



SuDS Strategy Report

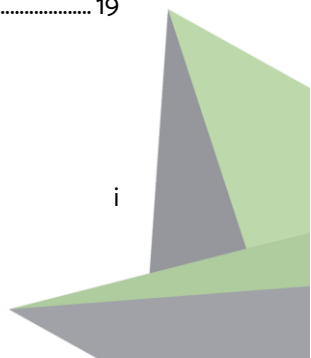
Land Adjacent to 4 Sunnyacre,

Wrexham, LL11 4RH

Project Reference: SD2403130

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Revisions and Additional Material

Document History and Status

Revision	Date	Purpose/Status
-	March 2024	First Issue

Document Details

Project Number	SD2403130
Project Director	David Brunning

Preamble

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The conclusions and recommendations made in this report are limited to those that can be made based on the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside of the stated scope of the research. Any comments made based on information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third-party information has been made by JMS Consulting Engineers Ltd.

1 Introduction

1.0.1 SuDS Designs have been appointed to prepare a surface water drainage strategy to support the planning application for the site at Land Adj to 4 Sunnyacre, Old Mold Road, Wrexham, LL11 4RH. As part of the proposals, this report will assess the potential impact from alterations to the site drainage, and the surface water characteristics are considered within the scope of the parameters set out in the National Planning Policy Framework (NPPF) and Technical Guidance to the NPPF.

1.0.2 This report will also review the requirements set out by Wrexham County Borough Council.

2 Location & Existing Conditions

2.0.2 The site is specifically located at Land Adj to 4 Sunnyacre, Old Mold Road, Gwersyllt, Wrexham, LL11 4RH and equates to an approximate total area of 0.036ha. The site is in the east of Old Mold Road, Adj to 4 Sunnyacre. The site is currently a vacant land, considered a greenfield.

2.0.3 To consider the ground conditions in the application site, the British Geological Society database has been reviewed.

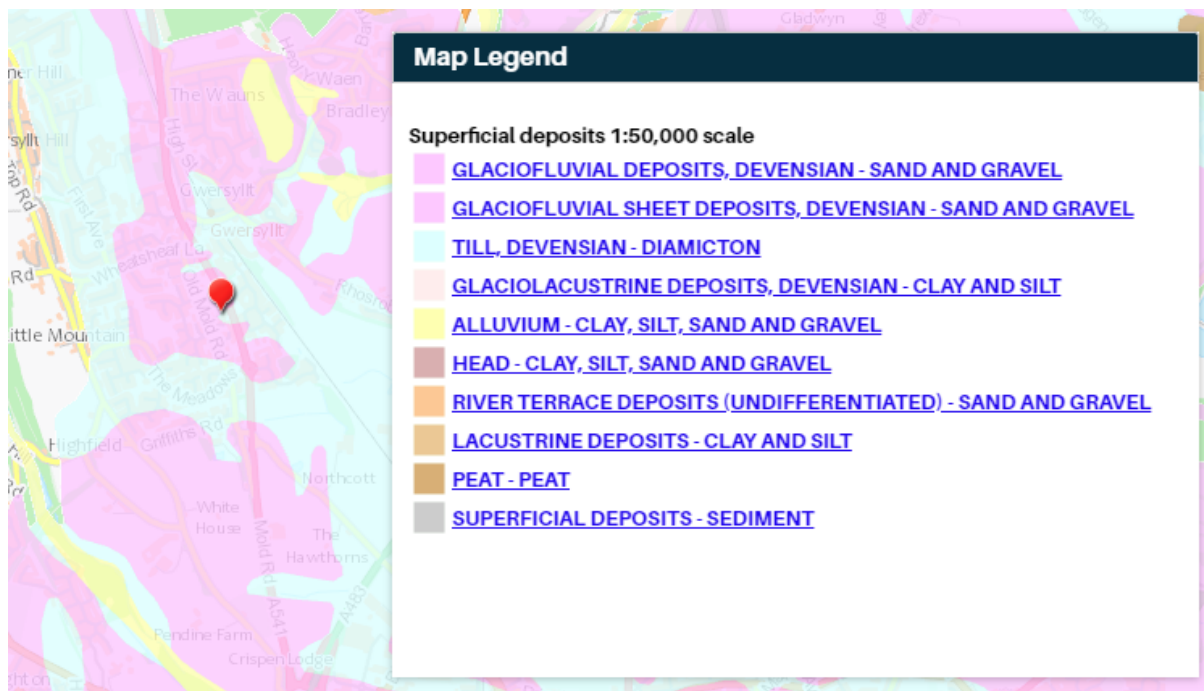


Figure 1: Extent of Superficial Geology

2.0.4 Bedrock Geology:

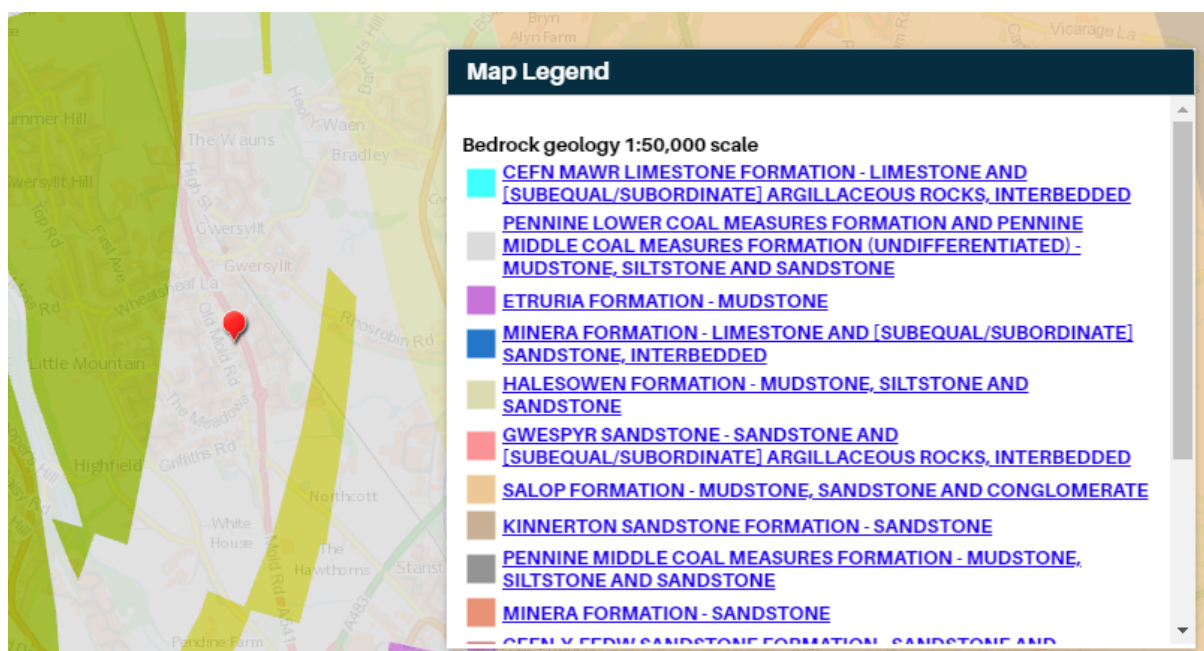


Figure 2: Extent of BGS Bedrock Geology

2.0.5 BGS mapping shows the site to be located above the Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (Undifferentiated) - Mudstone, Siltstone and Sandstone. Superficial deposits are shown in **Figure 1** above and shows the site is located above the border of two

different deposits which are Till, Devensian – Diamicton and Glaciofluvial Sheet Deposits, Devensian of Sand and Gravel.

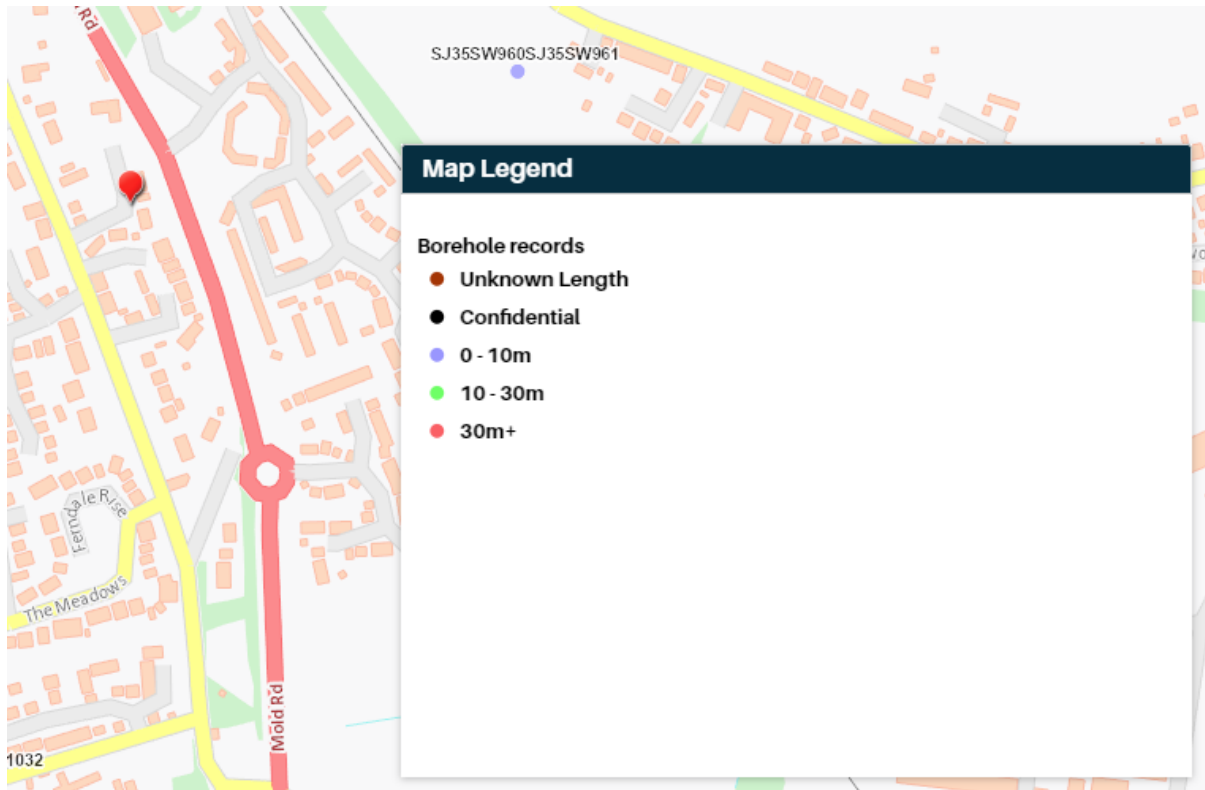


Figure 3 Local Borehole information.

2.0.6 Local borehole information has also been reviewed and **Figure 3** above shows the site in relation to the closest borehole SJ35SW960 and SJ35SW961. The borehole information in **Figure 4** shows Made ground over topsoil for about 0.5m and brown sand with slightly clay and stones were present for about 0.3m below it. Stiff brown clay with sand were present for a depth of 0.6m approximately. At the depth of 1.4m, reddish clay with pebbles and sand were found and continued up to the depth of about 3.3m from the ground where the borehole terminated. Ground water was not encountered.

British Geological Survey

BGS ID: 155820 : BGS Reference: SJ35SW960
British National Grid (27700) : 332290,353020

HOLST & CO. LTD.
 SITE INVESTIGATION DEPT.
 5-7 NEW YORK ROAD
 LEEDS 2

Contract No. 16907/B.369.

Location Wrexham - Rhosarobin J.T.C.

Client Denbigh County Architect.

Borehole No. 1

Ground Level 3229
3302

Date 20th January, 1965.

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c. lb./sq. ft.	φ deg.	m.c. %	γ lb./cu. ft.	N
Top Soil.		1'6"	1'6"						
Soft Brown Sand with Slight Clay and Stones.		2'6"	1'0"						
Stiff Brown Clay with Sand.		4'6"	2'0"	3'6"	1800		27	120	
Brittle Reddish Clay with Pebbles and Sand.			6'6"						
			11'0"						

Water struck at

Undisturbed Sample ☐

Disturbed Sample ☐

Water Sample ☐

Penetration Test ☐

Maximum Observed Water Level

c = Cohesion
 φ = Angle of Internal Friction
 m.c. = Moisture Content
 γ = Dry Density
 N = Standard Penetration Value

Water levels may be subject to seasonal or tidal variation and should not be taken as constant.

Figure 4 Borehole SJ35SW960

2.1 Site Topography

- 2.1.1 The site is falling towards southwest, and the site topography is provided within the drawing in **Appendix 8.4**.

2.2 Site Proposals

- 2.2.1 The erection of new two storey residential building with detached garage altogether associated with the access road for the entrance and parking also with landscaping on the site.

2.3 Existing Drainage Regime

- 2.3.1 The existing site can be described as permeable. It is considered that the existing surface water runoff from the site is assumed to be draining to the southwest or flows over the ground. The sewerage is provided by the Dwr Cymru (Welsh Water). The existing combined water sewer is in the Old Mold Road flowing through the south.
- 2.3.2 Given the existing site conditions and drainage regime, a greenfield runoff rate for the proposed development area can be calculated as shown in the table below. The proposed development total impermeable area is taken as 0.042ha based upon the proposed site layout. In order to calculate greenfield runoff rate, ICP SUDS methodology has been adopted. The results are shown below for the varying storm events. Calculation outputs are also shown in **Appendix 8.2**.

	QBAR	1:1 Year Storm Event	1:30 Year Storm Event	1:100 Year Storm Event
Greenfield Runoff Rate (l/s)	0.1	0.1	0.2	0.2

3 SuDS Considerations

3.0.1 Consideration of SuDS are a planning requirement for new developments. SuDS are designed to replicate the natural course of drainage as closely as possible with a view to reducing the impact of flooding, removing pollutants at source, and combining water management with green space.

Developments should utilise SuDS where possible and ensure that surface water run-off is managed as close to its source as possible in line with the following hierarchy:

1. Into ground (infiltration).
2. To a surface water body.
3. To a surface water sewer.
4. To a combined sewer.

3.0.2 Sustainable Drainage Systems should be included in the design to manage surface water flood risk. SuDS should be inspired by natural drainage processes and manage water as close to its source as possible whilst offering pollution control and landscape benefits.

3.0.3 For this development the criteria are set out by Wrexham County Borough Council, the planning application reference of GWE P/2021/1103 and reference is made to the Sustainable Drainage System Design Guidance. National guidance is also considered. The local design guidance states that a surface water drainage assessment should be carried out to demonstrate that the proposed development makes use of SuDS and will not create an increased risk of flooding from surface water to the development site and the surrounding area.

3.1 SuDS Incorporation

3.1.1 The below table, taken from the SuDS Manual, C753, CIRIA, 2015 Document lists a variety of SuDS component options which may be applied to development proposals.

3.1.2 The ground conditions do not appear to support the use of surface water disposal by infiltration. On that basis, following the hierarchy, proposals are to discharge surface water runoff to the existing combined water sewer in the Old Mold Road.

Component Type	Description	Collection Mechanism	Design Criteria						
			Water Quantity (Chapter 3)			Water Quality (Chapter 4)	Amenity (Chapter 5)	Biodiversity (Chapter 6)	Further Information (Chapter Ref)
			Peak Runoff Rate	Runoff Volumes					
		Events (Interceptions)		Large Events					
Rainwater Harvesting Systems	Systems that collect runoff from the roof of a building or other paved surface for use	P		●	●		●		11
Green roofs	Planted soil layers on the roof of buildings that slow and store runoff	S	○	●		●	●	●	12
Infiltration systems	Systems that collect and store runoff, allowing it to infiltrate into the ground	P	●	●	●	●	●	●	13
Proprietary treatment systems	Subsurface structures design to provide treatment to runoff	P				●			14
Filter strips	Grass strips hat promote sedimentation and filtration as runoff is conveyed over the surface	L		●		●	○	○	15
Filter drains	Shallow stone-filled trenches that provide attenuation, conveyance and treatment of runoff	L	●	○		●	○	○	16
Swales	Shallow landscaped depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils	L	●	●	●	●	●	●	17
Bioretention systems	Trees with soil-filled tree pits, tree planters or structural soils used to collect, store and treat runoff	P	●	●	●	●	●	●	18
Trees	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	P	●	●		●	●	●	19

Pervious pavements	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	S	●	●	●	●	○	○	20
Attenuation storage tanks	Large, below-ground voided spaces used to temporarily store runoff before infiltration-controlled release or use	P	●						21
Detention basins	Vegetated depressions that store and treat runoff	P	●	●		●	●	●	22
Ponds and wetlands	Permanent pools of water used to facilitate treatment of runoff – runoff can also be stored in an attenuation zone above the pool	P	●			●	●	●	23
P-Point L-Lateral S-Surface ● – likely valuable contribution to delivery of design criterion ○ – some potential contribution to delivery of design criterion, if specifically included in the design									

Figure 5 CIRIA Table 7.1 SuDS Components

3.1.3 The proposed site layout offers the opportunity to apply a range of SuDS measures in accordance with the table above. Proposals are as follows:

- **Pervious pavement**- located in the front and around the site- subsequently be stored the surface water generated by extreme storm events in the sub-base.
- **Rainwater Harvesting Systems** – Offering benefits in terms of water quantity and amenity. Proposals are to re-use water for garden irrigation.

3.1.4 By use of the above, the development proposals aim to drain all impermeable areas via SuDS measures.

3.1.5 In accordance with Table 26.2 of CIRIA Report C753, the pollution hazard level can be classified as ‘very low’ and ‘Low’. Using table 26.3 of the same document, the mitigation indices values for permeable surfacing exceed the pollution hazard values taken from the previous table. This ensures that proposals offer enough pollution risk mitigation.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4

Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Figure 6 Extract from Table 26.2 CIRIA SuDS Manual Pollution hazard indices for different land use classifications.

- 3.1.6 The above proposals ensure that an 'at source' SuDS measure is applied, and betterment is provided in terms of surface water runoff velocity and quality. Pollution indices from different land types can be found as per table 26.15 CIRIA SuDS Manual 2015, below.
- 3.1.7 In determining the flow rate, reference is made to the Non-Statutory Technical Standards for SuDS, March 2015. Paragraph 2 S2 requires the discharge rate for greenfield sites to not exceed the greenfield runoff rate for the equivalent rainfall event. When considering volume, paragraph S4 requires the greenfield runoff volume to not exceed the equivalent greenfield runoff volume. The discharge rate and volume of runoff should not exceed the rate of discharge from the greenfield runoff.

Mitigation Indices			
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

Figure 7 Extract from Table 26.3 CIRIA SuDS Manual 2015 Indicative SuDS mitigation indices for discharges to surface water

- 3.1.8 For this development, the equivalent Greenfield runoff rates have been calculated in 2.3.2. Therefore, the greenfield runoff rate is too low to be achieved for the proposed area. The development is designed to achieve the minimum or acceptable flow rate by restricting via a flow control and pervious pavement system.
- 3.1.9 The development proposals result in an increase in impermeable areas and therefore measures must be put in place to ensure the peak runoff rate is achieved to be low as possible because of the development. Surface water discharge proposals for this site are to discharge the existing combined water sewer in the Old Mold Road at an acceptable flow rate.
- 3.2.10 The calculated greenfield runoff rates were found to be extremely low for all storm events. Low discharge rates require a small diameter flow control with high blockage potential. Therefore, the system has been designed to reduce the flow rate as much as possible whilst ensuring the outlet diameter is not compromised.
- 3.2.11 Discharge rates should be managed as close as possible to the required standard by adopting a suitable flow control measure. On the basis that flow controls can manage flow rates as low as 0.5l/s without incurring blockages, this has been taken as the allowable flow rate for flow control devices and applied to this site.
- 3.1.12 Pervious pavement is proposed for the parking areas. The permeable surfacing sub-base is included in the design in order to provide necessary storage attenuation within the voids of the sub-base. The sub-base thickness shall be designed to provide the necessary storage for all storm events.
- 3.1.13 The above proposals ensure that SuDS measures are applied throughout the development.

3.2 Climate Change

- 3.2.1 The appended drainage calculation allows for a 1:100-year storm plus 45% climate change.

4 Surface Water Strategy

The surface water strategy is based upon the SuDS implementation as outlined above along with the hierarchy for surface water disposal as follows:

A. Store rainwater for later use:

The rainwater is used for non-potable purposes.

B. Use infiltration techniques, such as porous surfaces:

Permeable surfaces are proposed for the parking area. Runoff is to be intercepted via perforated pipes which will direct runoff to the existing combined water sewer in the Old Mold Road.

C. Attenuate rainwater in ponds or open water features for gradual release:

Not available within the provided architectural layout.

D. Attenuate rainwater by storing in tanks or sealed water features for gradual release:

Surface water from the roof and surfaced areas will be directed through the drainage network towards the permeable paving where surface water will back up into the sub-base via the perforated pipes where it is temporarily stored that helps to reduce the flow rate and directing it to the existing surface water sewer on the main road.

A flow control chamber will be located at the front of the site and will discharge the flow into the existing surface water sewer. Flows will be reduced with the sub-base beneath the permeable paving for extreme storm events. On that basis, the proposed runoff from the development shall be restricted to the minimum acceptable rate which is 0.5l/s for all storm events up to the 1:100-year event including climate change.

	1:1 Year Storm Event	1:30 Year Storm Event	1:100 Year Storm Event	1:100 Year Storm Event (+40% Climate Change)
Greenfield Runoff Rate – Q l/s	0.1	0.2	0.2	-
Proposed Site Peak Runoff Rate l/s	0.5	0.5	0.5	0.5

E. Direct rainwater direct to the watercourse:

Not Applicable.

F. Discharge rainwater to a surface water sewer/drain

Not Applicable.

G. Discharge rainwater to combined sewer:

The surface water runoff is to discharge to a combined water sewer on the main road via the Sunnyacre road and flow controlled to 0.5 l/s.

H. Discharge rainwater to foul sewer:

Not applicable.

The above is supported by the calculations and drawings as appended.

4.1 Designing for Exceedance

- 4.1.0 Consideration should be given to external levels to ensure they are set above overland flood risk levels, and low points are created to direct water away from the building footprints during exceedance events. Please see appended drawing for exceedance flow directions.
- 4.1.1 CIRIA document C635 *Designing for exceedance in urban drainage – good practice* states that “at present there are no guidelines on the return period of event (extreme event) that should be used for design exceedance”. However, Section 3.4 also states that “it is suggested that return periods of 1 in 30, to 1 in 100 or 1 in 200-year events would form a suitable framework for most applications”.
- 4.1.2 In accordance with the above, the drainage network has been modelled using a 1 in 100-year event.

5 Building and Detailed Design

5.1 Pollution, Water Quality, and Control Measures

- 5.1.0 Consideration for surface water needs to be taken during the construction process, and how it is managed including flood risk and pollution control.
- 5.1.1 On completion of the permanent drainage system the network will be relied upon to control pollution and water quality for the remainder of the construction works.
- 5.1.2 Wheel and plant washing will take place at the temporary entrance to minimise the pollutants being transferred to, or from site, and is also located to minimise the risk of pollutants entering the permeable surfacing and other drainage elements.
- 5.1.3 Pollution incident potential involving plant and machinery can be contained by simple measures:
- Use of drip trays
 - Emergency spill kits
 - Regular maintenance/checks of plant and machinery including checks for wear, oil leaks and immediate decommissioning when faults occur.
 - Procedures for refuelling areas, with spillage kits

6 Surface Water Drainage Maintenance Schedules

- 6.0.1 This section of the report gives guidance on the maintenance of the drainage system and outlines the responsible party as the freeholder.
- 6.0.2 The design life of the development is likely to exceed the design life of each of the SuDS components listed above. During the routine inspections of any drainage components, it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability, repairs should be the first-choice solution where practicable. If this is not the case, then it will be necessary for the property owners to undertake complete replacement of the component in question.

6.1 Rainwater Pipes, and Chambers

Table 1 - Rainwater Pipes, and Chambers: System storage operation and maintenance requirements

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspection of silt trap chamber and removal of debris when necessary	Quarterly or as required following monitoring
Remedial Actions	Check for blockages in manholes and pipes. Rodding and jetting of pipes to be carried out. CCTV survey can be carried out to inspect condition of pipework	Quarterly or as required following monitoring
Monitoring	Inspect collection apparatus for debris and litter. Remove where necessary to prevent blockages in the system.	Monthly or after periods of heavy rainfall

6.2 Flow Control

Table 2 - System storage operation and maintenance requirements (flow control)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter and debris and grass cuttings from upstream to prevent being washed into the flow control. Inspection of the flow control chamber and the removal of any sediment/debris when required.	Quarterly or as required following monitoring
Remedial Actions	Check flow control is functional	Quarterly or as required following monitoring

Monitoring	Inspect flow control and check flows are not impeded	Monthly or after periods of heavy rainfall
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6.3 Permeable Paving

Table 3 - System storage operation and maintenance requirements (permeable paving)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Sweeping. [NOTE: Any jointing material between the blocks that is lost or displaced as a result of sweeping must be replaced. New jointing material must be the same type as that removed or a suitable replacement]	3 no. times a year: - - At the end of Winter; - Mid-summer; and - After autumn leaf fall. Also as required based on site specific observations
Occasional Maintenance	Stabilise and mow contributing and adjacent areas to prevent excess sediment being washed into the paving	As required
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required
	Rehabilitation of surface and underlying sand a geotextile	As required (if local distortion or settlement occurs as a result of wash out of bedding)
Monitoring	Inspect for evidence for weed growth or deposits affecting run off. If required, take remedial action	Monthly for 3 no. months after installation, then during regular maintenance visits

6.4 Rainwater Harvesting

Table 4 - System Storage operation and maintenance requirements (Rainwater Harvesting)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters, Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and debris.	Annually (and following poor performance)
Occasional Maintenance	Cleaning and/or replacement of filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or tank damage. Pump repairs structural performance.	As required

7 Conclusions

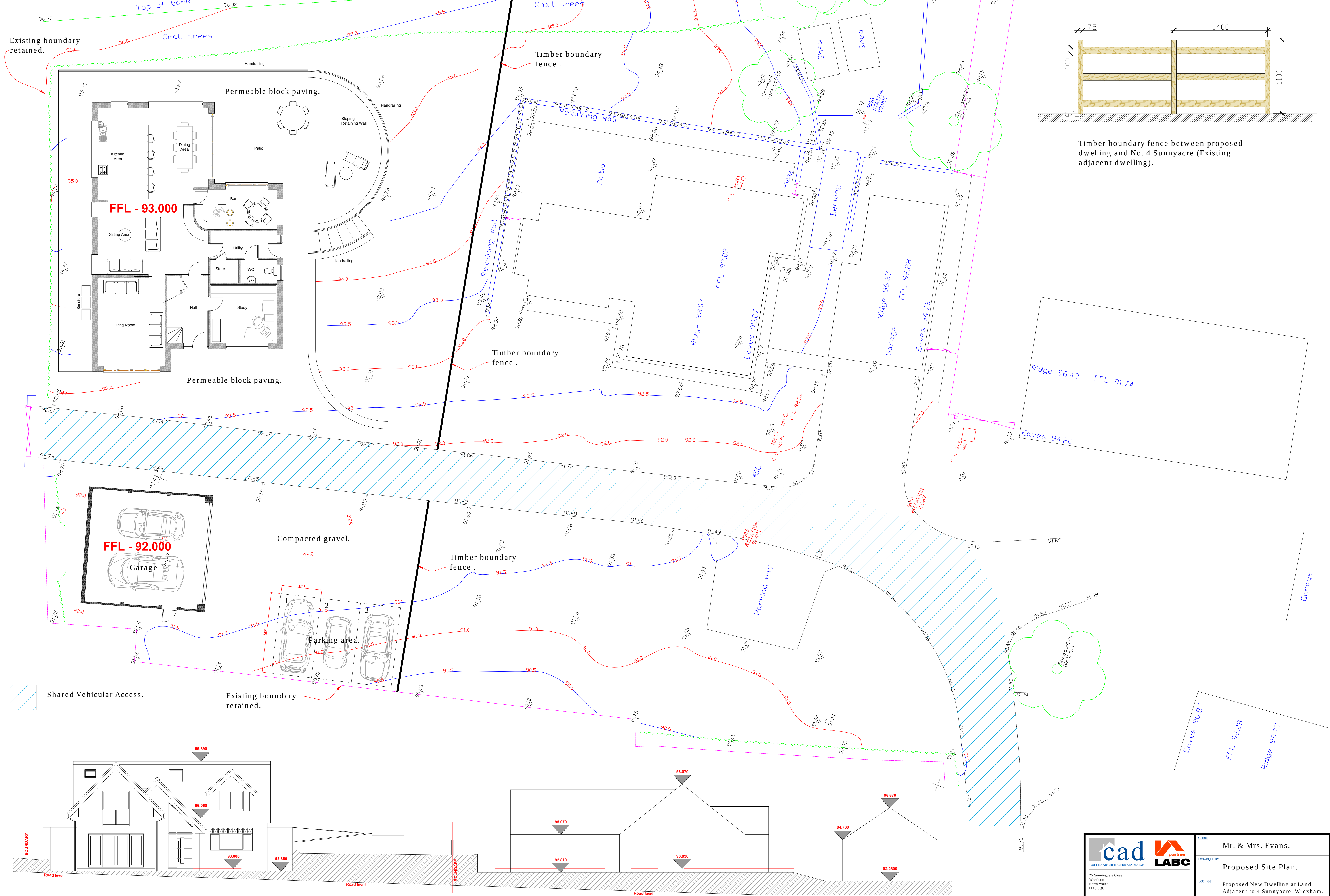
- 7.0.1 Local geology suggests non-compliant material for use of infiltration as a surface water disposal method, therefore proposals are to discharge surface water runoff to the existing combined water sewer on the Old Mold Road.
- 7.0.2 A series of SuDS components are proposed throughout the development including permeable paving. The SuDS measures implemented to ensure that contributions are made towards peak flow, runoff volume, water quality, amenity and biodiversity.
- 7.0.3 The drainage strategy is designed to limit the surface water runoff from the proposed development to an appropriate discharge rate. The proposed peak runoff rate offers significant reduction in flows, decreasing potential for surface water flooding downstream.

8 Appendices

8.1 Architect layout Plan

Proposed Site Plan

Scale 1:100



Proposed Site Section

1:100

CULLIS-ARCHITECTURAL-DESIGN
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Wrexham
North Wales
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T 01978 264376
M 07791 480768
E ajones540@btinternet.com

LABC

Client:	Mr. & Mrs. Evans.		
Drawing Title:	Proposed Site Plan.		
Job Title:	Proposed New Dwelling at Land Adjacent to 4 Sunnyacre, Wrexham.		
Date:	Feb 2021	Scale:	1:100 at A1
Rev:		Drawn by:	PD202/02

8.2 Greenfield Runoff Calculations

JMS Chelmsford Ltd		Page 1
BIC110 - The MedBIC Alan Cherry Drive Chelmsford CM1 1SQ		
Date 20/03/2024 17:16 File	Designed by MathanKumar Checked by	
XP Solutions	Source Control 2018.1	
ICP SUDS Mean Annual Flood Input Return Period (years) 100Soil 0.300 Area (ha) 0.040Urban 0.000 SAAR (mm) 938 Region Number Region 9 Results 1/s QBAR Rural 0.1 QBAR Urban 0.1 Q100 years 0.2 Q1 year 0.1 Q30 years 0.2 Q100 years 0.2		
©1982-2018 Innovyze		

8.3 Proposed Drainage Calculations

JMS Chelmsford Ltd		Page 1
BIC110 - The MedBIC Alan Cherry Drive Chelmsford CM1 1SQ		
Date 22/03/2024 17:34 File NETWORK CALC 100YRS+40%...	Designed by MathanKumar Checked by	
XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.307	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.020	4-8	0.022

Total Area Contributing (ha) = 0.042

Total Pipe Volume (m³) = 2.199

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	16.100	0.202	79.7	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	9.200	0.157	58.6	0.007	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	6.100	0.077	79.2	0.007	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.001	11.900	0.149	79.9	0.008	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	6.100	0.089	68.5	0.001	0.00	0.0	0.600	o	100	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	50.00	5.31	91.983	0.009	0.0	0.0	0.0	0.86	6.8	1.2
1.001	50.00	5.46	91.781	0.016	0.0	0.0	0.0	1.01	7.9	2.2
2.000	50.00	5.12	91.850	0.007	0.0	0.0	0.0	0.87	6.8	0.9
2.001	50.00	5.35	91.773	0.015	0.0	0.0	0.0	0.86	6.8	2.0
1.002	50.00	5.57	91.624	0.032	0.0	0.0	0.0	0.93	7.3	4.3

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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
3.000	7.900	0.099	79.8	0.003	5.00	0.0	0.600	o	100	Pipe/Conduit	
3.001	8.400	0.105	80.0	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.002	8.400	0.105	80.0	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.003	10.400	0.130	80.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.003	35.500	0.355	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	29.200	0.292	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	22.200	0.222	100.0	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)
3.000	50.00	5.15	91.400	0.003	0.0	0.0	0.0	0.86	6.8	0.4
3.001	50.00	5.32	91.301	0.005	0.0	0.0	0.0	0.86	6.8	0.7
3.002	50.00	5.48	91.196	0.010	0.0	0.0	0.0	0.86	6.8	1.4
3.003	50.00	5.68	91.091	0.010	0.0	0.0	0.0	0.86	6.8	1.4
1.003	50.00	6.27	90.911	0.042	0.0	0.0	0.0	1.00	17.8	5.7
1.004	50.00	6.75	90.556	0.042	0.0	0.0	0.0	1.00	17.8	5.7
1.005	50.00	7.12	90.264	0.042	0.0	0.0	0.0	1.00	17.8	5.7

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Name	Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		92.000	90.042	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet 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 Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.307		

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Online Controls for Storm Orifice Manhole: 6, DS/PN: 1.002, Volume (m³): 1.5 Diameter (m) 0.016 Discharge Coefficient 0.600 Invert Level (m) 91.624 Orifice Manhole: 10, DS/PN: 1.003, Volume (m³): 1.3 Diameter (m) 0.016 Discharge Coefficient 0.600 Invert Level (m) 90.911		
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Storage Structures for Storm

Porous Car Park Manhole: 6, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	13.0
Max Percolation (l/s)	36.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	92.290	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: 10, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	8.0
Max Percolation (l/s)	13.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	91.440	Cap Volume Depth (m)	0.350

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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet 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 Storage Structures 2

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.307

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 Cv (Winter) 0.840

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) 1, 30, 100

Climate Change (%) 0, 0, 45

									Water
US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow		Level	
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	1	120 Winter	1	+0%	1/60 Winter				92.110
1.001	2	120 Winter	1	+0%	1/15 Summer				92.109
2.000	3	120 Winter	1	+0%	1/15 Summer				92.110
2.001	4	120 Winter	1	+0%	1/15 Summer				92.109
1.002	6	120 Winter	1	+0%	1/15 Summer				92.108
3.000	7	15 Winter	1	+0%	30/120 Summer				91.415
3.001	7	240 Winter	1	+0%	1/240 Winter				91.404
3.002	8	240 Winter	1	+0%	1/60 Summer				91.404
3.003	9	240 Winter	1	+0%	1/15 Summer				91.403
1.003	10	240 Winter	1	+0%	1/15 Summer				91.403
1.004	11	240 Winter	1	+0%					90.571
1.005	12	240 Winter	1	+0%					90.279

Surcharged Flooded

Pipe

US/MH

Depth

Volume

Flow / Overflow

Flow

Level

PN

Name

(m)

(m³)

Cap.

(l/s)

(l/s)

Status

Exceeded

1.000

1

0.027

0.000

0.06

0.4

SURCHARGED

1.001

2

0.228

0.000

0.05

0.3

SURCHARGED

2.000

3

0.160

0.000

0.03

0.2

SURCHARGED

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

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)			Flow (l/s)		
2.001	4	0.236	0.000	0.04		0.2	SURCHARGED	
1.002	6	0.384	0.000	0.06		0.4	SURCHARGED	
3.000	7	-0.085	0.000	0.05		0.3	OK	
3.001	7	0.003	0.000	0.02		0.1	SURCHARGED	
3.002	8	0.108	0.000	0.04		0.2	SURCHARGED	
3.003	9	0.212	0.000	0.03		0.2	SURCHARGED	
1.003	10	0.342	0.000	0.02		0.4	SURCHARGED	
1.004	11	-0.135	0.000	0.02		0.4	OK	
1.005	12	-0.135	0.000	0.02		0.4	OK	

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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 2

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.307

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 Cv (Winter) 0.840

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) 1, 30, 100

Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level
							Act.	(m)
1.000	1	240 Winter	30	+0%	1/60 Winter			92.367
1.001	2	240 Winter	30	+0%	1/15 Summer			92.366
2.000	3	240 Winter	30	+0%	1/15 Summer			92.367
2.001	4	240 Winter	30	+0%	1/15 Summer			92.366
1.002	6	240 Winter	30	+0%	1/15 Summer			92.364
3.000	7	480 Winter	30	+0%	30/120 Summer			91.583
3.001	7	480 Winter	30	+0%	1/240 Winter			91.583
3.002	8	480 Winter	30	+0%	1/60 Summer			91.583
3.003	9	480 Winter	30	+0%	1/15 Summer			91.583
1.003	10	480 Winter	30	+0%	1/15 Summer			91.583
1.004	11	480 Winter	30	+0%				90.572
1.005	12	480 Winter	30	+0%				90.280

Surcharged Flooded

Pipe

US/MH

Depth

Volume

Flow / Overflow

Flow

Level

PN

Name

(m)

(m³)

Cap.

(l/s)

(l/s)

Status

Exceeded

1.000

1

0.284

0.000

0.08

0.5

SURCHARGED

1.001

2

0.485

0.000

0.13

0.9

SURCHARGED

2.000

3

0.417

0.000

0.07

0.4

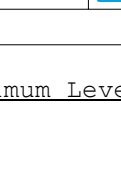
SURCHARGED

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe Flow	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	(l/s)		
2.001	4	0.493	0.000	0.14		0.9	SURCHARGED	
1.002	6	0.640	0.000	0.07		0.5	SURCHARGED	
3.000	7	0.083	0.000	0.02		0.1	SURCHARGED	
3.001	7	0.182	0.000	0.02		0.2	SURCHARGED	
3.002	8	0.287	0.000	0.05		0.3	SURCHARGED	
3.003	9	0.392	0.000	0.05		0.3	SURCHARGED	
1.003	10	0.522	0.000	0.03		0.4	SURCHARGED	
1.004	11	-0.134	0.000	0.03		0.4	OK	
1.005	12	-0.134	0.000	0.03		0.4	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 Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.307
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	240 Winter	100	+45%	1/60 Winter				92.566
1.001	2	240 Winter	100	+45%	1/15 Summer				92.565
2.000	3	240 Winter	100	+45%	1/15 Summer				92.566
2.001	4	240 Winter	100	+45%	1/15 Summer				92.565
1.002	6	240 Winter	100	+45%	1/15 Summer				92.563
3.000	7	960 Winter	100	+45%	30/120 Summer				91.789
3.001	7	960 Winter	100	+45%	1/240 Winter				91.789
3.002	8	960 Winter	100	+45%	1/60 Summer				91.789
3.003	9	960 Winter	100	+45%	1/15 Summer				91.789
1.003	10	960 Winter	100	+45%	1/15 Summer				91.788
1.004	11	960 Winter	100	+45%					90.573
1.005	12	960 Winter	100	+45%					90.281

Surcharged Flooded					Pipe		Level	
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Exceeded
1.000	1	0.483	0.000	0.15		1.0	FLOOD RISK	
1.001	2	0.684	0.000	0.24		1.7	FLOOD RISK	
2.000	3	0.616	0.000	0.12		0.8	FLOOD RISK	

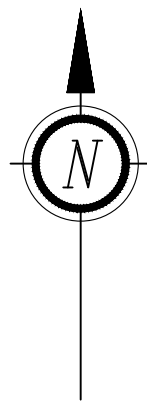
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)		
2.001	4	0.692	0.000	0.25	1.6	FLOOD RISK	
1.002	6	0.839	0.000	0.08	0.5	FLOOD RISK	
3.000	7	0.289	0.000	0.02	0.1	FLOOD RISK	
3.001	7	0.388	0.000	0.03	0.2	FLOOD RISK	
3.002	8	0.493	0.000	0.06	0.4	FLOOD RISK	
3.003	9	0.598	0.000	0.05	0.3	FLOOD RISK	
1.003	10	0.727	0.000	0.03	0.5	FLOOD RISK	
1.004	11	-0.133	0.000	0.03	0.5	OK	
1.005	12	-0.133	0.000	0.03	0.5	OK	

8.4 Proposed Drainage Layout and Details



Total Impermeable area- 420m²

Rainwater harvesting unit

Perforated pipe under permeable paving

Flow control-1
Oriflow control chamber with siltbolk to restrict outfall to 0.5l/s
Oriflow Dia-0.016m

Structure 1 - Porous car park
Plan Area: 130m²
Storage Volume: 13.65m³
Permeable Paving Sub-base Depth: 0.35m

Flow control-2
Oriflow chamber with siltbolk to restrict outfall to 0.5l/s
Oriflow Dia-0.016m

Structure 2 - Porous car park
Plan Area: 48m²
Storage Volume: 5.04m³
Permeable Paving Sub-base Depth: 0.35m

Scale
1:250
0m 5m 10m 15m

Scale
1:100
4m 3m 2m 1m 0m 2m 4m

CONTINUED ABOVE

For Planning Only

P1	Preliminary Issue			MKR	DB	21.03.20
Issue		Notes		Drawn	Approved	Date
						
Issuing Office: JMS East Anglia (Ipswich): Unit 27, Brightwell Barns Brightwell, Suffolk, United Kingdom, IP10 0BJ, Tel: 01473 487047						
Project Land Adj to 4 Sunnycare Wrexham, LL11 4RH						
Drawing Title Private Drainage Layout						
Project No. SD2403130		Drawing No. 201			Issue P1	
PRELIMINARY						

Original Sheet Size: A1

Private Drainage Notes:

1. Formation of trench beds and inspection chambers

- i) Excavate immediately before laying beds and pipes or base slabs for inspection chambers.
- ii) Remove all mud, rock projections, boulders and hard spots and replace with well compacted selected fill. Localised soft spots are to be hardened by tamping in granular bedding material.
- iii) If oil contamination is found adjacent to trench, the trench profile is to be cut back by 150mm from the face of bedding material and replaced with crushed concrete.

2. Concrete and mortar

- i) The concrete used to surround pipes and in the construction of gullies and inspection chambers is to be grade C20P (unless noted otherwise) and mixed using SRPC unless directed otherwise by the engineer or local authority. Sulphate resisting cement is to be used for in-situ or precast concrete and mortars to foul drains.

3. Covers and frames

All inspection chamber cover and frames are to be laid to have the top surface in alignment with both the longitudinal and transverse gradients of adjacent roads, drives, footways and verges. They are otherwise to be laid level. All cover levels as shown on the drainage layoutlongsection are approximate. Actual cover levels are to be determined on site from the position in the road, drive, footpath or otherwise.

4. Pipes to as follows:

Pipe dia. (mm)	Type	Remark
100 Internal (110 NOM. dia.)	uPVC	BS EN 1401
150 Internal (160 NOM. dia.)	uPVC	BS EN 1401

5. The contractor/developer is to ensure that all of the works comply with the following:

- i) BS 8301: 1985 (code of practice for building drainage)

- ii) The Building Regulations: Approved Document H 2002

- iii) NHBC Technical requirements

- iv) BRE Digest No. 363

6. The storage and installation of all proprietary drainage items used are to be strictly in accordance with the manufacturers instructions.

7. All uPVC items as specified on this drawing are to comply with BS EN 1401.

8. Mortar

Mortar shall be mixed only as and when required, the relevant proportions indicated in the following table, until its colour and consistency are uniform. The constituent materials shall be accurately gauged, allowance being made for bulking of sand.

Alternative Nominal Mixes by Volume		
Cement:Lime:Sand	Cement:Sand	Cement:Sand with plasticiser
1 : 1/4 : 3	1 : 3	1 : 2 1/2 to 3

9. Ready-mixed lime: Sand for mortar and ready-to-use retarded mortar shall comply with the relevant provisions of BS 4721 and to be of category 1.12 and designation (i) respectively.

10. All mortar shall be conveyed fresh to the works as required for use. Mortar which has begun to set or which has been site-mixed for a period of more than 1 hour shall not be used. Plasticising and set retarding mortar admixtures shall comply with BS 4887: part 1 and 2, respectively and shall be supplied with instructions for use.

11. Crushed natural stone and shall comply in all respects with BS 1200.

Pipe Bedding Notes:

Mortar

Mortar shall be mixed only as and when required, the relevant proportions indicated in the following table, until its colour and consistency are uniform. The constituent materials shall be accurately gauged, allowance being made for bulking of sand.

Alternative Nominal Mixes By Volume		
Cement:Lime:Sand	Cement:Sand	Cement:Sand with Plasticiser
1 : 1/4 : 3	1 : 3	1 : 2 1/2 to 3

2. Ready-mixed lime:sand for mortar and ready-to-use retarded mortar shall comply with the relevant provisions of BS 4721 and to be of category 1.12 and designation (i) respectively.

3. All mortar shall be conveyed fresh to the works as required for use. Mortar which has begun to set or which has been site-mixed for a period of more than one hour shall not be used. Plasticising and set retarding mortar admixtures shall comply with BS 4887: part 1 and 2, respectively and shall be supplied with instructions for use.

4. Fine aggregate for mortar shall be washed natural sand or crushed natural stone and shall comply in all respects with BS 1200.

5. 20mm thick Flexcell, or similar approved filler to be used to form a flexible joint to the concrete surround at the leading edge of a sleeved coupling. Dimensions shown are irrespective of type or diameter of pipe. The surrounds must terminate at a pipe joint.

6. If pipes are surrounded in concrete, the joints are to be protected from the the ingress of concrete by wrapping them in polythene sheet or building paper.

General fill material

May be of selected locally excavated material or imported. It shall be uniform readily compacted material free from stones larger than 40mm dia. lumps of clay over 100mm, timber, frozen material, vegetable matter, tree roots and building rubbish. The material shall be placed and compacted in layers not exceeding 300mm loose depth. Mechanical compaction equipment shall not be used until there is a minimum of 450mm of compacted material above the crown of the pipe.

Selected fill material

To be free from stones larger than 40mm dia. lumps of clay over 100mm, timber, frozen material, vegetable matter, tree roots and building rubbish. The material shall be placed uniformly on each side of the pipe in layers not exceeding 100mm. Each layer being compacted by hand tamping. Care to be taken not to displace the pipe from its correct line and level.

Private Drainage Notes:

1. Inspection chamber covers and frames as follows:-

Brickwork and pre-cast concrete:

- i) Private drives accepting vehicle traffic: BS EN124 class D400, 600mm clear opening, solid top cover and frame.

- ii) Footpaths, verges and gardens: BS EN124 class B125, 600mm clear opening, solid top cover and frame.

Polypropylene:

- iii) Areas accepting vehicle traffic: Class B

- iv) Soft landscaped areas: Class C

2. Mortar haunching to inspection chamber and frames.

3. i) For use with brick inspection chambers in non adopted roads, private drives, footways and verges; heavy duty (150mm nominal thickness) precast reinforced concrete cover slab to BS 5911, bedded on 10mm thick mortar bed; or 150mm grade C25P in-situ concrete (reinforced with A393 mesh to BS 4483) cover slab. Other locations inaccessible to vehicles; light duty (75mm nominal thickness) precast reinforced concrete cover slab to BS 5911, bedded on 10mm thick mortar bed; or 100mm grade C25P in-situ concrete (reinforced with A193 mesh to BS 4483) cover slab.
- ii) For use with precast concrete inspection chambers in non adopted roads, private drives, footways and verges; heavy duty (150mm nominal thickness) precast reinforced concrete cover slab to BS 5911, of size and type to suit chamber sections.
- Other locations inaccessible to vehicles: light duty (75mm nominal thickness) precast reinforced concrete cover slab to BS 5911, of size and type to suit chamber sections.

4. With precast or brick inspection chambers, cover slabs with a clear opening of 600x600mm are required. Offset to suit chosen face for step rungs.

5. 215mm thick walls in Class B engineering bricks to BS 3921 layered in English bond with frogs up. Inner faces to be plumb and in true alignment. Brick course to be level. Flush jointing to brickwork inner faces and precast concrete chamber sections to BS 5911.

6. All step rungs to BS 1247

- i) General purpose pattern (with 230mm tail) to be built into chamber wall of brick inspection chambers.

- ii) Precast concrete manhole pattern "let in" to chamber wall of precast inspection chambers. All step rungs to be horizontally and vertically staggered as shown on section x-x. Step rungs are not required to either type of inspection chamber where depth to soffit is less than 750mm.

7. Mass concrete infill.

8. Benching to rise vertically from edges of channel to a height not less than pipe (full section) soffit level. Steel float smooth hard surface with cement mortar 1:1 mix, 25mm thick.

9. 50mm min. thick mortar bed to half round channels.

10. 150mm min. thick mass concrete base slab (grade C20P) to precast, uPVC and brick types of inspection chamber.

11. 75mm thick lean mix concrete blinding.

12. Minimum of 2, and maximum of 4 courses of 215mm thick engineering bricks (Class B) to underside of cover & frame, built off cover slab, may be required to facilitate road or drive construction.

13. A brick relieving arch shall be turned over all pipes where they pass through the walls of a brick inspection chamber.

14. Pipes entering inspection chambers shall have a flexible joint within 150mm of the outer face of the brickwork or concrete surround.

15. Channel junctions within brick or precast concrete inspection chambers to be half round channel sections.

16. Backfill material to be as detailed above for normal pipe bedding.

17. Following the flexible joint from either a precast or brick inspection chamber (note 14 above) a 'rocker' pipe of 600mm length shall be installed.

18. Precast concrete inspection chambers may (if chosen for use) have a purpose made base units.

19. Where precast concrete inspection chambers are constructed wholly above the water table, joints are to be sealed with mortar. In waterlogged ground or where the water table is above the base slab, joints are to be water tight using a mastic sealant or rubber rings of a type suitable to the chamber units.

Minimum Dimensions for Access Fittings and Inspection Chambers

Type	Depth to invert from cover level (m)	Internal dimensions		Cover dimensions	
		Length (mm) x width (mm)	Circular dia. (mm)	Length (mm) x width (mm)	Circular dia. (mm)
Rodding eye		As drain but 100 min.			Same size as pipework.1
Access fitting Small 150 dia. 150x100 Large 225x100	0.6 or less, except where situated in a chamber	150x100 225x100	150 225	150x100.1 225x100.1	Same size as access fitting
Inspection chamber shallow Deep	0.6 or less 1.2 or less >1.2	225x100 450x450 450x450	190.2 450 450	- MIN. 430x430 MAX 300x300.3	190.1 430 access restricted to max 350.3

NOTES

1. The clear opening may be reduced by 20mm in order to provide proper support for the cover and frame.
2. Drains up to 150mm.
3. A larger clear opening cover may be used in conjunction with a restricted access, the size is restricted for health and safety reasons to deter entry.

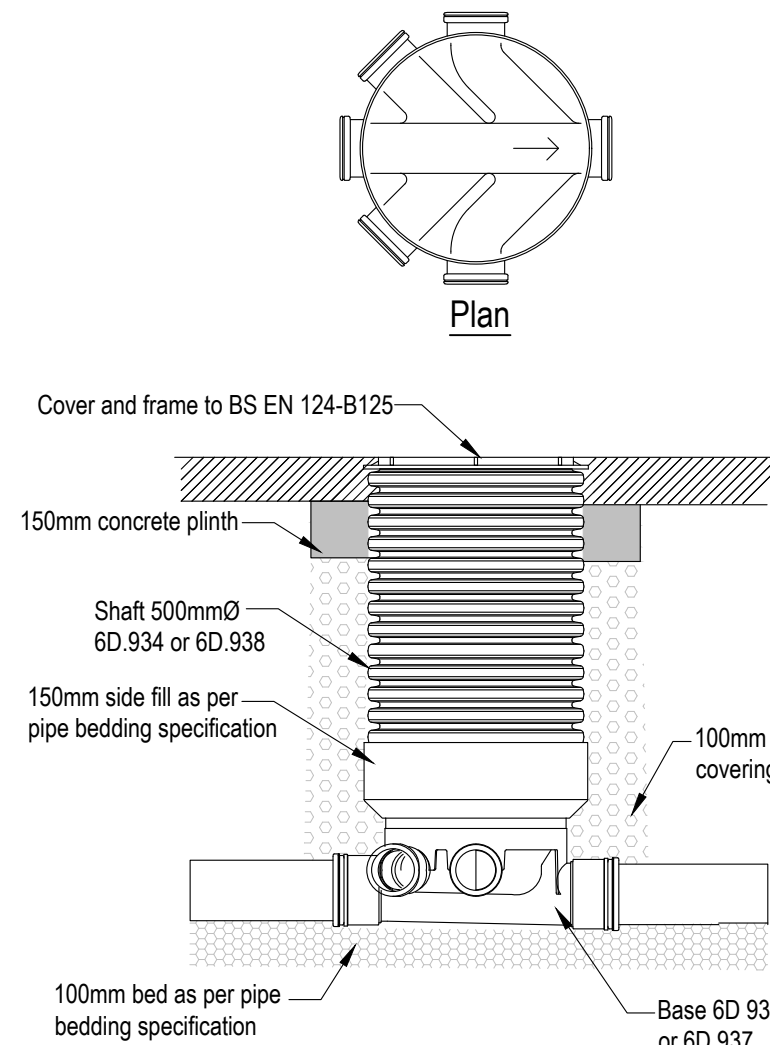
Materials for Access Points

Material	British Standard
1. Inspection chambers and manholes.	
Clay brick & blocks Vitrified clay Concrete-precast Concrete-in situ Plastics	BS 3921 BS EN 295, BS 65 BS 5911 BS 6110 BS 7158
2. Rodding eyes and access fittings (excludes covers and frames).	As pipes refer to materials for below ground drainage

Materials for Below Ground Drainage

Material	British Standard
1. Rigid pipes:	
Vitrified clay Concrete Grey iron Ductile iron	BS 65, BS EN 295 BS 5911 BS 437 BS EN 598
2. Flexible pipes:	
UPVC PP Structure walled Plastic pipes	BS EN 1401* BS EN 1852* BS EN 13476

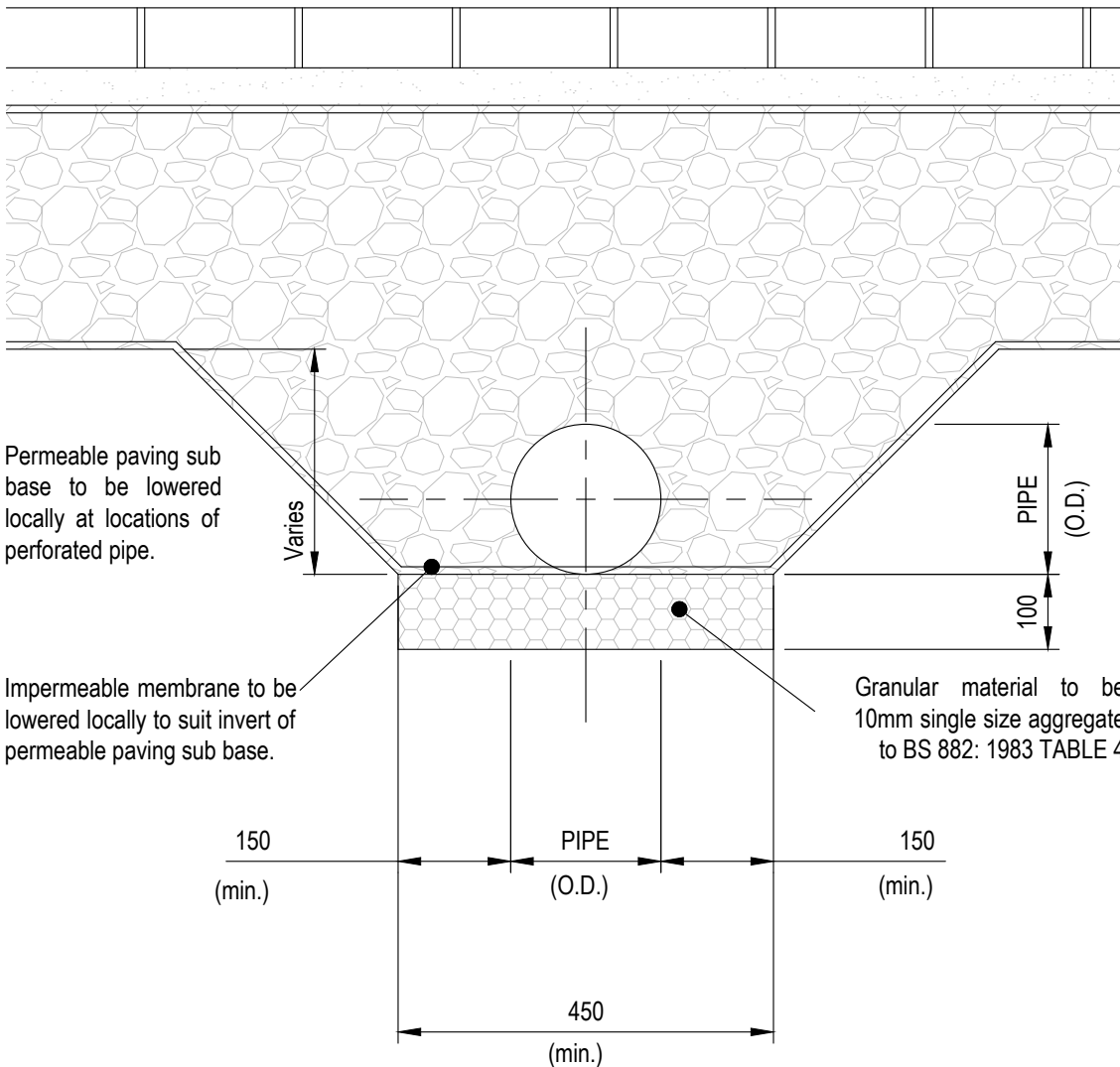
*Application area code "UD" should normally be specified
Note
Some of these materials may not be suitable for conveying trade effluent.



Polypropylene Shallow Inspection Chamber
Ø450mm (Light Loading B125)

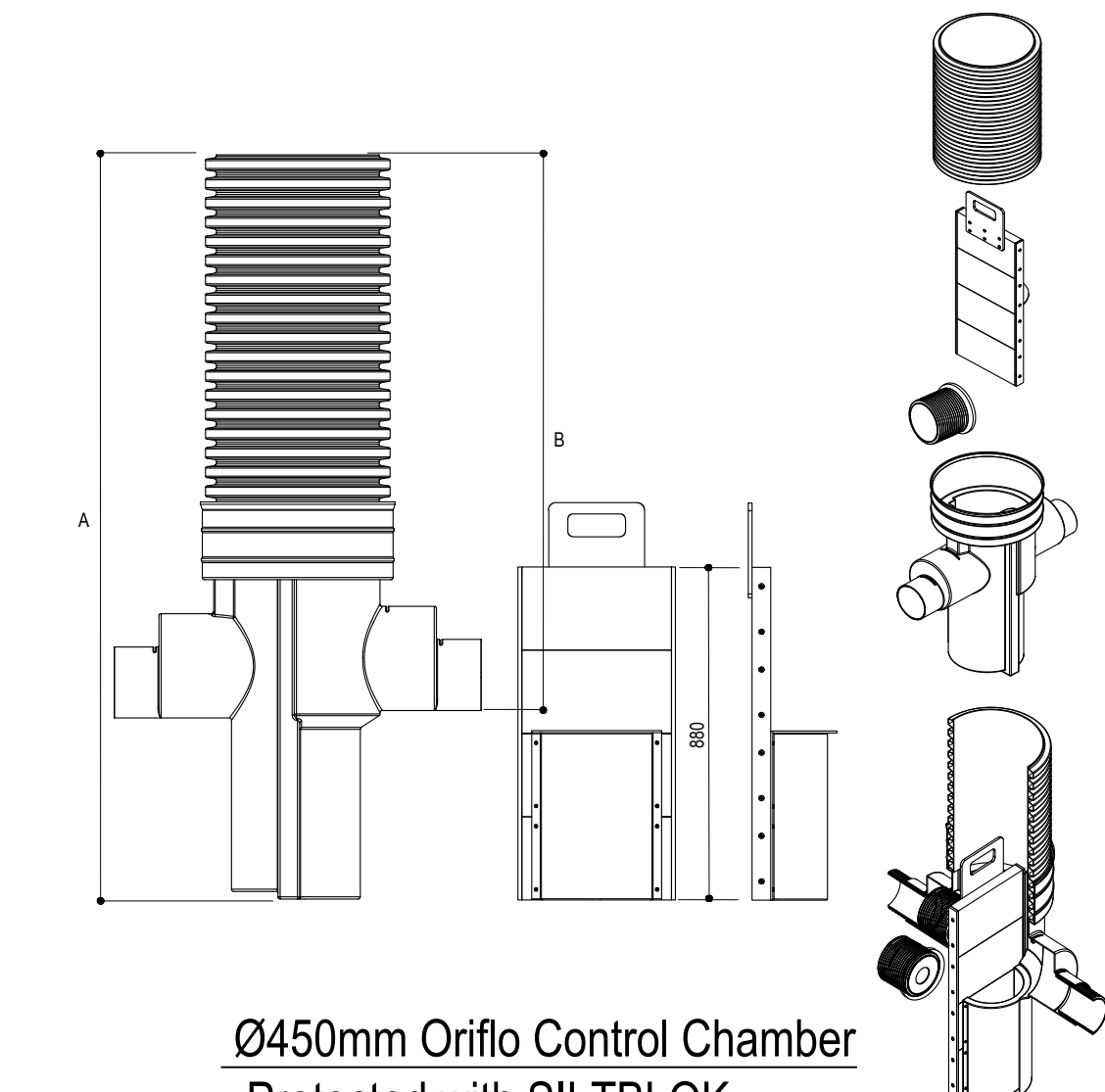
Scale 1:20

Note:
3m maximum depth. Up to Ø150mm pipework for 450mm shaft, or up to 300mm pipework on 500mm shaft. B125 maximum Loading, suitable for car parks and private drives



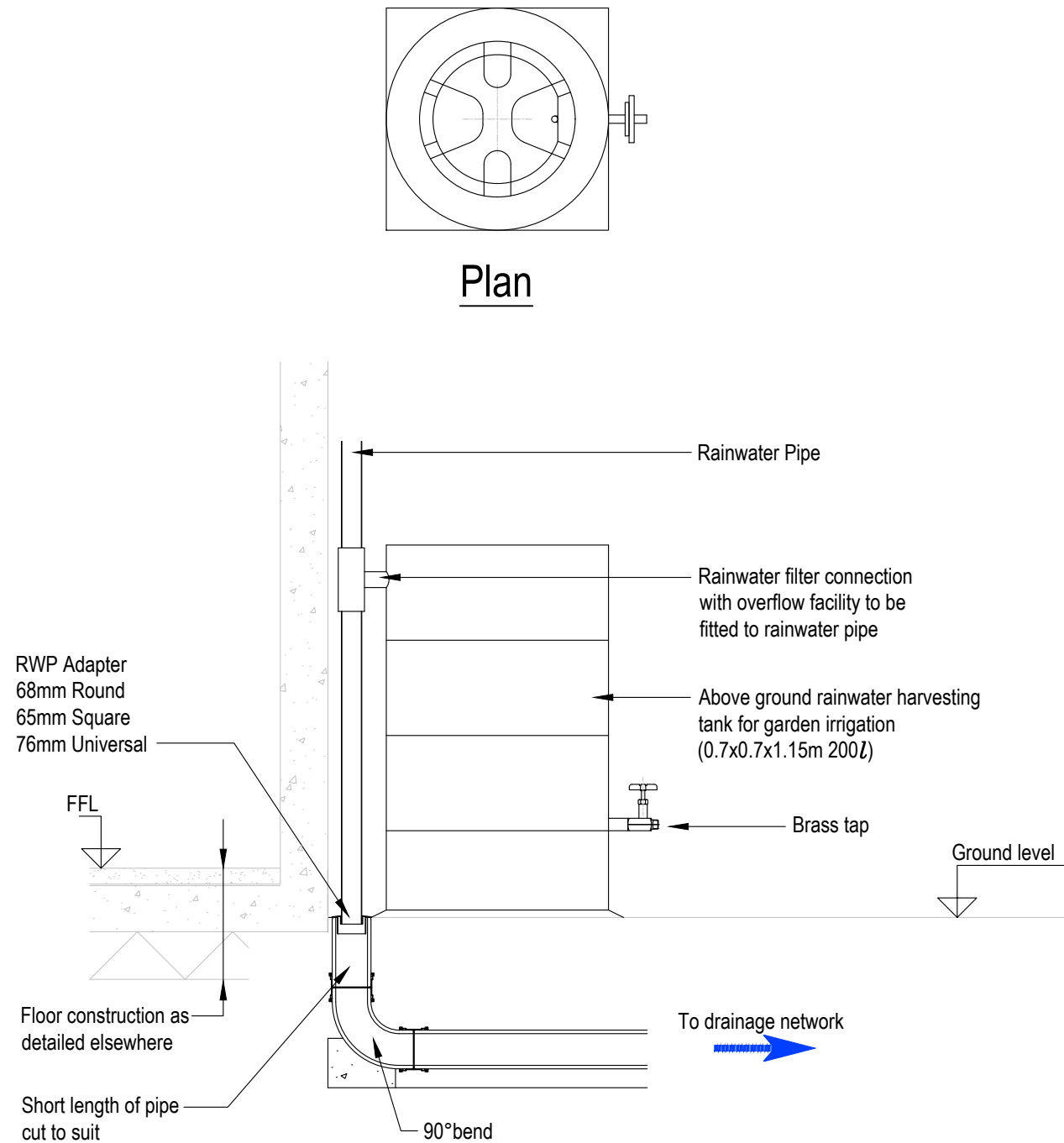
Perforated Pipe Bedding

Scale 1:10



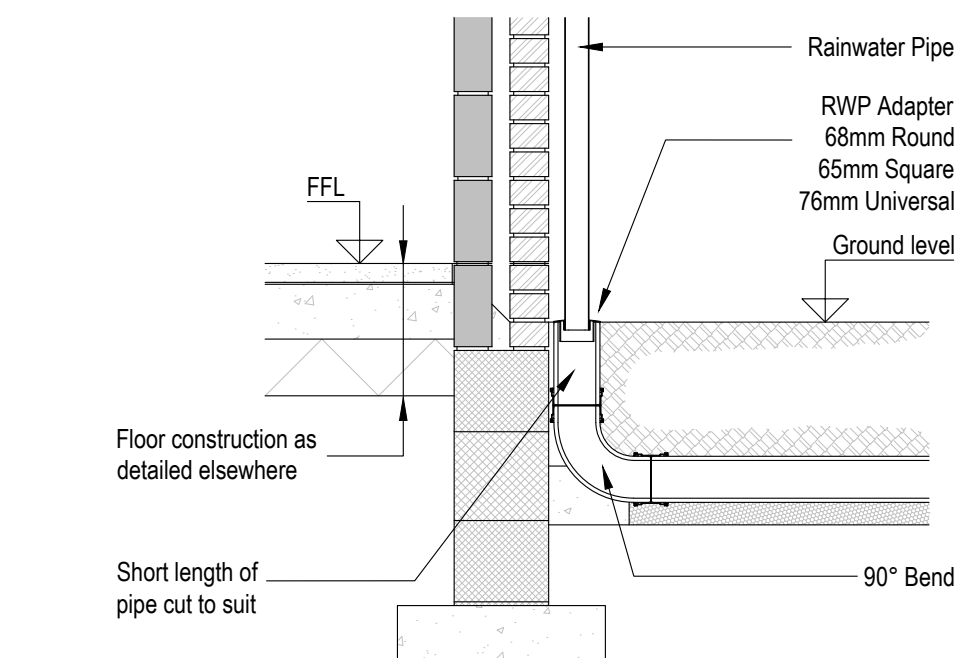
Ø450mm Oriflo Control Chamber
- Protected with SILTBLOK

Not to Scale



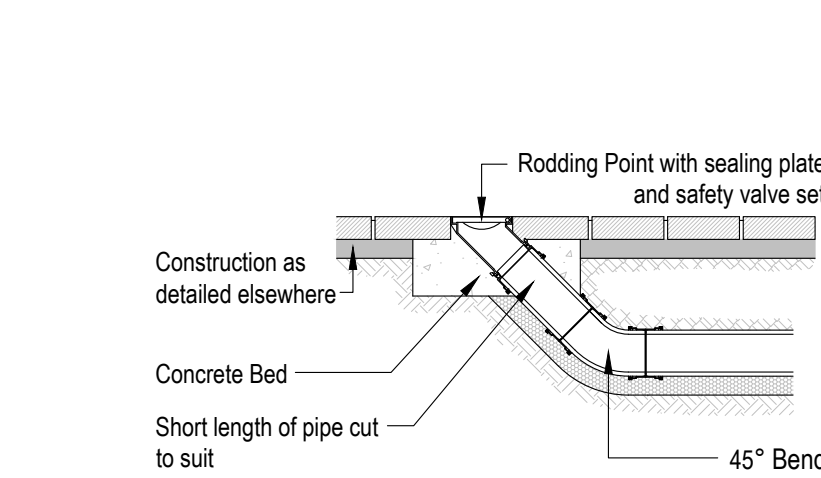
Rainwater Harvesting Detail

SCALE 1:20



External RWP Connection

Scale 1:20



Rodding Point

Scale 1:20

Drainage Key	
Surface Water Pipe PN 1.000, 100/80	Existing Combined Water Sewer
Inspection chamber 480mm Ø >600mm Depth	Oriflow control chamber
Inspection chamber 225mm Ø <600mm Depth	Impermeable area
Rodding Point	Rainwater Harvesting / Waterbutt
Private Yard Gully	Permeable Paving
Rain Water Pipe	Site Boundary
Perforated Pipe	

Scale
As Shown

P1 Preliminary Issue		MKR	DB	21.03.2024
Issue	Notes	Drawn	Approved	Date
 Sustainable Drainage Designs				
Issuing Office: JMS East Anglia (Ipswich): Unit 27, Brightwell Barns Brightwell, Suffolk, United Kingdom, IP10 0BJ, Tel: 01473 487047				
Project Land Adj to 4 Sunnycare Wrexham, LL11 4RH				
Drawing Title Construction Drawing Details				
Project No. SD2403130		Drawing No. 202		Issue P1
PRELIMINARY				



Questions?
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