whitby wood

Ossory Road

DRAINAGE STRATEGY

P450200-REP-C-001

Revision P03

September 2021

WHITBY WOOD LIMITED

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Whitby Wood Limited registered in England and Wales reg.no. 7786822

CONTENTS

Prepared by:	Reviewed by:	Approved by:
		
Andrew Prior	**Emma Francois**	**Daniel Zwetsloot**
Civil Engineer	Senior Engineer	Associate

1.0 INTRODUCTION

Proposed Scheme

The proposed scheme consists of the construction of no.117 residential units with light industrial space at ground floor, contained within a single block.

Scope of Work

Whitby Wood are responsible for the design of the onsite foul and surface water below ground drainage from where it passes under the lowest slab level of the building. Separate foul and surface water drainage networks will be designed to collect discharges from the building and hardstanding areas and convey it to the existing offsite public drainage infrastructure.

2.0 EXISTING DRAINAGE

The existing site contains a commercial building and a hardstanding area used for parking. It is understood that the existing site is positively drained with both foul and surface water discharging to the adjacent combined public sewer in Ossory Road via an onsite network and connection.

Thames Water public sewer records show that there is a 305mm diameter public sewer located in Ossory Road. Chamber MH0901 is located adjacent to the site, the invert level of which is unknown as the information in the public sewer record is clearly incorrect, suggesting that the pipe is above ground.

Refer to Appendix A for extracts of Thames Water public sewer records.

3.0 DESIGN STANDARDS AND GUIDANCE

The proposed onsite drainage will be designed in accordance with the relevant design standards including Sewers for Adoption, Building Regulations and British Standards where appropriate. The drainage will also be designed in accordance with the relevant policy and guidance published by Southwark Council, Thames Water and the London Plan.

The various guidance recommends that sustainable drainage systems (SuDS) are utilised where possible to manage surface water discharge rates and volumes in line with the following drainage hierarchy:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer.

Southwark Council publishes guidance on surface water management. The guidance recommends that the surface water discharge rate from the proposed site should be limited to greenfield rate where possible. Southwark Council's Flood Risk Team was consulted during the design development process and their response reiterated the above. Refer to Appendix B for copies of the correspondence.

A predevelopment enquiry was submitted to Thames Water and a response was received on 31st August 2021 confirming that capacity is available for the proposed foul and surface water discharge rates. A copy of their response is contained in Appendix C, which can be summarised as follows:

4.0 PROPOSED DISCHARGE RATES

To satisfy the requirements of Southwark Council, Thames Water, the London Plan and other relevant design guidance, it is proposed to restrict surface water discharge from the proposed site to the greenfield runoff rate of 1.47 l/s for a 1 in 100 year storm. Refer to the calculations in Appendix D for further details.

It is proposed to discharge foul water to the public sewers at an unrestricted rate. Thames Water have confirmed that there is sufficient capacity in their existing network to accommodate this.

The existing surface water discharge rate from the site has been calculated using Windes Microdrainage modelling software. The results can be seen in Table 1 below, and the calculations found in Appendix E.

It can be seen that the proposed scheme represents a significant reduction in surface water discharge from the site relative to existing.

	Surface Water Discharge Rate (1 in 100 yr storm)	Reduction
Existing Site (0% Climate Change allowance)	54 l/s	97%
Proposed Site (40% Climate Change allowance)	1.47 l/s	

Table 1 – Existing/Proposed Surface Water Discharge Rates

5.0 PROPOSED DRAINAGE

Surface Water

A proposed surface water drainage network has been designed to adhere to the discharge restrictions previously outlined, whilst utilising sustainable drainage techniques to manage surface water and provide the required attenuation. The network is designed to accommodate a 1 in 100 year storm event without flooding, whilst also providing an allowance for a 40% increase in rainfall intensity for climate change.

Almost the entire site is occupied by the proposed building, therefore infiltration is not possible given that Building Regulations requires infiltration devices to be located a minimum of 5m from building foundations.

Open water features such as ponds are also unsuitable for the site due to space constraints and health and safety considerations.

A green roof is proposed to intercept rainwater, in addition to providing wider ecological benefits. Rainwater will then be conveyed to a below ground attenuation tank for gradual release to the public sewers. A hydrobrake flow control device (or similar) will be used to restrict discharge from the site to the greenfield rate.

No watercourses or dedicated surface water sewers are available for connection nearby, therefore it is proposed to discharge to the combined public sewer in Ossory Road.

Windes Microdrainage modelling information is provided for the scheme in Appendix F

A SuDS Maintenance Plan is included in Appendix G

The Southward Council SuDS proforma is included in Appendix J.

Foul Water

A below ground gravity drainage network is proposed to serve the building and convey waste water to the existing combined water public sewer in Ossory Road. The foul water will be discharged at an unrestricted rate.

Refer to drawing P450200-C-100 in Appendix H for further details.

6.0 SUSTAINABLE DRAINAGE SOLUTIONS

Cellular attenuation tank

Cellular attenuation storage tanks are used to create a below ground void space for the temporary storage of surface water. These are comprised of structural plastics, usually polypropylene, and have a void ration of 95-96%. Various products are available on the market which can accommodate various vertical and lateral loading which are suitable for under vehicular loaded areas, public realm areas or landscaped areas. The inherent flexibility in size and shape means that they can be tailored to suit specific site characteristics and constraints. Tanks can be wrapped in geomembrane to create a sealed storage only system or can be wrapped in geotextile to allow for infiltration into the ground. Cellular attenuation tanks can be used below previous surfacing systems to increase the storage volume ratio of these SuDS.

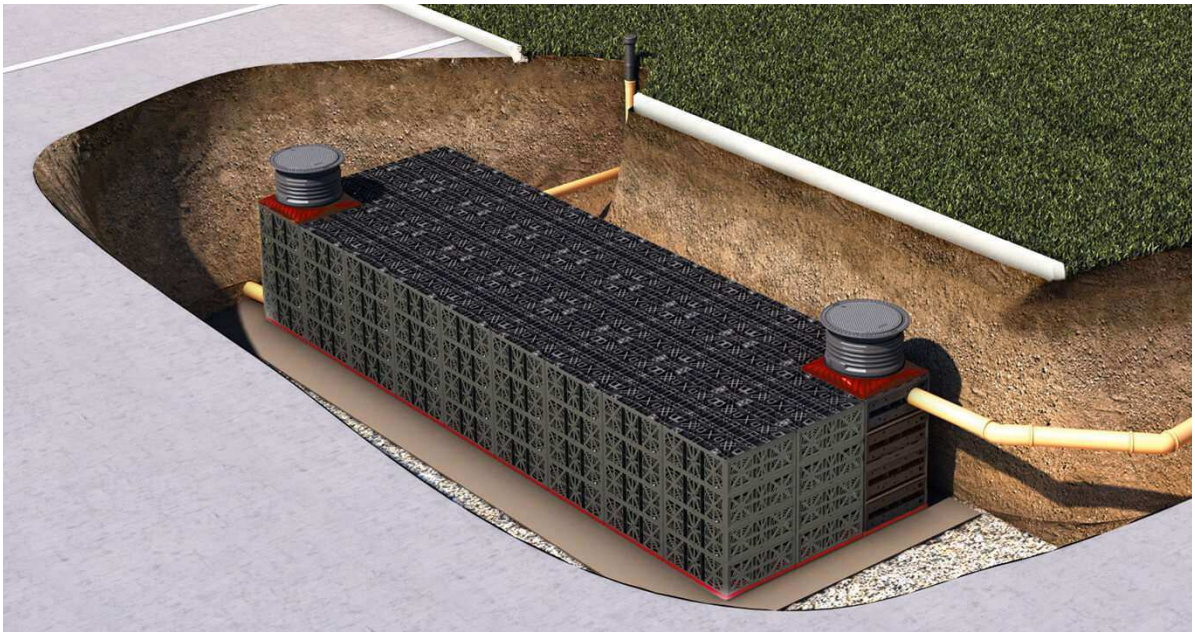


Figure 1 – Below Ground Attenuation Tank

ADVANTAGES:	High storage volume ratio, can be used under public realm areas, can be used below traffic areas, minimal maintenance.
DISADVANTAGES:	Cost of excavation, limited water quality treatment.
WATER QUALITY:	Low removal of suspended solids.

Green/Planted Roofs

Green/Planted roofs comprise a multi-layered system that covers the roof of a building or podium structure with a planted surface. The roof is likely to consist of an impermeable layer, a substrate or growing medium and a drainage layer (although not all roofs require a drainage layer).

Such roofs are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.

Figure 2 – Green/Planted Roof

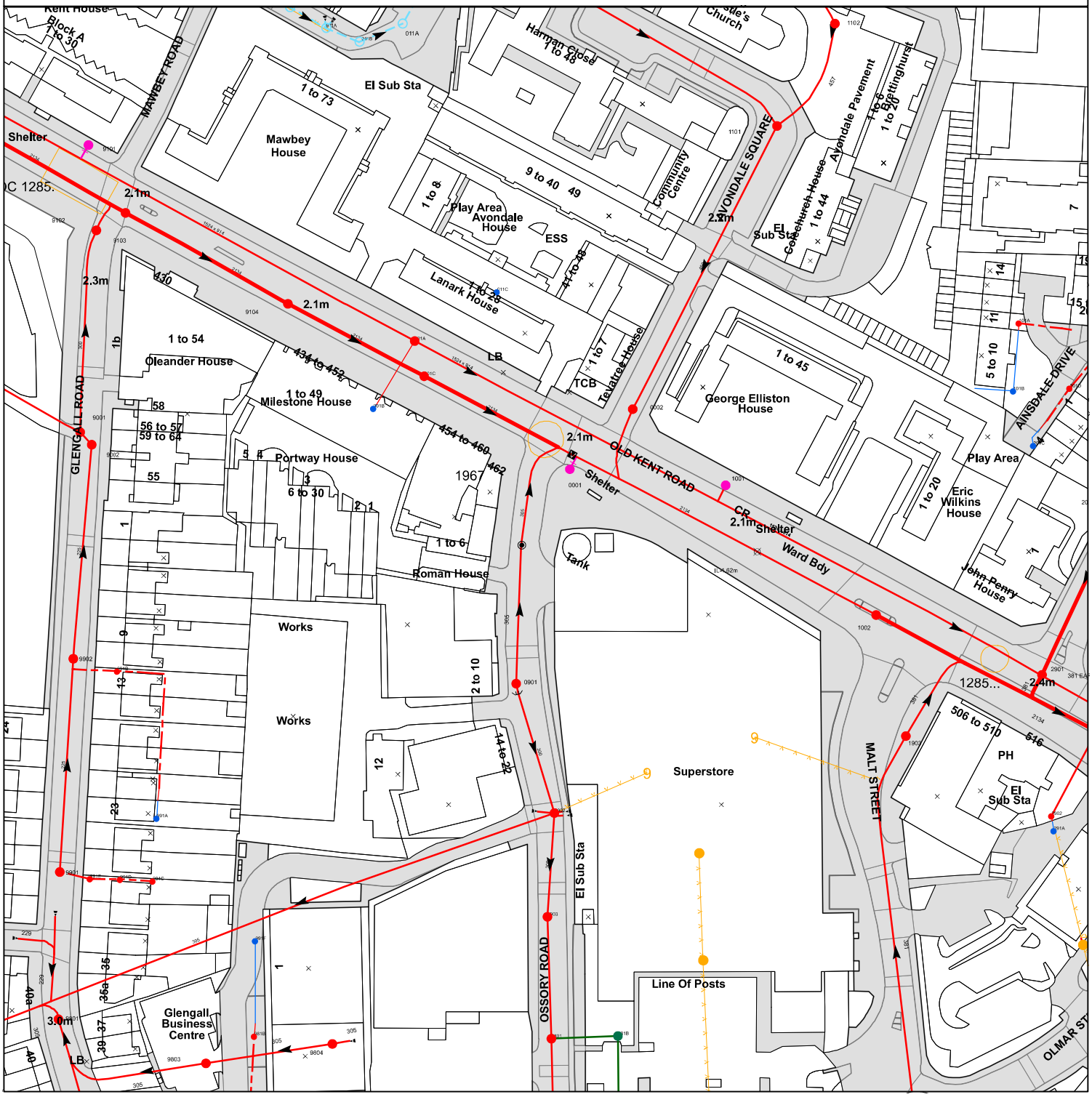
ADVANTAGES:	Mimic predevelopment state of hydraulics and hydrology, Good removal capability of atmospherically deposited urban pollutants, Can be applied in high density developments, Ecological, aesthetic and amenity benefits, Improve air quality, Help manage urban heat island impacts, Insulates buildings against temperature extremes, Sound absorption.
DISADVANTAGES:	Higher cost (compared to conventional roof)' Not appropriate for steep roofs, Maintenance of roof vegetation, Any subsequent damage to waterproof membrane likely to be more critical since water is encouraged to remain on the roof.
WATER QUALITY:	Improvements in water quality through a variety of physical, biological and chemical treatment processes, within the soil and root uptake zone, which filter airborne pollutants entrained within rainwater.

7.0 APPENDIX

A – THAMES WATER ASSET PLANS

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_3940456



0 5 10 20 30 40 Meters

Scale:	1:1142
Width:	319m
Printed By:	noconnor
Print Date:	28/01/2019
Map Centre:	534059,178028
Grid Reference:	TQ3478SW

Comments:

ALS/ALS Standard/2019_3940456

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
101A		
1101	2.06	-2.61
9804	3.48	1.3
1002	2.19	
9001	2.38	-1.62
0901	2.33	2.08
1102	2.05	-2.32
9801		
911B	2.41	0.05
011B	2.49	-0.13
0902	1.979	-0.881
001B		
0001	2.22	
0002	2.07	-3.15
9103	2	
2902		
001C		
991B		
0801	1.47	-1.76
201C		
991E		
991C		
991F		

REFERENCE	COVER LEVEL	INVERT LEVEL
101B		
1001	2.1	-1.23
9803	3.64	0.59
9902	2.63	0.02
9101		
1903	1.82	-2.95
2901		
9901	2.74	0.62
911A	2.36	-0.09
011A	2.27	-0.18
001A		
9104	1.94	
9102		
9002	2.47	-1.31
291A		
0903	1.58	-1.31
991A		
081B		
201D		
011C		
991D		
981B		

B – SOUTHWARK COUNCIL CORRESPONDENCE

Andrew Prior

From: Flood Risk Management <FloodRiskManagement@southwark.gov.uk>
Sent: 06 November 2019 16:04
To: Andrew Prior
Subject: RE: Ossory Road Drainage Scheme

Follow Up Flag: Follow up
Flag Status: Completed

Hi Andrew,

Thank you for getting in touch regarding both the above site and Credon House and apologies for the delay in responding.

Southwark expects all development to restrict surface water discharges to greenfield runoff rates, in line with Policy 5.13 of the London Plan and our Strategic Flood Risk Assessment. For constrained sites, alternative features such as blue (or blue-green) rooftop attenuation should be considered, as well as rainwater harvesting. If not viable, robust justification should be provided. We would expect planning applications to be accompanied by supporting hydraulic calculations to demonstrate that the development will not flood in events up to and including the 1% AEP storm plus climate change allowance.

Southwark's preference is for the discharge of surface water from the site via a gravity system, rather than pumping due to the ongoing maintenance requirements and associated risks (see our Strategic Flood Risk Assessment, Appendix H, 5.2). The installation of tanks below buildings is also of concern from an operational and maintenance perspective and is strongly discouraged unless no other feasible approaches are available.

Further guidance can be found in our 'Developers Guide for Surface Water Management' (Appendix H, SFRA):
www.southwark.gov.uk/environment/flood-risk-management/strategic-flood-risk-assessment-sfra?chapter=2

I hope that this helps to clarify our requirements.

Best regards,

Michael

Michael Green
Flood Risk Engineer
Southwark Council
Tel. 020 7525 2145

From: Andrew Prior [mailto:a.prior@whitbywood.com]
Sent: Thursday, October 17, 2019 11:39 AM
To: Flood Risk Management
Subject: Ossory Road Drainage Scheme

Hi,

We are undertaking the drainage design on a project in Southwark at 2-10 Ossory Road, London, SE1 5PA.

We are integrating SuDS where possible and looking to reduce discharge rates down as far as possible in line with your guidance and the London Plan. The site is quite small and very constrained so SuDS options are very limited. We have been able to achieve a restricted discharge rate of 5 l/s.

Please find the drainage strategy drawing attached. Please can you advise if this is acceptable to you and if we need to complete any proforma etc ahead of making a planning submission.

Thanks for your help and I look forward to hearing form you.

Regards,

Andrew Prior
CIVIL ENGINEER
m. +44 (0)7515 520535

whitby wood
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LEVEL 9, THE TOWER BUILDING,
11 YORK ROAD, LONDON, SE1 7NX

C – THAMES WATER PRE-DEVELOPMENT ENQUIRY

Mr Andrew Prior

Whitby Wood
91-94 Lower Marsh
London
SE1 7AB

Wastewater pre-planning
Our ref DS6087063

31 August 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 2-10 Ossory Road, London, SE1 5PA

Dear Andrew,

Thank you for providing information on your development comprising demolition of existing building and redevelopment to include 117 flats and 340sqm commercial space with proposed Surface Water discharge attenuated to 1.47l/s and Foul Water by gravity all connected to a 300mm combined sewer in Ossory Road.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

When developing a site, policy SI 13 of the London Plan states "Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to

its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:".

The disposal hierarchy being:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) rainwater infiltration to ground at or close to source
3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) controlled rainwater discharge to a surface water sewer or drain
6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on the number below

Yours sincerely

Natalya Collins
Developer Services – Adoptions Engineer
Mobile: 07747 641 932
developer.services@thameswater.co.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

D – GREENFIELD RUNOFF RATE CALCULATIONS

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	andrew prior
Site name:	Ossory Road
Site location:	London

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.48475° N
Longitude:	0.07099° W
Reference:	1040914476
Date:	Nov 22 2019 08:46

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.114

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	603	603
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.46	0.46
1 in 1 year (l/s):	0.39	0.39
1 in 30 years (l/s):	1.06	1.06
1 in 100 year (l/s):	1.47	1.47
1 in 200 years (l/s):	1.73	1.73

E – EXISTING SITE DISCHARGE RATE CALCULATIONS

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Date 03/11/2019 14:52	Designed by
File Existing SW discharge.MDX	Checked by
XP Solutions	Network 2018.1.1

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)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.470	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	550	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

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.057	0.057	0.057
1.001	-	-	100	0.057	0.057	0.057
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.114	0.114	0.114

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)
S1.002	S	10.000	7.675	7.500	0	0

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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	0
Number of Online Controls	0	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 0.470
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 minute 1 year Winter I+0%	10.000	8.560	-0.090	0.000	0.33
S1.001	S2	15 minute 1 year Winter I+0%	10.000	8.248	-0.152	0.000	0.22
S1.002	S3	15 minute 1 year Winter I+0%	10.000	7.997	-0.153	0.000	0.23

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1		0.062	3.925	1.3	8.3	OK
S1.001	S2		0.077	7.860	1.4	15.3	OK
S1.002	S3		0.093	7.877	1.4	15.5	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 Storage Structures	0
Number of Online Controls	0	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 0.470
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 minute 30 year Winter I+0%	10.000	8.605	-0.045	0.000	0.82
S1.001	S2	15 minute 30 year Winter I+0%	10.000	8.304	-0.096	0.000	0.61
S1.002	S3	15 minute 30 year Winter I+0%	10.000	8.054	-0.096	0.000	0.61

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1		0.113	9.580	1.6	20.5	OK
S1.001	S2		0.149	19.177	1.8	42.2	OK
S1.002	S3		0.189	19.274	1.8	42.0	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	0
Number of Online Controls	0	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 0.470
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 minute 100 year Winter I+0%	10.000	8.672	0.022	0.000	1.04
S1.001	S2	15 minute 100 year Winter I+0%	10.000	8.328	-0.072	0.000	0.79
S1.002	S3	15 minute 100 year Winter I+0%	10.000	8.077	-0.073	0.000	0.78

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1		0.189	12.476	1.6	26.2	SURCHARGED
S1.001	S2		0.183	24.921	1.9	53.9	OK
S1.002	S3		0.237	24.873	1.9	53.7	OK

F – PROPOSED SITE DISCHARGE RATE CALCULATIONS

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Date 29/07/2020 16:23	Designed by
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XP Solutions	Network 2018.1.1

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)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.470	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	550	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	0.096	4-8	0.018

Total Area Contributing (ha) = 0.114

Total Pipe Volume (m^3) = 1.171

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XP Solutions	Network 2018.1.1

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S3, DS/PN: S1.002, Volume (m³): 0.8

Unit Reference	MD-SHE-0051-1400-1400-1400
Design Head (m)	1.400
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	8.175
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	1.4
Flush-Flo™	0.226	1.0
Kick-Flo®	0.459	0.9
Mean Flow over Head Range	-	1.1

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)
0.100	0.9	1.200	1.3	3.000	2.0	7.000	2.9
0.200	1.0	1.400	1.4	3.500	2.1	7.500	3.0
0.300	1.0	1.600	1.5	4.000	2.3	8.000	3.1
0.400	1.0	1.800	1.6	4.500	2.4	8.500	3.2
0.500	0.9	2.000	1.6	5.000	2.5	9.000	3.3
0.600	1.0	2.200	1.7	5.500	2.6	9.500	3.4
0.800	1.1	2.400	1.8	6.000	2.7		
1.000	1.2	2.600	1.9	6.500	2.8		

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Storage Structures for Storm

Cellular Storage Manhole: S3, DS/PN: S1.002

Invert Level (m) 8.175 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)
0.000	47.0	0.0	1.401	0.0	0.0
1.400	47.0	0.0			

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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	1
Number of Online Controls	1	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 0.470
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%	100/15 Summer				9.060
S1.001	S2	15 Winter	1	+0%	100/15 Summer				8.745
S1.002	S3	120 Winter	1	+0%	30/15 Summer				8.391

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.090	0.000	0.33		8.3	OK	
S1.001	S2	-0.155	0.000	0.21		15.3	OK	
S1.002	S3	-0.009	0.000	0.03		1.0	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 Storage Structures	1
Number of Online Controls	1	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 0.470
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%	100/15 Summer				9.105
S1.001	S2	15 Winter	30	+0%	100/15 Summer				8.797
S1.002	S3	120 Winter	30	+0%	30/15 Summer				8.791

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.045	0.000	0.82		20.5	OK	
S1.001	S2	-0.103	0.000	0.57		42.2	OK	
S1.002	S3	0.391	0.000	0.03		1.0	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 Storage Structures	1
Number of Online Controls	1	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 0.470
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				9.473
S1.001	S2	240 Winter	100	+40%	100/15 Summer				9.398
S1.002	S3	240 Winter	100	+40%	30/15 Summer				9.395

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.323	0.000	1.35		33.9	SURCHARGED	
S1.001	S2	0.498	0.000	0.16		12.2	SURCHARGED	
S1.002	S3	0.995	0.000	0.04		1.3	SURCHARGED*	

G – SUDS MAINTENANCE STRATEGY

DRAINAGE MAINTENANCE STRATEGY

The following drainage maintenance and management strategy has been produced in accordance with the SuDS Manual, best practice and manufactures guidance. This is not intended to be an exhaustive list but outline guidance for the recommended requirements which are to be reviewed and updated based on the specific site requirements. It is expected that the maintenance for the drainage of the proposed development will be undertaken by the management company and will be suitably qualified to undertake the required maintenance.

This schedule should be read in accordance with the manufacturer's guidance and the SuDS Manual.

Attenuation Storage Tanks

Maintenance Schedule	Required action	Typical frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually.
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

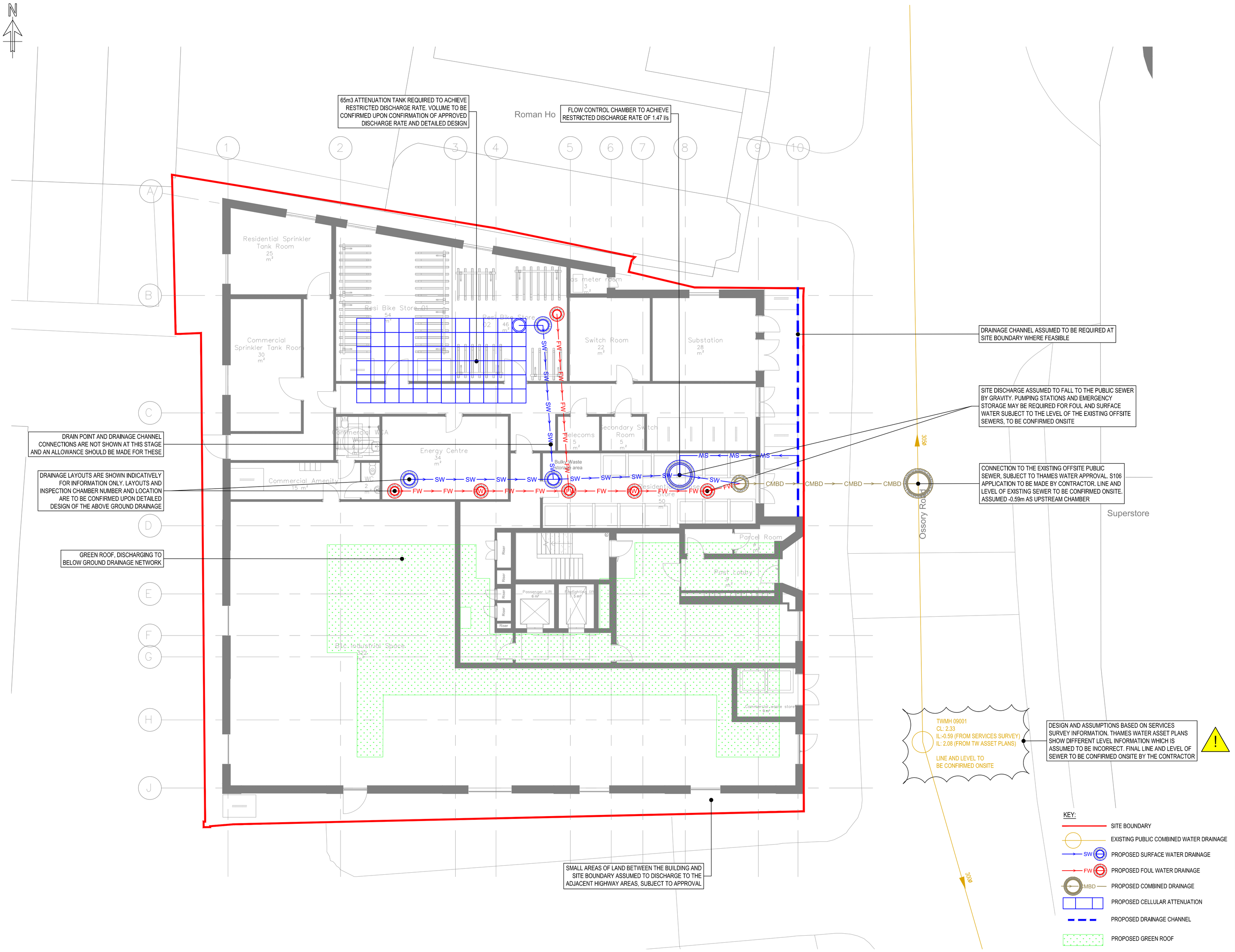
Operation and Maintenance Requirements for Attenuation Tanks (from SuDS Manual)

Green/Planted Roofs

Maintenance Schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drainage system.	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually the responsibility of the manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Operation and Maintenance Requirements for Green/Planted Roofs (from SuDS Manual)

H - DRAINAGE STRATEGY DRAWING



HEALTH AND SAFETY INFORMATION

CONSTRUCTION

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

NOTES

DO NOT SCALE FROM THIS DRAWING. ONLY FIGURED DIMENSIONS ARE TO BE USED.

ALL DIMENSIONS ARE IN MILLIMETRES U.N.O.

ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

FOUL AND SURFACE WATER DISCHARGE LOCATIONS AND RATES ARE SUBJECT TO APPROVAL BY THE SEWERAGE UNDERTAKER AND COUNCIL.

ALL EXISTING DRAINAGE INVERT LEVELS ARE TO BE CONFIRMED ONSITE PRIOR TO CONSTRUCTION. IF LEVELS ARE DIFFERENT TO THAT ASSUMED THEN THE DRAINAGE MAY NEED TO BE UPDATED OR PUMPING STATIONS PROVIDED.

STORAGE VOLUMES ARE INDICATIVE ONLY.

REQUIREMENT FOR RECESSED COVERS IS TO BE CONFIRMED BY THE DESIGN TEAM

MANHOLE CHAMBER NUMBER AND LOCATIONS ARE SUBJECT TO CHANGE DEPENDING ON DRAIN POINT LOCATION AND NUMBERS

DRAIN POINT CONNECTIONS TO BE CONFIRMED, NOT SHOWN AT THIS STAGE.

REV	DATE	DESCRIPTION	DRN	CHK	APD
P05	27/08/21	PRELIMINARY ISSUE	AP	RF	DZ
P04	17/07/20	PRELIMINARY ISSUE	AP	RF	DZ
P03	11/12/19	PRELIMINARY ISSUE	AP	EB	SL
P02	03/12/19	PRELIMINARY ISSUE	AP	EB	SL
P01	20/02/19	PRELIMINARY ISSUE	AP	EB	SL

KEY PLAN

whitby wood
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LONDON SE1 7AB, UNITED KINGDOM
+44 (0)20 7442 2216 www.whitbywood.com

CLIENT
POCKET LIVING

PROJECT
OSSORY ROAD

PRELIMINARY

DRAWING TITLE
DRAINAGE LAYOUT

DATE	SCALES @ A1	DRAWN BY	CHECKED	APPROVED
20/02/19	1:100	AP	EB	SL

PROJECT No.	DRAWING No.	REVISION
P450200	C-100	P05

J – SOUTHWARK SUDS PROFORMA

Southwark Council

GREATER**LONDON**AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Ossory Road
Address & post code	Ossory Rd, London SE1 5AN
OS Grid ref. (Easting, Northing)	E 534026 N 178004
LPA reference (if applicable)	
Brief description of proposed work	The proposed scheme consists of the construction of no.117 residential units with light industrial space at ground floor, contained within a single block.
Total site Area	1140 m^2
Total existing impervious area	1140 m^2
Total proposed impervious area	1140 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	
Existing drainage connection type and location	Combined to Ossory Road
Designer Name	Andrew Prior
Designer Position	Civil Engineer
Designer Company	WW

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Clay
Bedrock geology classification	Clay
Site infiltration rate	m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	Combined sewer to Ossory Road
Has the owner/regulator of the discharge location been consulted?	Yes, pre-dev completed with TW

Southwark Council

GREATER**LONDON**AUTHORITY

LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.46			
1 in 1	0.39	16	65	1.47
1 in 30	1.06	43	65	1.47
1 in 100	1.47	54	65	1.47
1 in 100 + CC			65	1.47
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Hydrobrake		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	Roofs	Roofs	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	1140		65
Total	**1140**	**0**	**65**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Page 4-6 Appendix A to H
Drainage hierarchy (2b)	Page 4-6 Appendix A to H
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Page 4-6 Appendix A to H
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Page 4-6 Appendix A to H
Proposed SuDS measures & specifications (3b)	Page 4-6 Appendix A to H
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix H
Detailed drainage design drawings, including exceedance flow routes	Appendix H
Detailed landscaping plans	
Maintenance strategy	Appendix G
Demonstration of how the proposed SuDS measures improve:	Page 4-6 Appendix A to H
a) water quality of the runoff?	Page 4-6 Appendix A to H
b) biodiversity?	Page 4-6 Appendix A to H
c) amenity?	Page 4-6 Appendix A to H