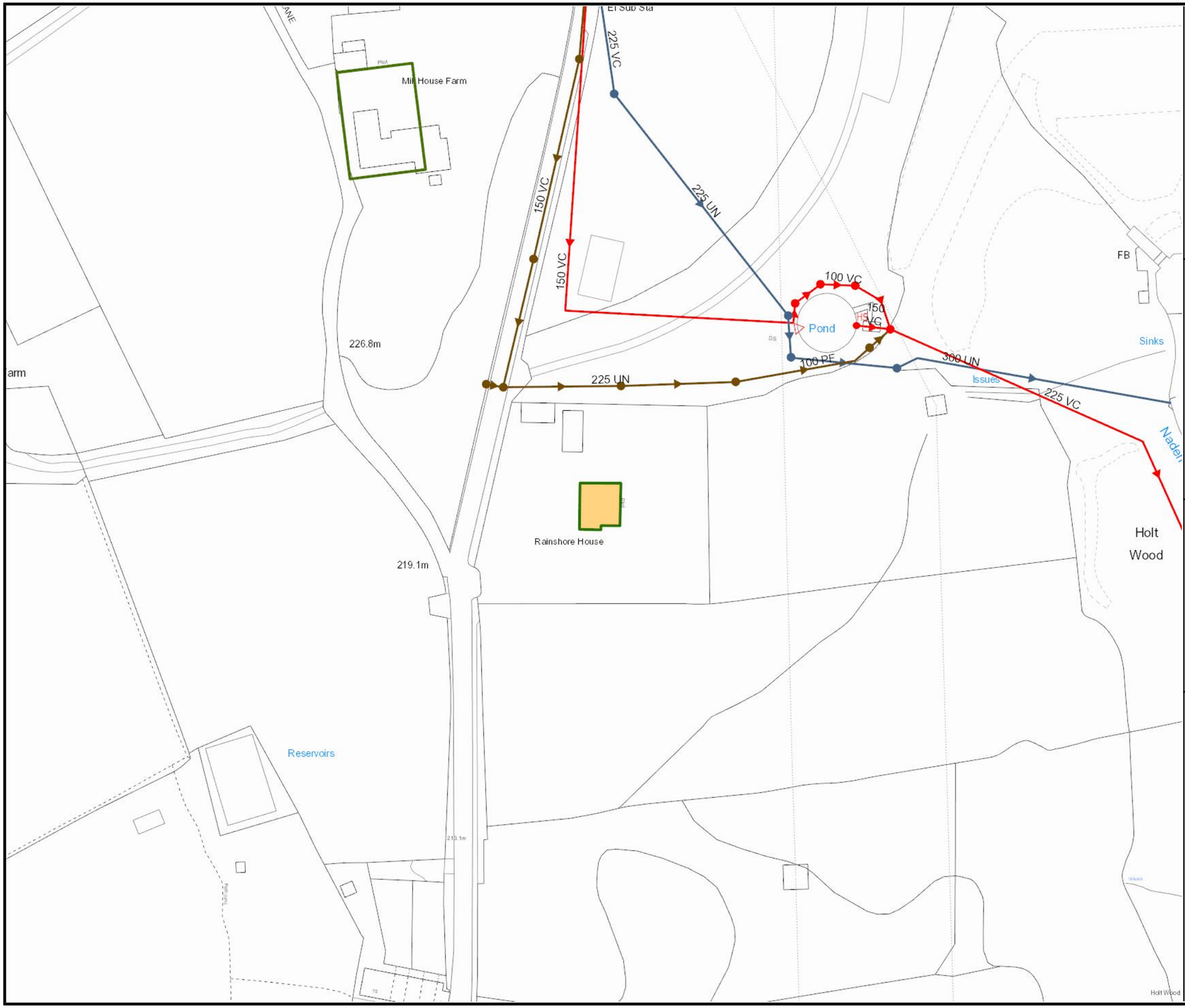
No groundwater strike recorded

Recovery details

Range (m)	% Recv
1.20 - 2.00	100
2.00 - 3.00	90
3.00 - 4.00	100
4.00 - 5.00	100

Title Dynamic windowless sampling record		**Date(s)** 11/03/2026
Method Windowless Sampling	**Plant used** ARCHWAY DART	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Logged by** JT	**Revision**
Co-ordinates Not surveyed	**Status** DRAFT	**WLS04**

Appendix D Existing Sewer and Drainage Plans



United Utilities
Water for the North West

SEWER RECORDS

Address or Site Reference

RAINSHORE HOUSE OVER
TOWN LANE,
ROCHDALE,
OL12 7TQ

Scale: 1:1250
Date: 30/03/2026

Printed by: Property Searches

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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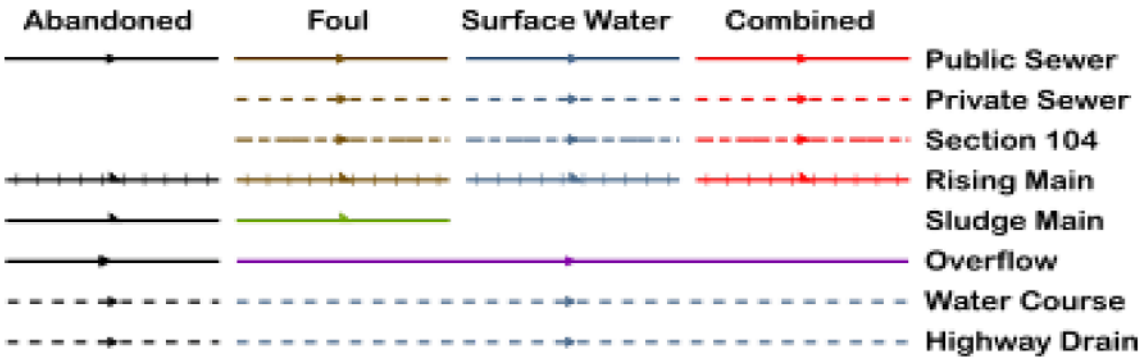
United Utilities
Water for the North West

Wastewater Symbology



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

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- DNM Network Monitoring Point
- Change of Characteristic

mcclure architects

GENERAL NOTES

1. Drawings & Specifications to be read in conjunction with information from all other design consultants and contractors.
2. All drawings in digital format are for reference only, paper copies are available on request.
3. Do not scale from this drawing except for Local Authority Planing purposes. Use figured dimensions only. Verify all dimensions on site.
4. All drawings issued prior to the relevant planning and building regulations have been obtained are to be deemed preliminary. Any works carried out using preliminary drawings are entirely at the clients risk. McClure Architects cannot be held responsible for additional works / expense incurred on this basis.
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Rev.	Revision Note / Purpose	Date
-	-	-

TOPOGRAPHICAL SURVEY - 1:200 @ A1

Drawing Stage: **RIBA Stage 3 Drawings**						
Client: Private						
Project / Address: Rainshore House, Over Town Lane, Norden, Rochdale, OL12 7TQ						
Drawing: Topographical Survey						
Scale @ A1: 1:100		Drawn By: GK			Date: Jan 26	
Proj.	Role	Zone	Level	Type	No.	Rev.
552	A	XX	XX	DR	222	R00

mcclure architects
186, Lisburn Road, Belfast BT9 6AL T:02890 284413

Appendix E Greenfield Run-Off Calculations

IH 124 Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 1160 Urban 0.320
Area (ha) 50.000 Soil 0.450 Region Number Region 10

Results	**l/s**
QBAR Rural	396.6
QBAR Urban	596.3
Q100 years	1075.2
Q1 year	518.8
Q2 years	579.9
Q5 years	718.8
Q10 years	810.9
Q20 years	895.9
Q25 years	920.1
Q30 years	936.2
Q50 years	987.3
Q100 years	1075.2
Q200 years	1186.5
Q250 years	1221.5
Q1000 years	1446.9

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Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 385280 415075 SD 85280 15075
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	0.180
SAAR (mm)	1160
CWI	123.723
SPR Host	47.000
URBEXT (USER)	0.3200

Results

Percentage Runoff (%)	54.48
Greenfield Runoff Volume (m^3)	61.481

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Appendix F Pre-Development Run-Off Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location GB 385280 415075 SD 85280 15075	
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.015	4-8	0.004	8-12	0.003	12-16	0.003

Total Area Contributing (ha) = 0.025

Total Pipe Volume (m³) = 0.177

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 0	Number of Storage Structures 0	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location GB 385280 415075 SD 85280 15075		Cv (Winter)	0.840
Data Type	Point	Storm Duration (mins)	30

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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 Coeffiecient	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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 385280 415075 SD 85280 15075	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	60 Summer	2	+0%					218.029	-0.121	0.000	0.09
1.001	2	30 Summer	2	+0%					217.995	-0.105	0.000	0.20

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1			1.2	OK	
1.001	2			2.8	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 Coeffiecient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 385280 415075 SD 85280 15075 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	60 Summer	30	+0%					218.044	-0.106	0.000	0.19
1.001	2	15 Summer	30	+0%					218.025	-0.075	0.000	0.49

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1			2.7	OK	
1.001	2			6.9	OK	

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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 Coeffiecient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 385280 415075 SD 85280 15075 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	60 Summer	100	+0%					218.050	-0.100	0.000	0.24
1.001	2	15 Summer	100	+0%					218.036	-0.064	0.000	0.61

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1			3.4	OK	
1.001	2			8.6	OK	

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Summary Wizard of 360 minute 100 year Winter I+0% 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 Coeffiecient	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	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 385280 415075 SD 85280 15075	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Discharge Vol (m³)
1.000	1	360 minute 100 year Winter I+0%	219.000	218.025	-0.125	0.000	0.07		8.150
1.001	2	360 minute 100 year Winter I+0%	219.000	217.986	-0.114	0.000	0.13		15.677

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1		0.9	OK
1.001	2		1.8	OK

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Appendix G Below Ground Drainage Layout and Details

General Drainage Notes:

Existing details shown on this drawing including kerblines, existing drains, chambers, sewers, pipework, stub connections where new connections, diversions or abandonment are shown, invert levels and pipe sizes shall be checked and confirmed to the engineer prior to the commencement of any works. Any discrepancies shall be reported to the engineer for action prior to any new construction.

All drainage works shall be carried out in accordance with the requirements of the local authority and in conjunction with all relevant British Standards and Codes of Practice

All drainage shall comply with the typical drainage construction details and the requirements of BS EN 752.

Access covers and frames shall comply with the loadings specified and to BS EN 124 and kitemarked or if recessed covers are specified then in accordance with FACTA association equivalent.

The proposed building outlines shown on this drawing are for information only. Refer to Architects plans for precise location setting out information and details.

All underslab drainage shall be clear of foundations unless shown otherwise with long radius bends kept to a minimum and used where unavoidable.

All private drainage pipework for foul and surface water systems have been designed on the basis of UPVC to BS EN 1401-1, unless noted otherwise.

Where new drainage is situated within 5 metres of new or existing trees the pipework shall be encased in concrete to reduce the risk of root ingress.

Concrete encasement of the pipework shall be required where the vertical clearance between two pipes crossing is less than 300mm.

All existing drainage shall be assumed to be 'live' and shall be maintained at all times during the works. Existing drainage shall be reconnected to the new drainage system unless proven to be redundant for abandonment. All existing drainage to be abandoned shall be sealed by appropriate means.

Upon completion all new drainage installation together with any existing drainage retained shall be jetted and CCTV surveyed upon completion. Contractor to ensure that the drainage system is fully operational, free of excess debris/silt and all identified faults rectified.

HEALTH & SAFETY: The works shall be carried out by specialist competent and experienced contractors. All operatives shall have received full and appropriate training with appropriate qualifications for the operations they are required to undertake. All work shall be carried out in accordance with the relevant Health & Safety Regulations.

Permeable Surfacing

Permeable surfacing to be formed over 350mm deep no fines 20mm aggregate, which is wrapped in an impermeable membrane, and houses a 150Ø perforated pipe to convey the surface water to the main drainage network.

Filter Drains

Filter drains to be formed of a 300 x 300mm trench filled with no fines 20mm aggregate, wrapped in an impermeable membrane, and is to house a perforated pipe to convey the surface water to the main drainage network.

Drainage Specifications

Foul water pipes to be Polypipe to BS EN 1401-1 or similar

Surface water pipes to be Polypipe Ridgidrain or similar

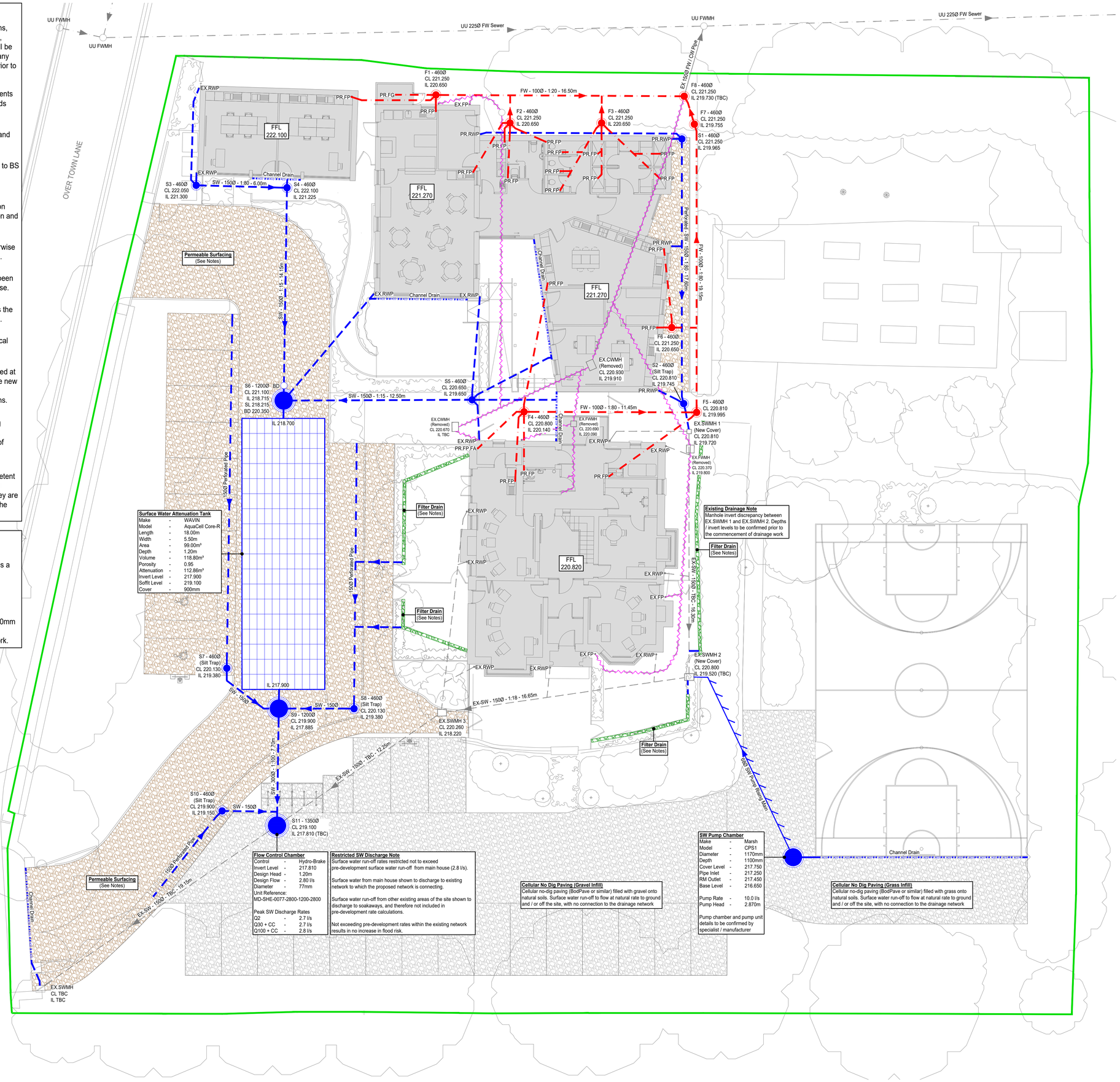
Flow control Chamber by Hydro-International or similar

Manholes by FP McCann or similar

Inspection chambers to be Polypipe or similar

Silt trap chambers yo be Polypipe or similar

Channel drain to be ACO M100D 10.0 or similar



Site Specific Drainage Notes:

Any existing drainage within the development site to remain live and to be diverted if required.

All existing sewer / drainage location, size, depths, and discharge destination to which the proposed networks are connecting to to be confirmed prior to the commencement of any drainage work. Design subject to change once confirmed.

Proposed rainwater and foul down pipe locations to be confirmed prior to the commencement of any drainage works. Design subject to change.

External levels and subsequent cover levels of proposed drainage network to be confirmed by Architect prior to commencement of any drainage works.

Covers of existing manholes that are to remain are to be replaced to suit proposed site levels.

Foul water discharge subject to United Utilities approval (via 106 agreement). No drainage work to commence until agreement and approval notice is given.

Surface water discharge subject to local authority approval. No drainage work to commence until agreement and approval notice is given.

All foul water pipes to be 100Ø, and all surface water pipes to be 150Ø unless shown otherwise.

Drainage Key:

- Proposed Surface Water Drainage
- Proposed Foul Water Drainage
- Proposed Perforated Pipe
- Existing Surface Water Drainage (Remain)
- Existing Surface Water Drainage (Removed)
- Existing Foul Water Drainage (Remain)
- Existing Foul Water Drainage (Removed)
- Existing Combined Water Drainage (Remain)
- Existing Combined Water Drainage (Removed)
- Proposed Channel Drain
- PR.RWP — Proposed Rainwater Pipe
- EX.RWP — Existing Rainwater Pipe
- PR.FP — Proposed Foul Down Pipe
- PR.FG — Proposed Foul Gully
- EX.FP — Existing Foul Down Pipe
- Permeable Surfacing (See Notes)
- No-Dig Permeable Surfacing
- Filter Drains (See Notes)
- Development Boundary

N

REV	DATE	DESCRIPTION	BY	CHECKED
P1	23.04.26	PRELIMINARY ISSUE	MS	DR

PRELIMINARY

rayment structures

EDEN LONDON UK LTD

CLIENT

RAINSHORE HOUSE
NORDEN, ROCHDALE

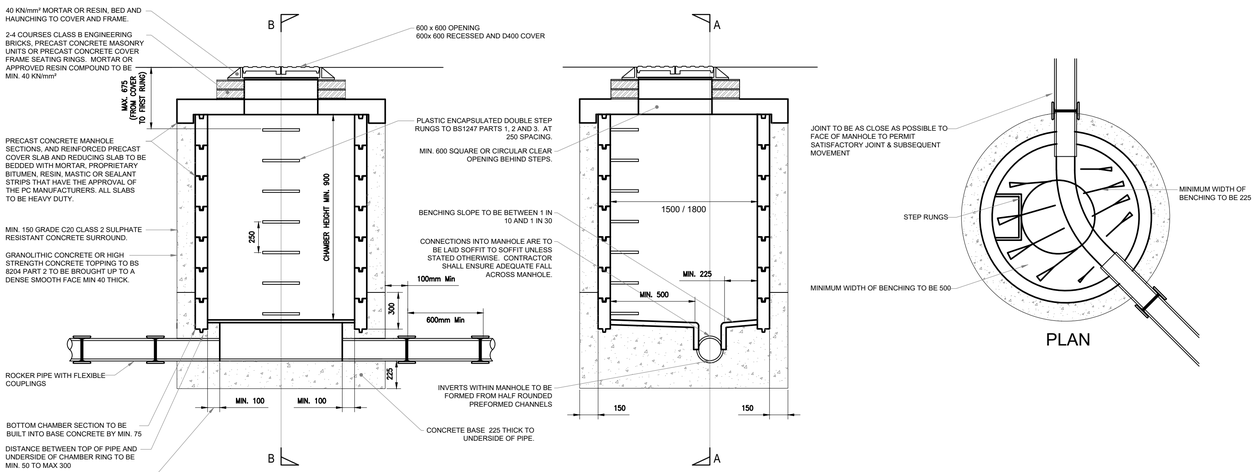
PROJECT

BELOW GROUND DRAINAGE LAYOUT

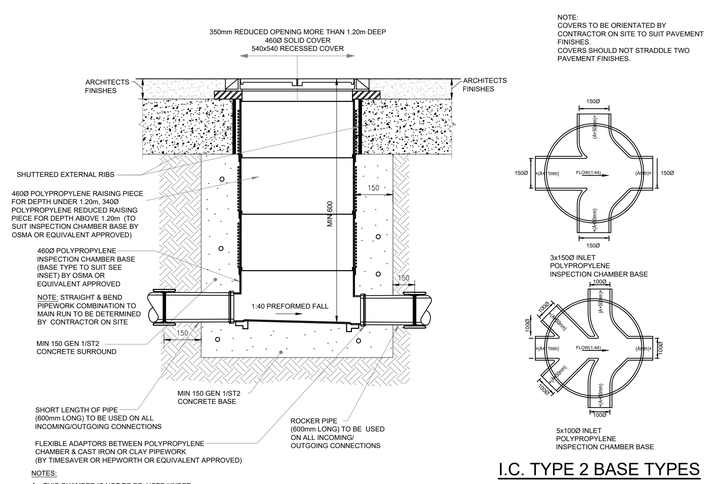
TITLE

SCALE	DRAWN	CHECKED	DATE
1 : 100@A1	MDS	DR	APR '26

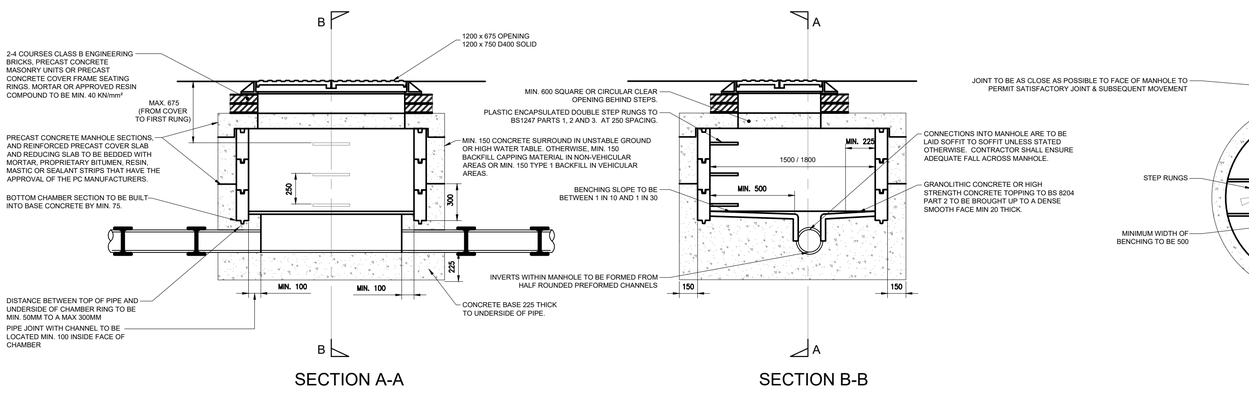
DRAWING No.	SUITABILITY	REVISION
4090-RAYME-ZZ-00-DR-C-1000	S0	P1



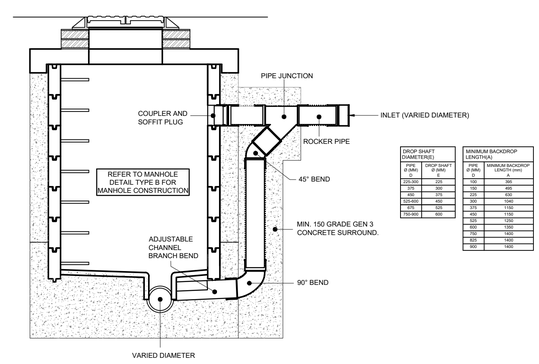
MANHOLE TYPE B
CIRCULAR PRECAST CONCRETE MANHOLE DETAIL
(DEPTH MORE THAN 1.50m TO PIPE SOFFIT)



MANHOLE TYPE D
POLYPROPYLENE INSPECTION CHAMBER
(MAXIMUM DEPTH 3.00m)



MANHOLE TYPE C
CIRCULAR PRECAST CONCRETE AND / OR BRICKWORK MANHOLE DETAIL
(DEPTH LESS THAN 1.50m TO PIPE SOFFIT)



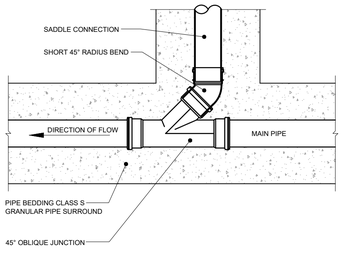
DROP SHAFT DIAMETER(S)	
PIPE Ø (Ø.N.)	DROP SHAFT Ø (Ø.N)
100	225
225-300	225
375	300
450	375
525-600	450
675	525
750-900	600

MINIMUM BACKDROP LENGTH(L)	
PIPE Ø (Ø.N)	MINIMUM BACKDROP LENGTH (mm)
100	450
150	500
225	600
300	1050
375	1150
450	1150
525	1250
600	1350
750	1400
825	1450
900	1500

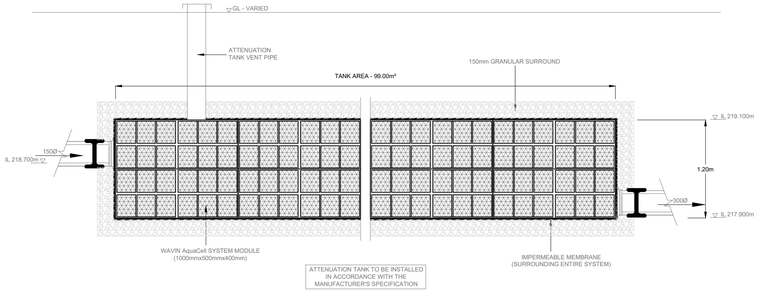
EXTERNAL BACKDROP DETAIL

REV	DATE	DESCRIPTION	BY	CHECKED
P1	23.04.26	PRELIMINARY ISSUE	MS	DR

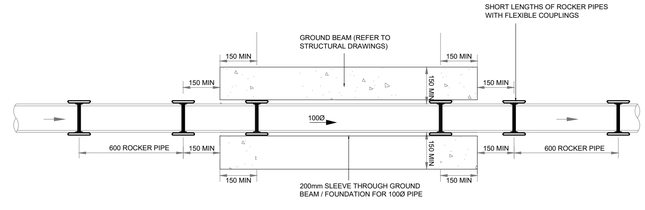
PRELIMINARY



TYPICAL 45° PIPE JUNCTION
CONNECTION DETAIL



ATTENUATION TANK DETAIL



TYPICAL PIPE THROUGH GROUND BEAM /
FOUNDATION DETAIL

raymentstructures

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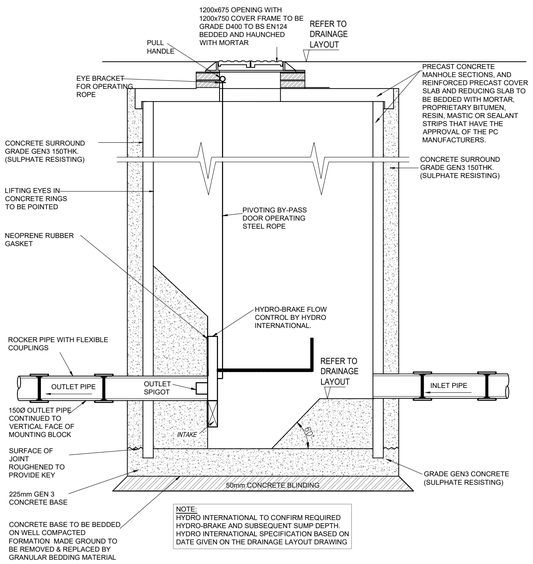
PROJECT

BELOW GROUND DRAINAGE DETAILS
SHEET 1
TITLE

SCALE	DRAWN	CHECKED	DATE
N.T.S@A1	MDS	DR	APR '26

DRAWING No.	SUITABILITY	REVISION
4090-RAYME-ZZ-00-DR-C-1002	S0	P1



NOTE:
HYDRO INTERNATIONAL TO CONFIRM REQUIRED HYDRO-BRAKE AND SUBSEQUENT SUMP DEPTH.
HYDRO INTERNATIONAL SPECIFICATION BASED ON DATE GIVEN ON THE DRAINAGE LAYOUT DRAWING

FLOW CONTROL MANHOLE DETAIL

CONTROL MANHOLE NOTES

ALL DIMENSION ARE IN MILLIMETERS

PRECAST CONCRETE UNITS TO BE BS5911 PART 200 AND TO BE CONSTRUCTED WITH A MINIMUM CLASS 3 SULPHATE RISISTING CEMENT.

ALL INSITU CONCRETE TO BE CLASS STANDARD MIX ST4 (GRADE C20) IN ACCORDANCE WITH SECTION 4 OF BS5328 PART 2.

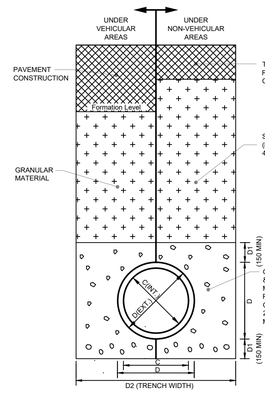
MATERIALS FOR JOINTING MANHOLE RINGS TO BE A RUBBER BITUMEN COMPOUND OF APPROVED MANUFACTURER 'TOKSTRIP' OR SIMILAR.

ALL BRICKWORK TO BE CLASS B ENGINEERING -2 COURSES MIN-4 COURSES MAX; 225mm THICK - BS5628 PART 3.

20mm THICK GRANOLITHIC CONCRETE BENCHING TO BE BROUGHT UP TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS. WHERE BENCHING IS LESS THAN 450mm WIDE, SLOPE TO BE 1:10; MORE THAN 450mm, 1:30

PIPES ENTERING MANHOLES TO HAVE A FLEXIBLE JOINT AS CLOSE AS FEASIBLE TO OUTSIDE FACE OF ANY STRUCTURE INTO WHICH THE PIPE IS BUILT IN ORDER TO FACILITATE MOVEMENT OF THE JOINT.

THE LENGTH OF THE NEXT PIPE (ROCKER PIPELINES, BEDDING, LAYING AND JOINTING OF PIPES AND BACKFILLING OF TRENCHES SHALL BE IN ACCORDANCE WITH THE W.S.A.SPEC 'SEWERS FOR ADOPTION - 6TH EDITION TOGETHER WITH ANY LOCAL AUTHORITY REQUIREMENTS.



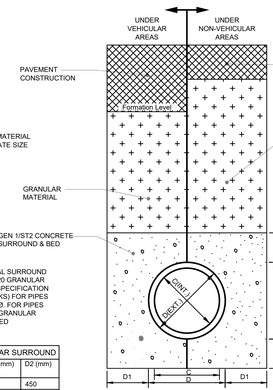
TO BE USED UNDER:

1. VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS GREATER THAN 900mm.
2. ALL NON-VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS GREATER THAN 600mm.

NOTE:
ALL PIPEWORK SHALL HAVE FLEXIBLE COUPLINGS

MIN. GRANULAR SURROUND		
PIPE Ø (C) (mm)	D1 (mm)	D2 (mm)
100	150	450
150	150	600
225	150	700
300	150	850
375	200	1050
450	200	1150
525	200	1200
600	200	1350
675	200	1450
750	200	1500

CLASS S PIPE BEDDING & SURROUND (TO BE USED FOR PLASTIC, VITRIFIED CLAY & CONCRETE PIPEWORK)



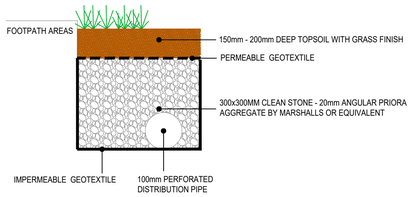
TO BE USED UNDER:

1. VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS EQUAL TO OR LESS THAN 900mm.
2. ALL NON-VEHICULAR AREAS WHERE COVER TO PIPE SOFFIT IS EQUAL TO OR LESS THAN 600mm.

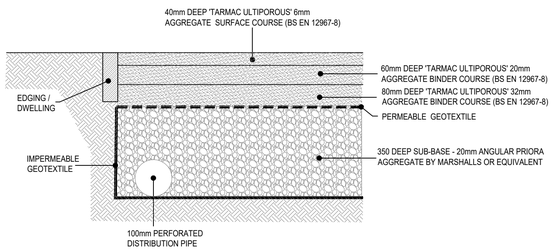
NOTE:
ALL PIPEWORK WITH CLASS Z (GEN 3/ST4) CONCRETE SURROUND SHALL HAVE FLEXIBLE COUPLINGS WITH FLEXI-BOARDS ON ALL JOINTS (REFER TO DETAIL D8)

MIN. CONCRETE ENCASEMENT		
PIPE Ø (C) (mm)	D1 (mm)	D2 (mm)
100-600	150	150
675	150	170
750	150	190
825	150	210
900	150	225
975	150	250
1050	150	270
1200	170	300
1350	180	350
1500	200	375
1650	220	420

CLASS Z PIPE BEDDING & SURROUND (TO BE USED FOR PLASTIC, VITRIFIED CLAY & CONCRETE PIPEWORK)

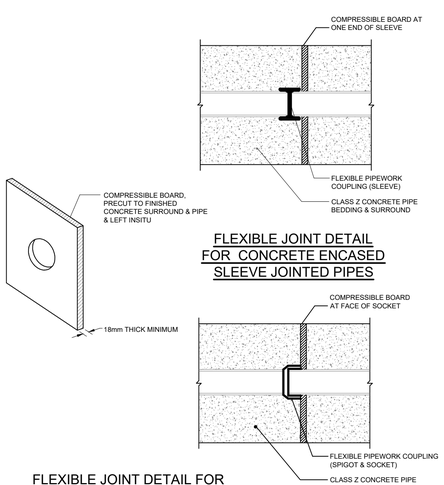


FILTER DRAIN DETAIL (LANDSCAPE AREA ADJACENT TO PAVING)



TYPICAL PERMEABLE SURFACING DRAINAGE DETAIL

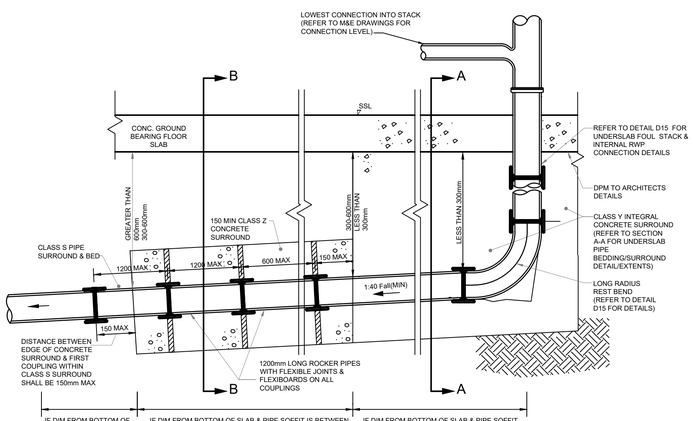
(NOTE - SURFACING / FINISHES INDICATIVE. CLIENT / ARCHITECT TO CONFIRM)



FLEXIBLE JOINT DETAIL FOR CONCRETE ENCASED SLEEVE JOINTED PIPES

FLEXIBLE JOINT DETAIL FOR CONCRETE ENCASED SPIGOT & SOCKET JOINTED PIPES

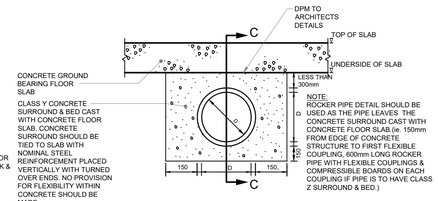
FLEXIBLE JOINT DETAIL FOR CONCRETE ENCASED PIPES (TO B.S. 1142)



NOTES:
1. THIS DETAIL SHALL ONLY BE USED UNDER AREAS OF GROUND BEARING SLAB WHERE UNDER SLAB PIPEWORK CAN BE SUPPORTED BY UNDER SLAB FILL MATERIAL.
2. CONNECTION INTO INTERNAL MANHOLE OR MAIN UNDER SLAB RUN OR EXIT THROUGH FOUNDATION EDGE DETAIL AS PER DETAIL D (REFER TO DRAINAGE PLAN)

SECTION C-C

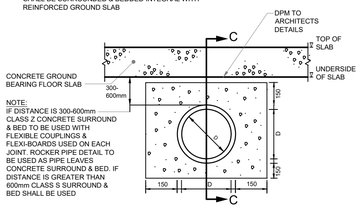
FOUL AND RAINWATER PIPE TYPICAL UNDERSLAB PIPE BEDDING DETAILS FOR PIPEWORK UNDER STRUCTURAL SLAB (FOR ALL UNDER SLAB PIPE DEPTHS)



NOTE:
ROCKER PIPE DETAIL SHOULD BE USED AS THE PIPE LEAVES THE CONCRETE SURROUND CAST WITH CONCRETE FLOOR SLAB.(ie. 150mm FROM EDGE OF CONCRETE STRUCTURE TO FIRST FLEXIBLE COUPLING, 600mm LONG ROCKER PIPE WITH FLEXIBLE COUPLINGS & COMPRESSIBLE BOARDS ON EACH COUPLING IF PIPE IS TO HAVE CLASS Z SURROUND & BED.)

SECTION A-A WHERE DISTANCE BETWEEN PIPE SOFFIT & UNDERSIDE OF CONCRETE GROUND BEARING FLOOR SLAB/GROUND BEAM IS LESS THAN 300mm

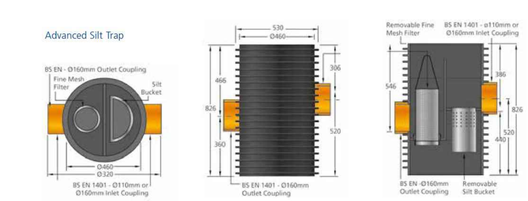
WHERE SOFFIT OF PIPE IS WITHIN 300mm OF UNDERSIDE OF CONCRETE FLOOR SLAB, THE PIPE SHALL BE SURROUNDED & BEDDED INTEGRAL WITH REINFORCED GROUND SLAB



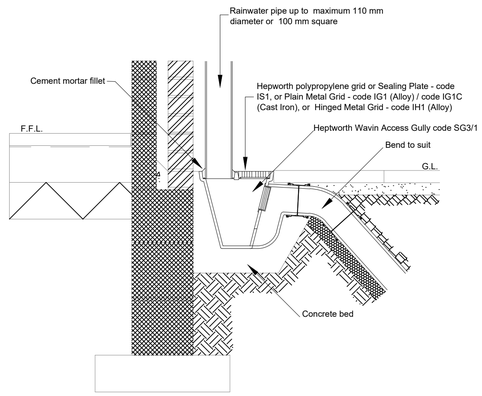
NOTE:
IF DISTANCE IS 300-600mm CLASS Z CONCRETE SURROUND & BED TO BE USED WITH FLEXIBLE COUPLINGS & FLEXI-BOARDS USED ON EACH JOINT. ROCKER PIPE DETAIL TO BE USED AS PIPE LEAVES CONCRETE SURROUND & BED. IF DISTANCE IS GREATER THAN 600mm CLASS S SURROUND & BED SHALL BE USED

WHERE SOFFIT OF PIPE IS BETWEEN 300 & 600mm FROM UNDERSIDE OF CONCRETE FLOOR SLAB, THE PIPE SHALL BE SURROUNDED & BEDDED IN ST4 CONCRETE. WHERE THIS DISTANCE EXCEEDS 600mm THE PIPE SHALL BE SURROUNDED & BEDDED IN GRANULAR MATERIAL

SECTION B-B WHERE DISTANCE BETWEEN PIPE SOFFIT & UNDERSIDE OF CONCRETE GROUND BEARING FLOOR SLAB/GROUND BEAM IS GREATER THAN 300mm



SILT TRAP CHAMBER DETAIL



RAINWATER PIPE TO GULLY DETAIL

REV	DATE	DESCRIPTION	BY	CHECKED
P1	23.04.26	PRELIMINARY ISSUE	MS	DR

PRELIMINARY

rayment structures

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NORDEN, ROCHDALE
PROJECT

BELOW GROUND DRAINAGE DETAILS
SHEET 2
TITLE

SCALE	DRAWN	CHECKED	DATE
N.T.S@A1	MDS	DR	APR '26

DRAWING No.	SUITABILITY	REVISION
4090-RAYME-ZZ-00-DR-C-1003	S0	P1

Appendix H Surface Water Network / Management Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 385280 415075 SD 85280 15075
Data Type	Point
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.114	4-8	0.031	8-12	0.018	12-16	0.016	16-20	0.000

Total Area Contributing (ha) = 0.180

Total Pipe Volume (m³) = 2.982

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
1.000	17.600	0.220	80.0	0.010	15.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	2.000	0.025	80.0	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	16.300	0.200	81.5	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	16.650	1.300	12.8	0.028	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	12.250	0.220	55.7	0.007	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)
1.000	0.00	15.26	219.965	0.010	0.0	0.0	0.0	1.12	19.9	0.0
1.001	0.00	15.29	219.745	0.014	0.0	0.0	0.0	1.12	19.9	0.0
1.002	0.00	15.53	219.720	0.021	0.0	0.0	0.0	1.11	19.7	0.0
1.003	0.00	15.63	219.520	0.049	0.0	0.0	0.0	2.83	50.0	0.0
1.004	0.00	15.78	218.220	0.056	0.0	0.0	0.0	1.35	23.9	0.0

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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
2.000	6.000	0.075	80.0	0.006	15.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	14.150	0.875	16.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	12.500	0.935	13.4	0.013	15.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	1.500	0.015	100.0	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	1.500	0.015	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	4.350	1.475	2.9	0.020	15.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	5.000	1.475	3.4	0.020	15.00	0.0	0.600	o	150	Pipe/Conduit	
2.004	7.700	0.075	102.7	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	19.150	0.240	79.8	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)
2.000	0.00	15.09	221.300	0.006	0.0	0.0	0.0	1.12	19.9	0.0
2.001	0.00	15.18	221.225	0.006	0.0	0.0	0.0	2.52	44.5	0.0
3.000	0.00	15.08	219.650	0.013	0.0	0.0	0.0	2.77	49.0	0.0
2.002	0.00	15.20	218.715	0.069	0.0	0.0	0.0	1.57	111.1	0.0
2.003	0.00	15.21	217.900	0.069	0.0	0.0	0.0	1.57	111.1	0.0
4.000	0.00	15.01	219.360	0.020	0.0	0.0	0.0	5.91	104.5	0.0
5.000	0.00	15.02	219.360	0.020	0.0	0.0	0.0	5.51	97.4	0.0
2.004	0.00	15.30	217.885	0.124	0.0	0.0	0.0	1.55	109.7	0.0
1.005	0.00	16.07	217.810	0.180	0.0	0.0	0.0	1.13	19.9	0.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	221.250	1.285	Open Manhole	460	1.000	219.965	150				
S2	220.810	1.065	Open Manhole	460	1.001	219.745	150	1.000	219.745	150	
EX.SWMH 1	220.810	1.090	Open Manhole	460	1.002	219.720	150	1.001	219.720	150	
EX.SWMH 2	220.260	0.740	Open Manhole	460	1.003	219.520	150	1.002	219.520	150	
EX.SWMH 3	220.260	2.040	Open Manhole	460	1.004	218.220	150	1.003	218.220	150	
S3	222.050	0.750	Open Manhole	460	2.000	221.300	150				
S4	222.100	0.875	Open Manhole	460	2.001	221.225	150	2.000	221.225	150	
S5	220.650	1.000	Open Manhole	460	3.000	219.650	150				
S6	221.100	2.385	Open Manhole	1200	2.002	218.715	300	2.001	220.350	150	1485
								3.000	218.715	150	
Tank	220.000	2.100	Open Manhole	1	2.003	217.900	300	2.002	218.700	300	800
S7	220.130	0.770	Open Manhole	460	4.000	219.360	150				
S8	220.130	0.770	Open Manhole	460	5.000	219.360	150				
S9	219.900	2.015	Open Manhole	1200	2.004	217.885	300	2.003	217.885	300	
								4.000	217.885	150	
								5.000	217.885	150	
S10/FC	219.100	1.290	Open Manhole	1350	1.005	217.810	150	1.004	218.000	150	190
								2.004	217.810	300	
EX.SW	219.000	1.430	Open Manhole	0		OUTFALL		1.005	217.570	150	

No coordinates have been specified, layout information cannot be produced.

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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)
1.000	o	150	S1	221.250	219.965	1.135	Open Manhole	460
1.001	o	150	S2	220.810	219.745	0.915	Open Manhole	460
1.002	o	150	EX.SWMH 1	220.810	219.720	0.940	Open Manhole	460
1.003	o	150	EX.SWMH 2	220.260	219.520	0.590	Open Manhole	460
1.004	o	150	EX.SWMH 3	220.260	218.220	1.890	Open Manhole	460
2.000	o	150	S3	222.050	221.300	0.600	Open Manhole	460
2.001	o	150	S4	222.100	221.225	0.725	Open Manhole	460
3.000	o	150	S5	220.650	219.650	0.850	Open Manhole	460
2.002	o	300	S6	221.100	218.715	2.085	Open Manhole	1200
2.003	o	300	Tank	220.000	217.900	1.800	Open Manhole	1
4.000	o	150	S7	220.130	219.360	0.620	Open Manhole	460
5.000	o	150	S8	220.130	219.360	0.620	Open Manhole	460
2.004	o	300	S9	219.900	217.885	1.715	Open Manhole	1200
1.005	o	150	S10/FC	219.100	217.810	1.140	Open Manhole	1350

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)
1.000	17.600	80.0	S2	220.810	219.745	0.915	Open Manhole	460
1.001	2.000	80.0	EX.SWMH 1	220.810	219.720	0.940	Open Manhole	460
1.002	16.300	81.5	EX.SWMH 2	220.260	219.520	0.590	Open Manhole	460
1.003	16.650	12.8	EX.SWMH 3	220.260	218.220	1.890	Open Manhole	460
1.004	12.250	55.7	S10/FC	219.100	218.000	0.950	Open Manhole	1350
2.000	6.000	80.0	S4	222.100	221.225	0.725	Open Manhole	460
2.001	14.150	16.2	S6	221.100	220.350	0.600	Open Manhole	1200
3.000	12.500	13.4	S6	221.100	218.715	2.235	Open Manhole	1200
2.002	1.500	100.0	Tank	220.000	218.700	1.000	Open Manhole	1
2.003	1.500	100.0	S9	219.900	217.885	1.715	Open Manhole	1200
4.000	4.350	2.9	S9	219.900	217.885	1.865	Open Manhole	1200
5.000	5.000	3.4	S9	219.900	217.885	1.865	Open Manhole	1200
2.004	7.700	102.7	S10/FC	219.100	217.810	0.990	Open Manhole	1350
1.005	19.150	79.8	EX.SW	219.000	217.570	1.280	Open Manhole	0

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Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	S1	150	0.915	1.135	Unclassified	460	0	1.135	Unclassified
1.001	S2	150	0.915	0.940	Unclassified	460	0	0.915	Unclassified
1.002	EX.SWMH 1	150	0.590	0.940	Unclassified	460	0	0.940	Unclassified
1.003	EX.SWMH 2	150	0.590	1.890	Unclassified	460	0	0.590	Unclassified
1.004	EX.SWMH 3	150	0.950	1.890	Unclassified	460	0	1.890	Unclassified
2.000	S3	150	0.600	0.725	Unclassified	460	0	0.600	Unclassified
2.001	S4	150	0.600	0.725	Unclassified	460	0	0.725	Unclassified
3.000	S5	150	0.850	2.235	Unclassified	460	0	0.850	Unclassified
2.002	S6	300	1.000	2.085	Unclassified	1200	0	2.085	Unclassified
2.003	Tank	300	1.715	1.800	Unclassified	1	0	1.800	Unclassified
4.000	S7	150	0.620	1.865	Unclassified	460	0	0.620	Unclassified
5.000	S8	150	0.620	1.865	Unclassified	460	0	0.620	Unclassified
2.004	S9	300	0.990	1.715	Unclassified	1200	0	1.715	Unclassified
1.005	S10/FC	150	1.140	1.280	Unclassified	1350	0	1.140	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	EX.SW	219.000	217.570	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location GB 385280 415075 SD 85280 15075		Cv (Winter)	0.840
Data Type	Point	Storm Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S10/FC, DS/PN: 1.005, Volume (m³): 2.5

Unit Reference	MD-SHE-0077-2800-1200-2800
Design Head (m)	1.200
Design Flow (l/s)	2.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	77
Invert Level (m)	217.810
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.8	Kick-Flo®	0.683	2.2
Flush-Flo™	0.336	2.7	Mean Flow over Head Range	-	2.4

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	2.1	0.800	2.3	2.000	3.5	4.000	4.9	7.000	6.4
0.200	2.6	1.000	2.6	2.200	3.7	4.500	5.2	7.500	6.6
0.300	2.7	1.200	2.8	2.400	3.8	5.000	5.4	8.000	6.8
0.400	2.7	1.400	3.0	2.600	4.0	5.500	5.7	8.500	7.0
0.500	2.6	1.600	3.2	3.000	4.3	6.000	5.9	9.000	7.2
0.600	2.4	1.800	3.4	3.500	4.6	6.500	6.1	9.500	7.3

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Storage Structures for Storm

Cellular Storage Manhole: Tank, DS/PN: 2.003

Invert Level (m) 217.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	99.0	0.0	1.800	0.0	0.0	3.600	0.0	0.0
0.200	99.0	0.0	2.000	0.0	0.0	3.800	0.0	0.0
0.400	99.0	0.0	2.200	0.0	0.0	4.000	0.0	0.0
0.600	99.0	0.0	2.400	0.0	0.0	4.200	0.0	0.0
0.800	99.0	0.0	2.600	0.0	0.0	4.400	0.0	0.0
1.000	99.0	0.0	2.800	0.0	0.0	4.600	0.0	0.0
1.200	99.0	0.0	3.000	0.0	0.0	4.800	0.0	0.0
1.400	0.0	0.0	3.200	0.0	0.0	5.000	0.0	0.0
1.600	0.0	0.0	3.400	0.0	0.0			

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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 Coeffiecient 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 FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 385280 415075 SD 85280 15075 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
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) 2, 30, 100
Climate Change (%) 0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S1	60 Summer	2	+0%					219.986	-0.129	0.000
1.001	S2	30 Summer	2	+0%					219.781	-0.114	0.000
1.002	EX.SWMH 1	30 Summer	2	+0%					219.756	-0.114	0.000
1.003	EX.SWMH 2	15 Summer	2	+0%					219.557	-0.113	0.000
1.004	EX.SWMH 3	15 Summer	2	+0%	30/15 Summer				218.281	-0.089	0.000
2.000	S3	60 Summer	2	+0%					221.318	-0.132	0.000
2.001	S4	60 Summer	2	+0%					221.235	-0.140	0.000
3.000	S5	60 Summer	2	+0%					219.666	-0.134	0.000
2.002	S6	30 Summer	2	+0%	100/240 Winter				218.794	-0.221	0.000
2.003	Tank	240 Summer	2	+0%	30/15 Summer				218.108	-0.092	0.000
4.000	S7	60 Summer	2	+0%					219.376	-0.134	0.000
5.000	S8	60 Summer	2	+0%					219.376	-0.134	0.000
2.004	S9	240 Summer	2	+0%	30/15 Summer				218.110	-0.075	0.000
1.005	S10/FC	240 Summer	2	+0%	2/15 Summer				218.111	0.151	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.05			0.9	OK	
1.001	S2	0.13			1.4	OK	
1.002	EX.SWMH 1	0.13			2.4	OK	
1.003	EX.SWMH 2	0.14			6.3	OK	
1.004	EX.SWMH 3	0.34			7.3	OK	
2.000	S3	0.03			0.6	OK	
2.001	S4	0.01			0.6	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	S5	0.03			1.2	OK	
2.002	S6	0.16			8.7	OK	
2.003	Tank	0.05		109	2.9	OK	
4.000	S7	0.02			1.9	OK	
5.000	S8	0.02			1.9	OK	
2.004	S9	0.04			2.8	OK	
1.005	S10/FC	0.14			2.7	SURCHARGED	

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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 Coeffiecient 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 FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 385280 415075 SD 85280 15075 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
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) 2, 30, 100
Climate Change (%) 0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S1	60 Summer	30	+40%					220.004	-0.111	0.000
1.001	S2	30 Summer	30	+40%					219.814	-0.081	0.000
1.002	EX.SWMH 1	15 Summer	30	+40%					219.792	-0.078	0.000
1.003	EX.SWMH 2	15 Summer	30	+40%					219.598	-0.072	0.000
1.004	EX.SWMH 3	240 Winter	30	+40%	30/15 Summer				218.764	0.394	0.000
2.000	S3	60 Summer	30	+40%					221.332	-0.118	0.000
2.001	S4	60 Summer	30	+40%					221.245	-0.130	0.000
3.000	S5	60 Summer	30	+40%					219.679	-0.121	0.000
2.002	S6	15 Summer	30	+40%	100/240 Winter				218.883	-0.132	0.000
2.003	Tank	240 Winter	30	+40%	30/15 Summer				218.733	0.533	0.000
4.000	S7	60 Summer	30	+40%					219.387	-0.123	0.000
5.000	S8	60 Summer	30	+40%					219.387	-0.123	0.000
2.004	S9	240 Winter	30	+40%	30/15 Summer				218.756	0.571	0.000
1.005	S10/FC	240 Winter	30	+40%	2/15 Summer				218.766	0.806	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.16			2.9	OK	
1.001	S2	0.42			4.6	OK	
1.002	EX.SWMH 1	0.46			8.5	OK	
1.003	EX.SWMH 2	0.54			24.9	OK	
1.004	EX.SWMH 3	0.28			6.1	SURCHARGED	
2.000	S3	0.10			1.7	OK	
2.001	S4	0.04			1.7	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	S5	0.08			3.8	OK	
2.002	S6	0.60			33.3	OK	
2.003	Tank	0.08		298	4.7	SURCHARGED	
4.000	S7	0.08			5.8	OK	
5.000	S8	0.08			5.8	OK	
2.004	S9	0.05			3.6	SURCHARGED	
1.005	S10/FC	0.14			2.7	SURCHARGED	

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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 Coeffiecient 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 FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 385280 415075 SD 85280 15075 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
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) 2, 30, 100
Climate Change (%) 0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S1	60 Summer	100	+45%					220.011	-0.104	0.000
1.001	S2	30 Summer	100	+45%					219.826	-0.069	0.000
1.002	EX.SWMH 1	15 Summer	100	+45%					219.805	-0.065	0.000
1.003	EX.SWMH 2	15 Summer	100	+45%					219.613	-0.057	0.000
1.004	EX.SWMH 3	360 Winter	100	+45%	30/15 Summer				219.072	0.702	0.000
2.000	S3	60 Summer	100	+45%					221.337	-0.113	0.000
2.001	S4	60 Summer	100	+45%					221.248	-0.127	0.000
3.000	S5	60 Summer	100	+45%					219.683	-0.117	0.000
2.002	S6	360 Winter	100	+45%	100/240 Winter				219.039	0.024	0.000
2.003	Tank	360 Winter	100	+45%	30/15 Summer				219.038	0.838	0.000
4.000	S7	60 Summer	100	+45%					219.392	-0.118	0.000
5.000	S8	60 Summer	100	+45%					219.392	-0.118	0.000
2.004	S9	360 Winter	100	+45%	30/15 Summer				219.060	0.875	0.000
1.005	S10/FC	360 Winter	100	+45%	2/15 Summer				219.069	1.109	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.21			3.8	OK	
1.001	S2	0.56			6.0	OK	
1.002	EX.SWMH 1	0.60			11.0	OK	
1.003	EX.SWMH 2	0.69			32.2	OK	
1.004	EX.SWMH 3	0.27			5.9	SURCHARGED	
2.000	S3	0.14			2.3	OK	
2.001	S4	0.06			2.3	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	S5	0.11			5.0	OK	
2.002	S6	0.13			7.3	SURCHARGED	
2.003	Tank	0.09		388	5.0	SURCHARGED	
4.000	S7	0.10			7.7	OK	
5.000	S8	0.10			7.7	OK	
2.004	S9	0.06			3.9	SURCHARGED	
1.005	S10/FC	0.15			2.8	FLOOD RISK	

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