
Appendix K. Rochdale Borough Council SFRA Map

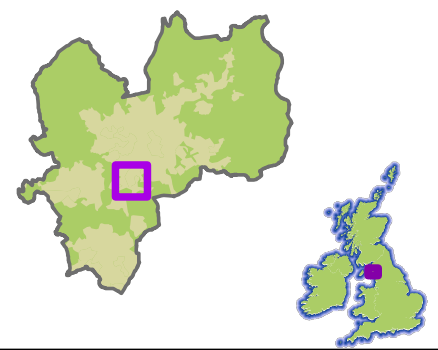
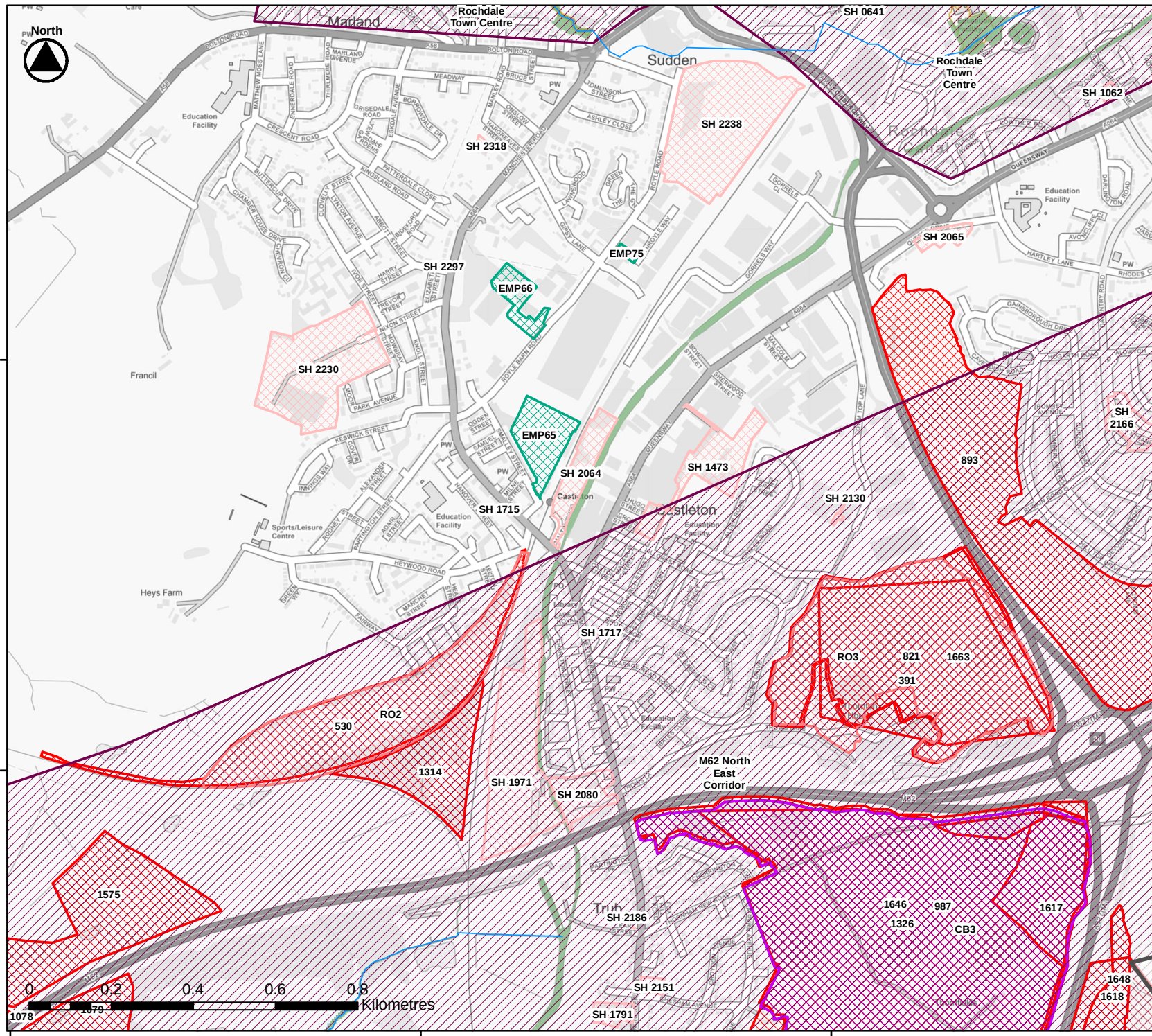
411000

410000

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LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT

For
ROCHDALE BOROUGH COUNCIL

Please select a data type from the dropdown menu below that you wish to view:

Flood Zones

- Watercourse
- Proposed Development Sites**
 - GMSF 2019 Strategic Locations
 - 2018 GMSF Call for Sites
- 2018 Baseline Land Supply**
 - Residential
 - Industry / Warehousing
 - Offices
- 2019 GMSF Allocations**
 - Residential
 - Industry / Warehousing
 - Mixed Use
- Flood Zone 3b
- Flood Zone 3a
- Climate Change Outline (+70%)
- Flood Zone 2

☒ Show Site Reference Labels



Appendix L. LLFA Correspondence

Robert Rigge

From: Robert Rigge
Sent: 11 November 2025 10:33
To: 'Keith Mealey'
Cc: Lee Fletcher; Francis Comyn
Subject: RE: Queens Drive, Rochdale - LLFA

Morning Keith,

No problem at all, I did think it was odd from the notes, hence asking the question.

Thanks for confirming – we should have something to share with you towards the end of the week in advance of the planning submission.

Best regards,



Find us on:



Robert Rigge *BEng, MSc, CEng, MICE, NECREg*
Associate
T: 0161 974 0291 / M: 07300 181 340
W: www.adeptcsce.com

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From: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Sent: 11 November 2025 10:19
To: Robert Rigge <Robert.Rigge@adeptsce.com>
Cc: Lee Fletcher <Lee.Fletcher@adeptsce.com>; Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>
Subject: RE: Queens Drive, Rochdale - LLFA

Robert

I don't recall saying that. I thought we discussed the SuDS proforma and I said if your strategy captures what the proforma covers then you don't need to submit a proforma as well.

A FRA should be provided for major developments. This is basically 10 or more dwelling units or more than 1Ha site area.

Your site is within flood zone 1 and does not appear to be close to any water bodies except potentially the canal which would be low flood risk.

Therefore if you do need a FRA it should be fairly straightforward.

Regards

Keith Mealey

Flood & Drainage Engineer

Public Protection & Customers



07872 500 722

✉ keith.mealey@rochdale.gov.uk

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Floor 2, Number One Riverside
Smith Street, Rochdale, OL16 1XU

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Please consider the environment before printing this email.

From: Robert Rigge <Robert.Rigge@adeptcsce.com>

Sent: 11 November 2025 09:15

To: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>

Cc: Lee Fletcher <Lee.Fletcher@adeptcsce.com>

Subject: RE: Queens Drive, Rochdale - LLFA

Good Morning Keith,

We're just working up the details for the planning application – we have noted from our meeting on the 9th that you didn't require an FRA for the site, is that correct?

Best regards,

ADEPT
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CONSULTING ENGINEERS



Find us on:



Robert Rigge BEng, MSc, CEng, MICE, NECREg
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From: Robert Rigge <Robert.Rigge@adeptcsce.com>

Sent: 09 October 2025 10:32

To: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>

Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>; Lee Fletcher <Lee.Fletcher@adeptcsce.com>

Subject: RE: Queens Drive, Rochdale - LLFA

Sory mix up, I'll send an invite for this afternoon

Best regards,

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Associate

T: 0161 974 0291 / M: 07300 181 340

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From: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Sent: 09 October 2025 10:22
To: Robert Rigge <Robert.Rigge@adeptcsce.com>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>; Lee Fletcher <Lee.Fletcher@adeptcsce.com>
Subject: RE: Queens Drive, Rochdale - LLFA

Sorry no can't do Friday

Regards

Keith Mealey

Flood & Drainage Engineer
Public Protection & Customers



 07872 500 722

 keith.mealey@rochdale.gov.uk

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From: Robert Rigge <Robert.Rigge@adeptcsce.com>
Sent: 09 October 2025 10:20
To: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>; Lee Fletcher <Lee.Fletcher@adeptcsce.com>
Subject: RE: Queens Drive, Rochdale - LLFA

Can we say tomorrow please?

Best regards,

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CONSULTING ENGINEERS



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From: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Sent: 09 October 2025 09:34
To: Robert Rigge <Robert.Rigge@adeptcsce.com>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>; Lee Fletcher <Lee.Fletcher@adeptcsce.com>
Subject: RE: Queens Drive, Rochdale - LLFA

Robert

Apologies meant Today 9th 15.30. But could actually do from 15.00

Regards

Keith Mealey

Flood & Drainage Engineer

Public Protection & Customers



☎ 07872 500 722

✉ keith.mealey@rochdale.gov.uk

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Please consider the environment before printing this email.

From: Robert Rigge <Robert.Rigge@adeptcsce.com>

Sent: 08 October 2025 19:15

To: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>

Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>; Lee Fletcher <Lee.Fletcher@adeptcsce.com>

Subject: RE: Queens Drive, Rochdale - LLFA

Good Evening Keith,

Thanks for the email.

Next week is exceptionally busy for me, can we do this week. You've said Thursday and then quoted the 10th, which is Friday, which is a problem that has happened to the best of us, I'm available either day at 15.30.

If you confirm Thursday, the 9th or Friday the 10th at 15.30 I'll send a calendar invite.

Best regards,

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From: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Sent: 08 October 2025 17:29
To: Robert Rigge <Robert.Rigge@adeptcsce.com>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>
Subject: RE: Queens Drive, Rochdale - LLFA

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Robert

My current availability for a Teams discussion is

Thu 10th from 15.30

Mon 13th am

Tue 14th from 14.00

Wed 15th 11.00 to 15.00

Thu 16th am.

Some initial thoughts. The proposal appears to be a traditional gullies to buried storage solution whereas we would be looking for more sustainable approach incorporating green SuDS source control. Eg, swales , tree pits, rain gardens etc. together with ponds / detention basins to minimise buried storage.

Regards

Keith Mealey

Flood & Drainage Engineer

Public Protection & Customers



☎ 07872 500 722

✉ keith.mealey@rochdale.gov.uk

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From: Robert Rigge <Robert.Rigge@adeptcsce.com>
Sent: 03 October 2025 10:11
To: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>
Subject: RE: Queens Drive, Rochdale - LLFA

Good Morning Keith,

Thanks for confirming your details. The scheme is detailed on the attached proposed plan produced by the architect "22-042_SK23C"

At the moment we have an outline design, also attached. Noting your discharge hierarchy below we are reviewing the design with the landscape architect with a view to integrating a combined

landscaping / drainage strategy i.e. raingardens or similar, to treat and attenuation flows are source.

It would be good to know how Rochdale Borough Council is treating the new SuDS Guidance published earlier this year, our understanding is that these aren't statutory - <https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds#the-regulatory-framework>

As the scheme is a housing scheme, some of which are to be privately maintained, it is our view that providing reuse on our network shouldn't be relied on for the design life of the scheme. Do you agree?

We are carrying out on site testing to determine is infiltration is a viable discharge location. Alternatively, there is a SW public sewer crossing the site, we have a predevelopment enquiry with UU for this and will share their response when we receive it.

If you think it would be beneficial, are you open to a Teams meeting to discuss the scheme prior to a planning submission?

Best regards,



Find us on:



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From: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>
Sent: 26 September 2025 22:24
To: Robert Rigge <Robert.Rigge@adeptcsce.com>
Cc: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>
Subject: RE: Queens Drive, Rochdale - LLFA

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Hi Robert

Please feel free to forward initial / pre-planning LLFA enquiries to myself.

The aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

The ordered drainage techniques to be assessed with the aim to reduce or omit lower techniques:

- Control at Source (Infiltration / Recycling)
- On Site Treatment (Basins, Swales, Rain gardens, Tree pits)
- Local Treatment (Adoptable Ponds, Basins, Swales etc)
- Regional Treatment (ditto usually to a larger scale)
- Discharge to Watercourses / Bodies
- Discharge to SW Sewers
- Discharge to Combined Sewers

Regards

Keith Mealey

Flood & Drainage Engineer
Public Protection & Customers



☎ 07872 500 722

✉ keith.mealey@rochdale.gov.uk

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From: Francis Comyn <Francis.Comyn@Rochdale.Gov.UK>

Sent: 26 September 2025 16:58

To: Keith Mealey <Keith.Mealey@Rochdale.Gov.UK>

Subject: FW: Queens Drive, Rochdale - LLFA

Hi Keith

One for you. I hope you had a good break.

Cheers

Fran

Francis Comyn

Service Manager Strategic Planning
Economy



☎ 01706 924353

☎ 07976 059367

✉ francis.comyn@rochdale.gov.uk

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From: Robert Rigge <Robert.Rigge@adeptcsce.com>
Sent: 22 September 2025 14:58
To: Strategic Planning <Strategic.Planning@Rochdale.Gov.UK>
Subject: Queens Drive, Rochdale - LLFA

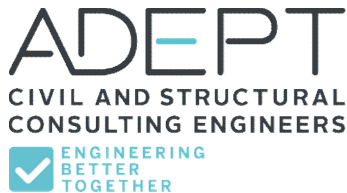
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Good afternoon,

We're appointed to develop a scheme at the above location, I am enquiring to confirm if you have a Lead Local Flood Authority pre planning service? If so, who is the correct person or address to contact?

Best regards,



Find us on:



Robert Rigge *BEng, MSc, CEng, MICE, NECReg*
Associate
T: 0161 974 0291 / M: 07300 181 340
W: www.adeptcsce.com

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Appendix M. Greenfield Runoff Calculation

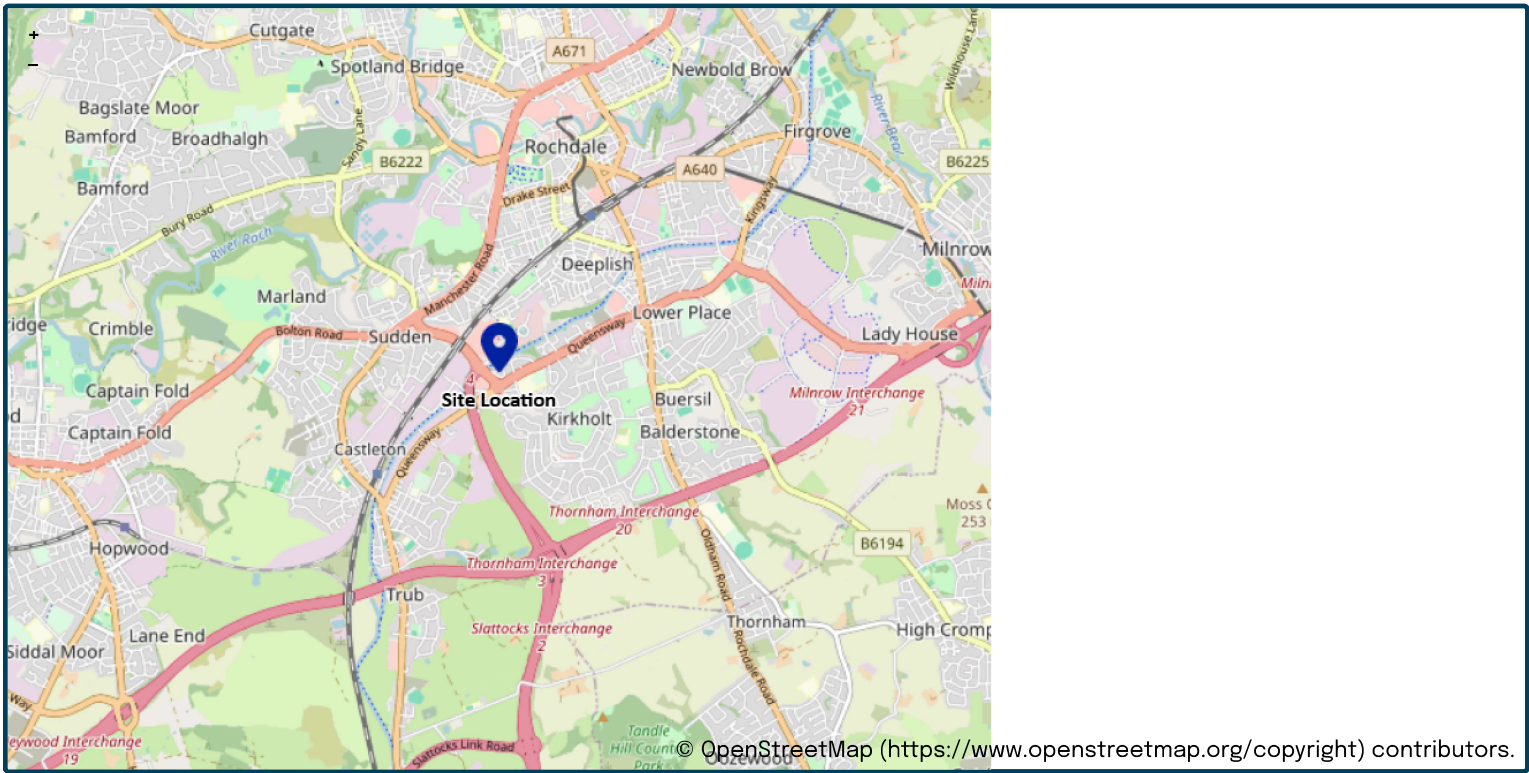
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	15/12/2025
Calculated by	R Rigge
Reference	100.25073
Model version	2.2.2

Location

Site name	Queens Drive
Site location	Rochdale



Site easting (British National Grid)	389278
Site northing (British National Grid)	411310

Site details

Total site area (ha)	0.39	ha
----------------------	-----------------------------------	----

Greenfield runoff

Method

Method	FEH statistical (2025)
--------	------------------------

FEH statistical (2025)

	My value	Map value
SAAR9120 (mm)	1228	mm
BFIHOST19scaled	0.83	
QMed-QBar conversion	1.075	☒ 1.075
QMed (l/s)	0.7	l/s
QBar (FEH statistical 2025) (l/s)	0.7	l/s

Growth curve factors

	My value	Map value
Hydrological region	10	☒ 10
1 year growth factor	0.87	
2 year growth factor	0.93	
10 year growth factor	1.38	
30 year growth factor	1.7	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

Method	FEH statistical (2025)	
Flow rate 1 year (l/s)	0.6	l/s
Flow rate 2 year (l/s)	0.7	l/s
Flow rate 10 years (l/s)	1.0	l/s
Flow rate 30 years (l/s)	1.2	l/s
Flow rate 100 years (l/s)	1.5	l/s
Flow rate 200 years (l/s)	1.7	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

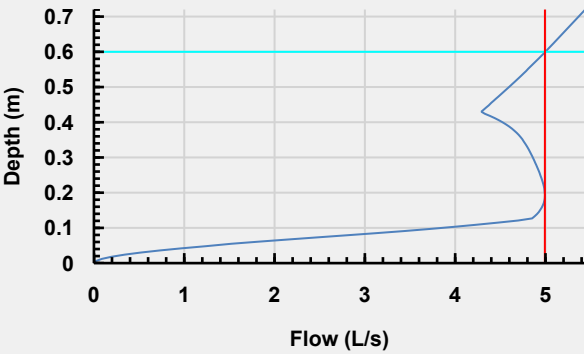
Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix N. Proposed Drainage Hydraulic Calculations

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Junctions Storm Phase: Phase	Company Address:			

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SW01	Outlet	Pipe	Free Discharge
SW02.1	Outlet	Pipe (1)	Free Discharge
SW03	Outlet	Pipe (2)	Free Discharge
SW05	Outlet	Pipe (4)	Free Discharge
SW04	Outlet	Pipe (3)	Free Discharge
SW06	Outlet	Pipe (7)	Free Discharge
SW08	Outlet	Pipe (5)	Free Discharge
SW09	Outlet	Pipe (10)	Free Discharge
SW07	Outlet	Pipe (6)	Hydro-Brake®
	Invert Level (m)	141.510	
	Design Depth (m)	0.600	
	Design Flow (L/s)	5.0	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☒	
	Unit Reference	SHE-0111-5000-0600-5000	
			
SW02.2	Outlet	Pipe (1) (1)	Free Discharge
SW02.3	Outlet	Pipe (1) (1) (1)	Free Discharge

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			



Rain garden 1

Type : Bioretention

Ponding Area

Exceedance Level (m)	143.300
Depth (m)	0.150
Base Level (m)	143.150
Top Area (m²)	8.57
Side Slope (1:X)	1.53
Base Area (m²)	6.31
Freeboard (mm)	150
Porosity (%)	100
Length (m)	4.916
Long. Slope (1:X)	1000.00
Filtration Rate (m/hr)	1.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	1.136

Filter Area

Base Level (m)	142.350
----------------	---------

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	600	20	0.35	Soil Type
	Storage	200	30	1.0	

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (19) Catchment Area (25)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (18)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

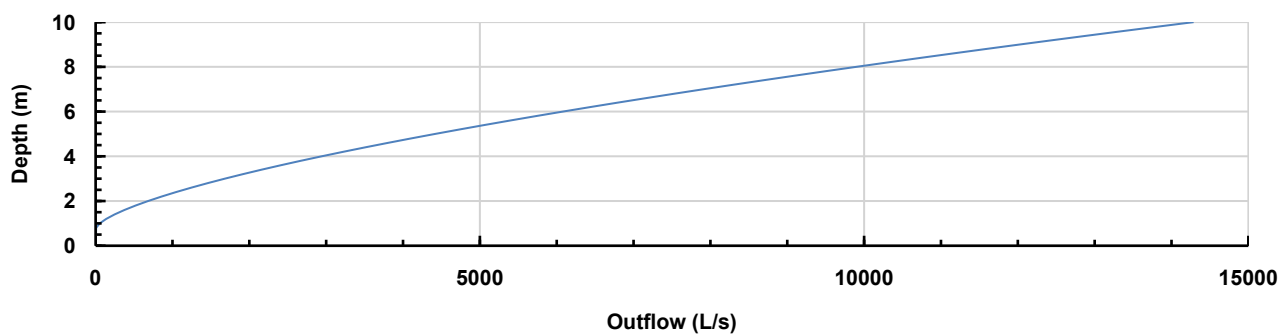
Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	
Report Details:	Company Address:		
Type: Stormwater Controls Storm Phase: Phase			

Outlets

Outlet

Outgoing Connection	Pipe (11)
Outlet Type	Multiple
Invert Level (m)	142.350

Combined Outflow



Orifice

Diameter (m)	0.060
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.000

Weir

Width (m)	0.300
Coefficient of Discharge	0.544
Depth Above Invert (m)	0.800

Advanced

Ponding Area

Base Perimeter (m)	12.400
Top Perimeter (m)	13.318



Rain garden 2

Type : Bioretention

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			

Ponding Area

Exceedance Level (m)	143.350
Depth (m)	0.150
Base Level (m)	143.200
Top Area (m²)	8.56
Side Slope (1:X)	1.53
Base Area (m²)	6.31
Freeboard (mm)	150
Porosity (%)	100
Length (m)	4.917
Long. Slope (1:X)	1000.00
Filtration Rate (m/hr)	1.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	1.136

Filter Area

Base Level (m)	142.400
----------------	---------

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	600	20	0.35	Soil Type
	Storage	200	30	1.0	

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (20) Catchment Area (26)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (17)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

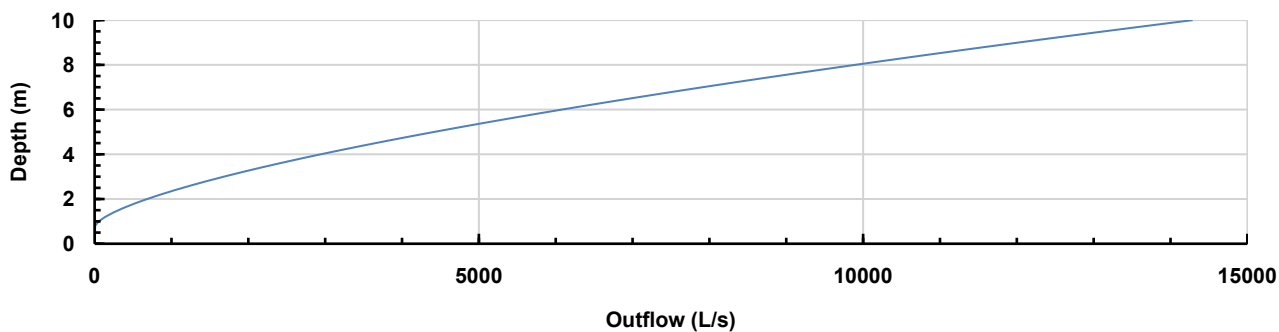


Outlets

Outlet

Outgoing Connection	Pipe (12)
Outlet Type	Multiple
Invert Level (m)	142.400

Combined Outflow



Orifice

Diameter (m)	0.060
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.000

Weir

Width (m)	0.300
Coefficient of Discharge	0.544
Depth Above Invert (m)	0.800

Advanced

Ponding Area

Base Perimeter (m)	12.402
Top Perimeter (m)	13.317



Rain garden 3

Type : Bioretention

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			

Ponding Area

Exceedance Level (m)	143.350
Depth (m)	0.150
Base Level (m)	143.200
Top Area (m²)	8.57
Side Slope (1:X)	1.53
Base Area (m²)	6.31
Freeboard (mm)	150
Porosity (%)	100
Length (m)	4.924
Long. Slope (1:X)	1000.00
Filtration Rate (m/hr)	1.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	1.136

Filter Area

Base Level (m)	142.400
----------------	---------

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	600	20	0.35	Soil Type
	Storage	200	30	1.0	

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (21) Catchment Area (27)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (16)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

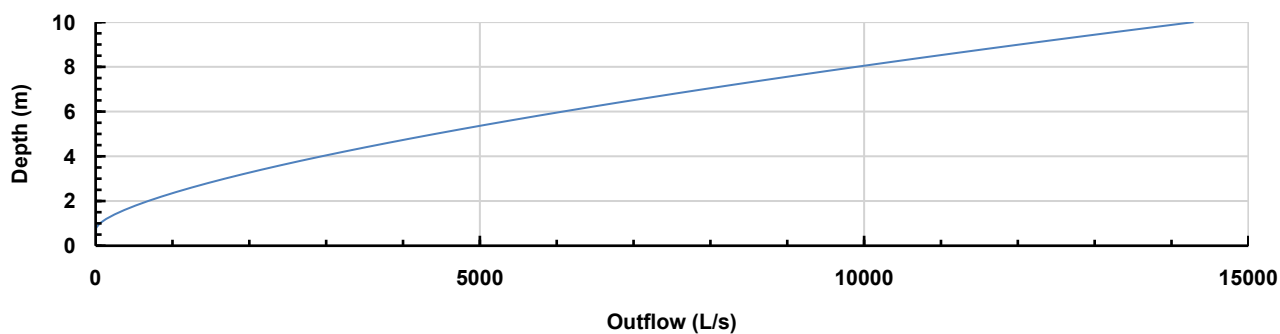
Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	
Report Details:	Company Address:		
Type: Stormwater Controls Storm Phase: Phase			

Outlets

Outlet

Outgoing Connection	Pipe (13)
Outlet Type	Multiple
Invert Level (m)	142.400

Combined Outflow



Orifice

Diameter (m)	0.060
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.000

Weir

Width (m)	0.300
Coefficient of Discharge	0.544
Depth Above Invert (m)	0.800

Advanced

Ponding Area

Base Perimeter (m)	12.411
Top Perimeter (m)	13.330



Rain garden 4

Type : Bioretention

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			

Ponding Area

Exceedance Level (m)	143.400
Depth (m)	0.150
Base Level (m)	143.250
Top Area (m²)	8.57
Side Slope (1:X)	1.53
Base Area (m²)	6.31
Freeboard (mm)	150
Porosity (%)	100
Length (m)	4.921
Long. Slope (1:X)	1000.00
Filtration Rate (m/hr)	1.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	1.136

Filter Area

Base Level (m)	142.450
----------------	---------

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	600	20	0.35	Soil Type
	Storage	200	30	1.0	

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (22) Catchment Area (28) Catchment Area (6)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

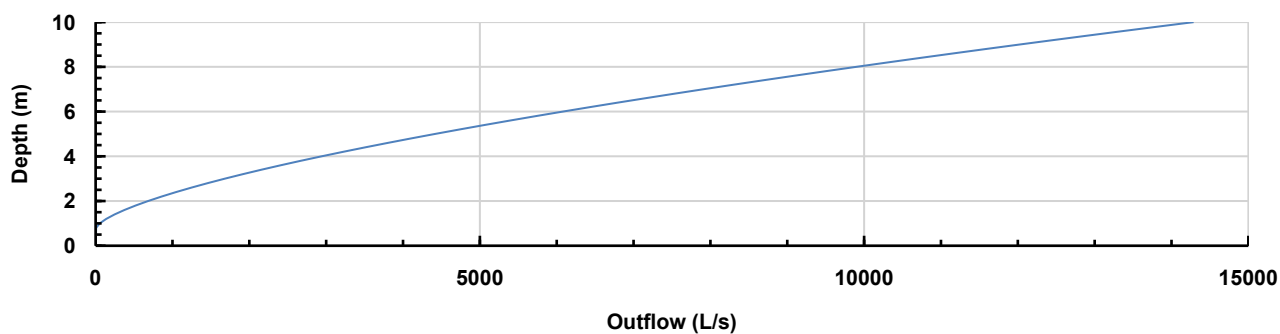
Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	
Report Details:	Company Address:		
Type: Stormwater Controls Storm Phase: Phase			

Outlets

Outlet

Outgoing Connection	Pipe (14)
Outlet Type	Multiple
Invert Level (m)	142.450

Combined Outflow



Orifice

Diameter (m)	0.060
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.000

Weir

Width (m)	0.300
Coefficient of Discharge	0.544
Depth Above Invert (m)	0.800

Advanced

Ponding Area

Base Perimeter (m)	12.408
Top Perimeter (m)	13.327



Rain garden 5

Type : Bioretention

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			

Ponding Area

Exceedance Level (m)	143.050
Depth (m)	0.150
Base Level (m)	142.900
Top Area (m²)	10.42
Side Slope (1:X)	2.34
Base Area (m²)	6.31
Freeboard (mm)	150
Porosity (%)	100
Length (m)	5.855
Long. Slope (1:X)	1000.00
Filtration Rate (m/hr)	1.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	1.136

Filter Area

Base Level (m)	142.100
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Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	600	20	0.35	Soil Type
	Storage	200	30	1.0	

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (23) Catchment Area (29)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (5)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

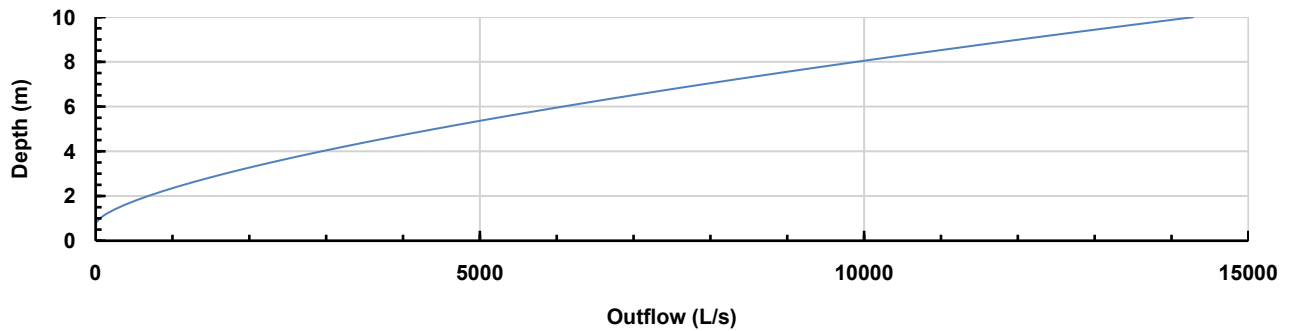
Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	
Report Details:	Company Address:		
Type: Stormwater Controls Storm Phase: Phase			

Outlets

Outlet

Outgoing Connection	Pipe (15)
Outlet Type	Multiple
Invert Level (m)	142.100

Combined Outflow



Orifice

Diameter (m)	0.060
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.000

Weir

Width (m)	0.300
Coefficient of Discharge	0.544
Depth Above Invert (m)	0.800

Advanced

Ponding Area

Base Perimeter (m)	13.866
Top Perimeter (m)	15.270

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				



Porous Paving

Type : Porous Paving

Dimensions

Exceedance Level (m)	142.330
Depth (m)	0.360
Base Level (m)	141.970
Paving Layer Depth (mm)	60
Membrane Percolation (m/hr)	4.0
Porosity (%)	30
Length (m)	43.200
Long. Slope (1:X)	129.00
Width (m)	2.200
Total Volume (m³)	8.913

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (13)
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (15)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (9)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	100.0
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Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			



Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	141.910
Depth (m)	0.400
Base Level (m)	141.510
Number of Crates Long	40
Number of Crates Wide	10
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	76.000

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (7)
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (10)
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (9)
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (3)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (14)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (8)
Outlet Type	Free Discharge

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		



Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
Pipe	27.016	Pipe	54.033		0.6	100	143.572	142.872
Pipe (2)	32.652	Pipe	83.723		0.6	150	143.220	142.000
Pipe (3)	24.097	Pipe	149.674		0.6	225	142.756	141.736
Pipe (4)	22.753	Pipe	350.044		0.6	450	143.142	141.575
Pipe (5)	28.955	Pipe	101.240		0.6	150	142.998	141.796
Pipe (6)	9.009	Pipe	100.096		0.6	150	142.666	141.510
Pipe (7)	3.390	Pipe	0.000		0.6	450	142.858	141.510
Pipe (8)	2.461	Pipe	0.000		0.6	450	141.910	141.510
Pipe (10)	2.655	Pipe	0.000		0.6	150	142.822	141.510
Pipe (9)	1.268	Pipe	2.756		0.6	150	142.665	141.970
Pipe (12)	11.990	Pipe	29.975		0.6	150	143.355	142.400
Pipe (13)	17.712	Pipe	44.281		0.6	150	143.355	142.400
Pipe (14)	23.428	Pipe	52.062		0.6	150	143.405	142.450
Pipe (15)	2.051	Pipe	4.186		0.6	150	143.056	142.100
Pipe (11)	6.220	Pipe	17.772		0.6	150	143.305	142.350
Pipe (1)	9.774	Pipe	59.961		0.6	150	143.561	142.372
Pipe (1) (1)	5.216	Pipe	59.957		0.6	150	143.571	142.209
Pipe (1) (1) (1)	3.021	Pipe	24.759		0.6	150	143.501	142.122

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Lock	Flow Restriction (L/s)	Culvert Type	Culvert Entrance
Pipe	143.561	142.372	All		(None)	(None)
Pipe (2)	143.142	141.610	All		(None)	(None)
Pipe (3)	143.142	141.575	All		(None)	(None)
Pipe (4)	142.858	141.510	All		(None)	(None)
Pipe (5)	142.822	141.510	None		(None)	(None)
Pipe (6)	142.390	141.420	None	5.4	(None)	(None)
Pipe (7)	141.910	141.510	All		(None)	(None)
Pipe (8)	142.666	141.510	All		(None)	(None)
Pipe (10)	141.910	141.510	None		(None)	(None)
Pipe (9)	142.797	141.510	None		(None)	(None)
Pipe (12)	143.220	142.000	All	6.6	(None)	(None)
Pipe (13)	143.220	142.000	All	6.6	(None)	(None)
Pipe (14)	143.220	142.000	All	6.6	(None)	(None)
Pipe (15)	143.142	141.610	All	6.6	(None)	(None)
Pipe (11)	143.220	142.000	All	6.6	(None)	(None)
Pipe (1)	143.571	142.209	All		(None)	(None)
Pipe (1) (1)	143.501	142.122	All		(None)	(None)
Pipe (1) (1) (1)	143.220	142.000	All		(None)	(None)

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		



Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	SW03		Time of Concentration	0.005	100	0	100	0.005
Catchment Area (1)	SW03		Time of Concentration	0.009	100	0	100	0.009
Catchment Area (2)	SW02.1		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (3)	SW02.1		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (4)	SW01		Time of Concentration	0.013	100	0	100	0.013
Catchment Area (5)	Rain garden 5		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (6)	Rain garden 4		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (7)	SW04		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (8)	SW05		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (9)	SW05		Time of Concentration	0.015	100	0	100	0.015
Catchment Area (10)	SW08		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (11)	SW09		Time of Concentration	0.016	100	0	100	0.016
Catchment Area (12)	SW09		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (13)	Porous Paving		Time of Concentration	0.026	100	0	100	0.026
Catchment Area (14)	Cellular Storage		Time of Concentration	0.004	100	0	100	0.004
Catchment Area (15)	Porous Paving		Time of Concentration	0.022	100	0	100	0.022
Catchment Area (16)	Rain garden 3		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (17)	Rain garden 2		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (18)	Rain garden 1		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (19)	Rain garden 1		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (20)	Rain garden 2		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (21)	Rain garden 3		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (22)	Rain garden 4		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (23)	Rain garden 5		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (24)	SW06		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (25)	Rain garden 1		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (26)	Rain garden 2		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (27)	Rain garden 3		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (28)	Rain garden 4		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (29)	Rain garden 5		Time of Concentration	0.003	100	0	100	0.003
TOTAL		0.0		0.188				0.188

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Title: Rainfall Analysis Criteria	Company Address:			

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Reduced
Urban Creep	Use Catchment Values
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 389290 411309 SD 89290 11309
Rainfall Version	2022
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	40.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW01	FEH: 2 years: +0 %: 15 mins: Winter	143.57 2	142.87 2	142.90 4	0.032	1.8	0.005	0.000	1.8	0.837	OK
SW02.1	FEH: 2 years: +0 %: 15 mins: Winter	143.56 1	142.37 2	142.41 9	0.047	4.7	0.007	0.000	4.5	2.171	OK
SW03	FEH: 2 years: +0 %: 15 mins: Winter	143.22 0	142.00 0	142.05 6	0.056	6.4	0.009	0.000	5.5	3.340	OK
SW05	FEH: 2 years: +0 %: 15 mins: Winter	143.14 2	141.57 5	141.64 5	0.070	9.6	0.124	0.000	8.7	5.308	OK
SW04	FEH: 2 years: +0 %: 15 mins: Winter	142.75 6	141.73 6	141.76 3	0.027	1.5	0.008	0.000	1.4	0.687	OK
SW06	FEH: 2 years: +0 %: 360 mins: Winter	142.85 8	141.51 0	141.62 5	0.115	2.6	0.204	0.000	2.5	22.935	OK
SW08	FEH: 2 years: +0 %: 15 mins: Winter	142.99 8	141.79 6	141.82 4	0.028	1.5	0.031	0.000	1.4	0.685	OK
SW09	FEH: 2 years: +0 %: 360 mins: Winter	142.82 2	141.51 0	141.62 5	0.115	0.8	0.131	0.000	0.8	7.033	OK
SW07	FEH: 2 years: +0 %: 360 mins: Winter	142.66 6	141.51 0	141.62 5	0.115	2.6	0.203	0.000	2.6	37.120	OK
UU 2305	FEH: 2 years: +0 %: 360 mins: Winter	142.39 0	141.42 0	141.45 8	0.038	2.6	0.000	0.000	2.6	37.107	OK
SW02.2	FEH: 2 years: +0 %: 15 mins: Winter	143.57 1	142.20 9	142.25 7	0.048	4.5	0.008	0.000	4.4	2.169	OK
SW02.3	FEH: 2 years: +0 %: 15 mins: Winter	143.50 1	142.12 2	142.16 0	0.038	4.4	0.006	0.000	4.4	2.166	OK

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW01	FEH: 30 years: +40 %: 15 mins: Winter	143.57 2	142.87 2	142.93 2	0.060	5.7	0.010	0.000	5.6	2.630	OK
SW02.1	FEH: 30 years: +40 %: 15 mins: Winter	143.56 1	142.37 2	142.46 7	0.095	14.6	0.015	0.000	14.3	6.816	OK
SW03	FEH: 30 years: +40 %: 15 mins: Winter	143.22 0	142.00 0	142.15 5	0.155	26.1	0.025	0.000	19.8	12.452	Surcharged
SW05	FEH: 30 years: +40 %: 240 mins: Winter	143.14 2	141.57 5	141.81 1	0.236	9.4	0.418	0.000	8.8	55.036	OK
SW04	FEH: 30 years: +40 %: 240 mins: Winter	142.75 6	141.73 6	141.81 1	0.075	1.0	0.021	0.000	1.0	5.747	OK
SW06	FEH: 30 years: +40 %: 240 mins: Winter	142.85 8	141.51 0	141.81 1	0.301	9.0	0.532	0.000	8.6	55.835	OK
SW08	FEH: 30 years: +40 %: 15 mins: Winter	142.99 8	141.79 6	141.84 6	0.050	4.7	0.057	0.000	4.4	2.157	OK
SW09	FEH: 30 years: +40 %: 240 mins: Winter	142.82 2	141.51 0	141.81 1	0.301	2.8	0.341	0.000	2.7	15.972	Surcharged
SW07	FEH: 30 years: +40 %: 240 mins: Winter	142.66 6	141.51 0	141.81 1	0.301	5.1	0.532	0.000	5.0	87.824	Surcharged
UU 2305	FEH: 30 years: +40 %: 60 mins: Summer	142.39 0	141.42 0	141.47 4	0.054	5.0	0.000	0.000	5.0	25.878	OK
SW02.2	FEH: 30 years: +40 %: 15 mins: Winter	143.57 1	142.20 9	142.30 6	0.097	14.3	0.015	0.000	14.1	6.811	OK
SW02.3	FEH: 30 years: +40 %: 15 mins: Winter	143.50 1	142.12 2	142.20 7	0.085	14.1	0.013	0.000	14.1	6.808	OK

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW01	FEH: 100 years: +45 %: 15 mins: Winter	143.572	142.872	142.946	0.074	7.5	0.012	0.000	7.2	3.436	OK
SW02.1	FEH: 100 years: +45 %: 30 mins: Winter	143.561	142.372	142.519	0.147	13.4	0.023	0.000	13.1	12.416	OK
SW03	FEH: 100 years: +45 %: 30 mins: Winter	143.220	142.000	142.391	0.391	24.4	0.062	0.000	24.0	23.681	Surcharged
SW05	FEH: 100 years: +45 %: 240 mins: Winter	143.142	141.575	141.931	0.356	12.4	0.628	0.000	11.6	71.420	OK
SW04	FEH: 100 years: +45 %: 240 mins: Winter	142.756	141.736	141.931	0.195	1.3	0.055	0.000	1.3	7.403	OK
SW06	FEH: 100 years: +45 %: 240 mins: Winter	142.858	141.510	141.931	0.421	11.9	0.743	0.000	11.3	72.278	OK
SW08	FEH: 100 years: +45 %: 240 mins: Winter	142.998	141.796	141.931	0.135	1.3	0.152	0.000	1.3	7.377	OK
SW09	FEH: 100 years: +45 %: 240 mins: Winter	142.822	141.510	141.931	0.421	3.6	0.476	0.000	3.5	20.499	Surcharged
SW07	FEH: 100 years: +45 %: 240 mins: Winter	142.666	141.510	141.931	0.421	5.2	0.743	0.000	5.0	108.850	Surcharged
UU 2305	FEH: 100 years: +45 %: 30 mins: Winter	142.390	141.420	141.474	0.054	5.0	0.000	0.000	5.0	12.744	OK
SW02.2	FEH: 100 years: +45 %: 30 mins: Winter	143.571	142.209	142.456	0.247	13.1	0.039	0.000	12.9	12.413	Surcharged
SW02.3	FEH: 100 years: +45 %: 30 mins: Winter	143.501	142.122	142.417	0.295	12.9	0.047	0.000	12.9	12.411	Surcharged

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. DS Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)
Cellular Storage	FEH: 2 years: +0 %: 360 mins: Winter	141.625	141.625	141.625	0.115	0.115	0.115	4.8	21.918	0.000	0.000	2.6	37.176	
Porous Paving	FEH: 2 years: +0 %: 15 mins: Winter	142.383	141.993	142.025	0.078	0.023	0.055	6.9	1.566	0.000	0.000	4.9	2.887	
Rain garden 1	FEH: 2 years: +0 %: 15 mins: Winter	143.155	142.552	143.150	0.800	0.202	0.800	0.8	0.392	0.000	0.000	0.1	0.086	
Rain garden 2	FEH: 2 years: +0 %: 15 mins: Winter	143.205	142.601	143.200	0.800	0.201	0.800	0.8	0.386	0.000	0.000	0.1	0.079	
Rain garden 3	FEH: 2 years: +0 %: 15 mins: Winter	143.205	142.601	143.200	0.800	0.201	0.800	0.8	0.387	0.000	0.000	0.1	0.079	
Rain garden 4	FEH: 2 years: +0 %: 360 mins: Summer	143.262	142.651	143.254	0.807	0.201	0.804	0.2	0.726	0.000	0.000	0.2	0.671	
Rain garden 5	FEH: 2 years: +0 %: 15 mins: Winter	142.907	142.308	142.901	0.801	0.208	0.801	0.9	0.413	0.000	0.000	0.2	0.107	

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Summary Storm Phase: Phase				

Percentage Available (%)	Status
71.160	OK
82.426	OK
65.489	Flood Risk
65.992	Flood Risk
65.973	Flood Risk
36.100	Flood Risk
63.661	Flood Risk

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. DS Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)
Cellular Storage	FEH: 30 years: +40 %: 240 mins: Winter	141.811	141.811	141.811	0.301	0.301	0.301	16.3	57.242	0.000	0.000	5.1	87.961	105
Porous Paving	FEH: 30 years: +40 %: 15 mins: Winter	142.527	142.013	142.107	0.222	0.043	0.137	21.7	3.896	0.000	0.000	14.0	9.667	
Rain garden 1	FEH: 30 years: +40 %: 15 mins: Winter	143.170	143.169	143.167	0.815	0.819	0.817	2.6	0.614	0.000	0.000	1.6	0.722	0
Rain garden 2	FEH: 30 years: +40 %: 15 mins: Winter	143.219	143.218	143.216	0.814	0.818	0.816	2.5	0.611	0.000	0.000	1.5	0.699	5
Rain garden 3	FEH: 30 years: +40 %: 15 mins: Winter	143.219	143.218	143.216	0.814	0.818	0.816	2.5	0.612	0.000	0.000	1.5	0.699	5
Rain garden 4	FEH: 30 years: +40 %: 15 mins: Winter	143.273	143.269	143.269	0.818	0.819	0.819	2.6	0.635	0.000	0.000	1.5	0.655	
Rain garden 5	FEH: 30 years: +40 %: 15 mins: Winter	142.923	142.921	142.919	0.817	0.821	0.819	2.9	0.639	0.000	0.000	1.9	0.847	

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:			

Percentage Available (%)	Status
24.682	OK
56.292	OK
46.008	Flood Risk
46.234	Flood Risk
46.175	Flood Risk
44.074	Flood Risk
43.749	Flood Risk

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. DS Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)
Cellular Storage	FEH: 100 years: +45 %: 240 mins: Winter	141.931	141.931	141.931	0.421	0.421	0.421	21.3	79.901	3.901	0.000	5.2	109.082	190
Porous Paving	FEH: 100 years: +45 %: 15 mins: Summer	142.603	142.016	142.153	0.298	0.046	0.183	27.0	5.229	0.000	0.000	14.9	11.359	0
Rain garden 1	FEH: 100 years: +45 %: 15 mins: Winter	143.176	143.175	143.173	0.821	0.825	0.823	3.4	0.700	0.000	0.000	2.3	1.116	
Rain garden 2	FEH: 100 years: +45 %: 15 mins: Winter	143.225	143.224	143.222	0.820	0.824	0.822	3.3	0.668	0.000	0.000	2.2	1.044	
Rain garden 3	FEH: 100 years: +45 %: 15 mins: Winter	143.225	143.225	143.223	0.821	0.825	0.823	3.3	0.669	0.000	0.000	2.2	1.049	
Rain garden 4	FEH: 100 years: +45 %: 15 mins: Winter	143.278	143.275	143.274	0.824	0.825	0.824	3.3	0.688	0.000	0.000	2.3	1.002	
Rain garden 5	FEH: 100 years: +45 %: 15 mins: Winter	142.929	142.928	142.926	0.823	0.828	0.826	3.8	0.691	0.000	0.000	2.7	1.231	

Project:	Date: 29/12/2023			
	Designed by: andre	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:			

Percentage Available (%)	Status
-5.133	Flood
41.334	OK
38.409	Flood Risk
41.240	Flood Risk
41.147	Flood Risk
39.471	Flood Risk
39.202	Flood Risk

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		





FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW01	SW02.1	143.572	142.904	0.039	0.837	0.6	0.21	1.8	OK
Pipe (2)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW03	SW05	143.220	142.056	0.055	3.340	0.9	0.29	5.5	OK
Pipe (3)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW04	SW05	142.756	141.763	0.049	0.687	0.2	0.03	1.4	OK
Pipe (4)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW05	SW06	143.142	141.645	0.072	5.308	0.5	0.05	8.7	OK
Pipe (5)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW08	SW09	142.998	141.824	0.049	0.685	0.3	0.08	1.4	OK
Pipe (6)	FEH: 2 years: +0 %: 360 mins: Winter	Pipe	SW07	UU 2305	142.666	141.625	0.039	37.107	0.7	0.15	2.6	OK
Pipe (7)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW06	Cellular Storage	142.858	141.583	0.052	5.220	0.8	0.07	8.3	OK
Pipe (8)	FEH: 2 years: +0 %: 360 mins: Winter	Pipe	Cellular Storage	SW07	141.910	141.625	0.115	37.176	0.1	0.02	2.6	OK
Pipe (10)	FEH: 2 years: +0 %: 15 mins: Summer	Pipe	SW09	Cellular Storage	142.822	141.577	0.045	1.615	1.3	0.35	4.6	OK
Pipe (9)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	Porous Paving	Cellular Storage	142.665	142.025	0.031	2.887	1.9	0.05	4.9	OK
Pipe (12)	FEH: 2 years: +0 %: 30 mins: Winter	Pipe	Rain garden 2	SW03	143.355	142.640	0.031	0.131	0.1	0.01	0.2	Surcharged
Pipe (13)	FEH: 2 years: +0 %: 30 mins: Winter	Pipe	Rain garden 3	SW03	143.355	142.640	0.031	0.129	0.1	0.01	0.2	Surcharged
Pipe (14)	FEH: 2 years: +0 %: 240 mins: Summer	Pipe	Rain garden 4	SW03	143.405	143.254	0.022	0.483	0.1	0.01	0.2	Flood Risk
Pipe (15)	FEH: 2 years: +0 %: 30 mins: Winter	Pipe	Rain garden 5	SW05	143.056	142.388	0.018	0.168	0.7	0	0.3	Surcharged
Pipe (11)	FEH: 2 years: +0 %: 30 mins: Winter	Pipe	Rain garden 1	SW03	143.305	142.593	0.031	0.135	0.1	0.01	0.2	Surcharged
Pipe (1)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW02.1	SW02.2	143.561	142.419	0.048	2.171	0.9	0.2	4.5	OK
Pipe (1) (1)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW02.2	SW02.3	143.571	142.257	0.043	2.169	1.0	0.19	4.4	OK
Pipe (1) (1) (1)	FEH: 2 years: +0 %: 15 mins: Winter	Pipe	SW02.3	SW03	143.501	142.160	0.047	2.166	0.9	0.12	4.4	OK

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		





FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW01	SW02.1	143.572	142.932	0.078	2.630	0.8	0.67	5.6	OK
Pipe (2)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW03	SW05	143.220	142.155	0.142	12.452	1.2	1.02	19.8	Surcharged
Pipe (3)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW04	SW05	142.756	141.784	0.096	2.164	0.3	0.11	4.5	OK
Pipe (4)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW05	SW06	143.142	141.718	0.145	18.610	0.7	0.19	32.6	OK
Pipe (5)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW08	SW09	142.998	141.846	0.086	2.157	0.4	0.25	4.4	OK
Pipe (6)	FEH: 30 years: +40 %: 60 mins: Summer	Pipe	SW07	UU 2305	142.666	141.747	0.056	25.878	0.8	0.28	5.0	Surcharged
Pipe (7)	FEH: 30 years: +40 %: 15 mins: Summer	Pipe	SW06	Cellular Storage	142.858	141.659	0.144	16.147	1.9	0.38	45.0	OK
Pipe (8)	FEH: 30 years: +40 %: 60 mins: Winter	Pipe	Cellular Storage	SW07	141.910	141.778	0.268	27.190	0.1	0.04	5.3	OK
Pipe (10)	FEH: 30 years: +40 %: 30 mins: Summer	Pipe	SW09	Cellular Storage	142.822	141.699	0.150	6.959	1.3	0.83	11.0	Surcharged
Pipe (9)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	Porous Paving	Cellular Storage	142.665	142.107	0.091	9.667	2.7	0.13	14.0	OK
Pipe (12)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	Rain garden 2	SW03	143.355	143.216	0.088	0.691	0.2	0.04	1.4	Flood Risk
Pipe (13)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	Rain garden 3	SW03	143.355	143.216	0.088	0.688	0.2	0.05	1.3	Flood Risk
Pipe (14)	FEH: 30 years: +40 %: 60 mins: Summer	Pipe	Rain garden 4	SW03	143.405	143.266	0.069	1.324	0.2	0.06	1.4	Flood Risk
Pipe (15)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	Rain garden 5	SW05	143.056	142.919	0.061	0.845	0.3	0.02	1.8	Flood Risk
Pipe (11)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	Rain garden 1	SW03	143.305	143.167	0.087	0.717	0.2	0.03	1.5	Flood Risk
Pipe (1)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW02.1	SW02.2	143.561	142.467	0.096	6.816	1.2	0.62	14.3	OK
Pipe (1) (1)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW02.2	SW02.3	143.571	142.306	0.091	6.811	1.3	0.61	14.1	OK
Pipe (1) (1) (1)	FEH: 30 years: +40 %: 15 mins: Winter	Pipe	SW02.3	SW03	143.501	142.207	0.120	6.808	0.9	0.39	14.1	OK

Project:	Date: 29/12/2023		
	Designed by: andre	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

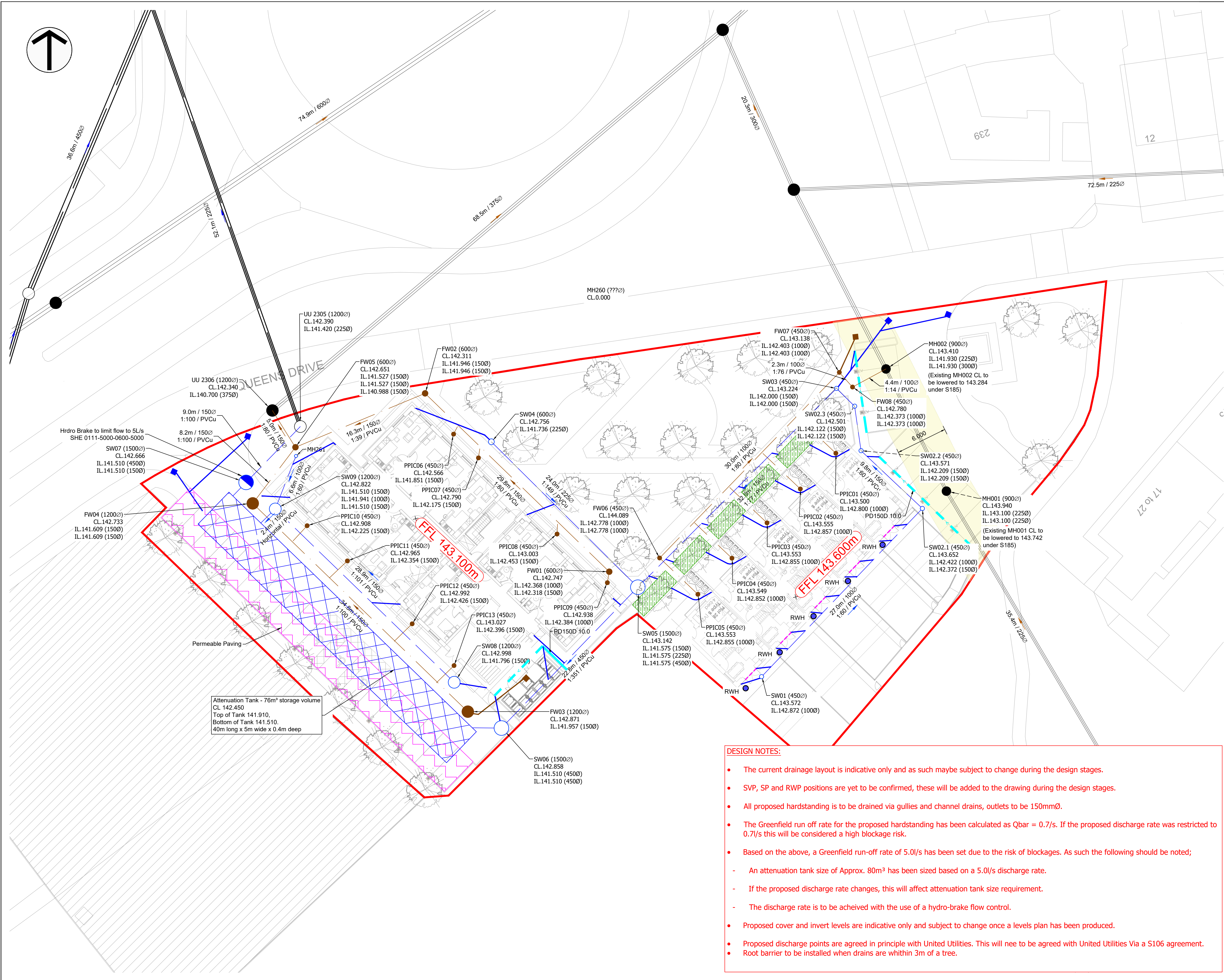




FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	SW01	SW02.1	143.572	142.946	0.100	3.436	0.9	0.87	7.2	OK
Pipe (2)	FEH: 100 years: +45 %: 30 mins: Winter	Pipe	SW03	SW05	143.220	142.391	0.150	23.681	1.4	1.24	24.0	Surcharged
Pipe (3)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	SW04	SW05	142.756	141.791	0.109	2.836	0.3	0.14	5.9	OK
Pipe (4)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	SW05	SW06	143.142	141.737	0.178	24.551	0.8	0.23	40.4	OK
Pipe (5)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	SW08	SW09	142.998	141.855	0.109	2.822	0.5	0.33	5.8	OK
Pipe (6)	FEH: 100 years: +45 %: 30 mins: Winter	Pipe	SW07	UU 2305	142.666	141.799	0.056	12.744	0.8	0.28	5.0	Surcharged
Pipe (7)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	SW06	Cellular Storage	142.858	141.721	0.211	23.762	1.5	0.41	48.5	OK
Pipe (8)	FEH: 100 years: +45 %: 60 mins: Summer	Pipe	Cellular Storage	SW07	141.910	141.840	0.330	27.549	0.1	0.05	5.5	OK
Pipe (10)	FEH: 100 years: +45 %: 15 mins: Summer	Pipe	SW09	Cellular Storage	142.822	141.698	0.150	6.565	1.7	1.39	18.4	Surcharged
Pipe (9)	FEH: 100 years: +45 %: 15 mins: Summer	Pipe	Porous Paving	Cellular Storage	142.665	142.153	0.109	11.359	2.5	0.14	14.9	Surcharged
Pipe (12)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	Rain garden 2	SW03	143.355	143.222	0.150	0.998	0.2	0.06	2.1	Flood Risk
Pipe (13)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	Rain garden 3	SW03	143.355	143.223	0.150	0.995	0.2	0.08	2.1	Flood Risk
Pipe (14)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	Rain garden 4	SW03	143.405	143.274	0.150	0.987	0.2	0.08	2.1	Flood Risk
Pipe (15)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	Rain garden 5	SW05	143.056	142.926	0.072	1.229	0.3	0.03	2.6	Flood Risk
Pipe (11)	FEH: 100 years: +45 %: 15 mins: Winter	Pipe	Rain garden 1	SW03	143.305	143.173	0.150	1.029	0.2	0.09	4.0	Flood Risk
Pipe (1)	FEH: 100 years: +45 %: 15 mins: Summer	Pipe	SW02.1	SW02.2	143.561	142.487	0.129	7.950	1.1	0.78	17.8	OK
Pipe (1) (1)	FEH: 100 years: +45 %: 15 mins: Summer	Pipe	SW02.2	SW02.3	143.571	142.352	0.150	7.946	1.0	0.6	13.8	OK
Pipe (1) (1) (1)	FEH: 100 years: +45 %: 30 mins: Winter	Pipe	SW02.3	SW03	143.501	142.417	0.150	12.411	0.9	0.36	12.9	Surcharged

Appendix O. Proposed Outline Layout



Do Not Scale

Drawing Notes

Drawing & schedule based on the following information:
Architect's drawing/model: Saville Landscape Design
Revision: 500-01D Landscape GA
Received: 12.12.25
Topographic Survey: Survey Operations - 248138
Revision: -
Received: -

Health, Safety & Environmental Notes

Depicts Low Residual Risk

Depicts Medium Residual Risk

Depicts High Residual Risk

Refer to Designer's Risk Assessment for Control Measures

Key

Site Boundary

Proposed Surface Water

Proposed Foul Water

Existing UU SW Sewer

Existing UU Combined Sewer

Proposed Channel Drain

Threshold Drain

Attenuation Tank

Rain Garden

Permeable Paving

RWH Tank (above ground)

UU Sewer Easement

Proposed SW Gully & Leg

Flow Control Chamber

15.12.25	Threshold drains added: SW network revised to suit Landscape Architect's Site layout.	IAB	RR	P05
26.11.25	Revised to suit the proposed levels.	IAB	RR	P04
20.11.25	Revised to suit latest Architect's Site layout	IAB	RR	P03
29.09.25	Updated levels	LF	RR	P02
21.08.25	First Issue	AH	LF	P01
Date	Description	By	Chk	Rev

ADEPT

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Office Address: 7 St James Square, 4th Floor, Manchester, M2 6DN

Project

Queens Drive, Kirkholt

Title

Proposed Drainage Plan

Client

MSV Housing

Scale @ A1 1:200	Initial author AH	Initial checker LF	Approver NB	Initial Date Aug' 25
Status S1	Purpose Preliminary	Adept Project Number 100.25073		Rev. P05
Project Originator-Functional Breakdown-Spatial Breakdown-Form-Discipline-Number 100.25073-ACE-ZZ-ZZ-DR-C-1000				

DESIGN NOTES:

- The current drainage layout is indicative only and as such maybe subject to change during the design stages.
- SVP, SP and RWP positions are yet to be confirmed, these will be added to the drawing during the design stages.
- All proposed hardstanding is to be drained via gullies and channel drains, outlets to be 150mmØ.
- The Greenfield run off rate for the proposed hardstanding has been calculated as Qbar = 0.7/s. If the proposed discharge rate was restricted to 0.7/s this will be considered a high blockage risk.
- Based on the above, a Greenfield run-off rate of 5.0/s has been set due to the risk of blockages. As such the following should be noted;
 - An attenuation tank size of Approx. 80m³ has been sized based on a 5.0/s discharge rate.
 - If the proposed discharge rate changes, this will affect attenuation tank size requirement.
 - The discharge rate is to be achieved with the use of a hydro-brake flow control.
- Proposed cover and invert levels are indicative only and subject to change once a levels plan has been produced.
- Proposed discharge points are agreed in principle with United Utilities. This will need to be agreed with United Utilities via a S106 agreement.
- Root barrier to be installed when drains are within 3m of a tree.

Appendix P. Phase 2 – Infiltration Test

6.0 In-situ Testing (Cont'd): -

6.4 In-situ Variable Head (Falling) Permeability Tests: -

Variable head (falling) permeability tests were carried out within WS01 and WS04 to determine the coefficient of permeability (k) for the natural deposits present below the site and to assess the potential for utilising soakaways.

At the test locations the calculations were carried out in accordance with BS EN ISO 22282:2012, after Hvorslev (general approach), with the summarised results displayed in Table 6.4 below with copies of the calculation sheets attached in Appendix II.

Table 6.4

Position	Depth of Test (m)	Coefficient of Permeability (m/s)	Drainage Characteristics	Permeability Classification
WS01	1.00	3.596×10^{-8}	Poor / Practically Impervious	Very low
WS03	0.95	7.111×10^{-6}	Poor	Very low
WS07	1.68	6.053×10^{-6}	Poor	Very low

7.0 Laboratory Testing

7.1 Determination of pH & SO₄: -

Representative samples of the made ground and natural strata were tested to determine their acidic (pH) and soluble sulphate (SO₄) levels. The results are shown in Table 7.1 below and are also contained within the Chemtech Analytical Report (Ref. 25-09964-01) a copy of which can be seen in Appendix III.

Table 7.1

Position	Depth (m)	Strata	pH	SO ₄ (mg/l)	Design SO ₄ Class	ACEC Class
WS03	0.25	MG - Granular	7.1	30.1	DS-1	AC-1
WS07	0.50	MG - Granular	8.3	93.9	DS-1	AC-1
HP01	0.60	MG - Granular	8.7	<10.0	DS-1	AC-1
HP02	0.30	NG - Granular	8.2	15.7	DS-1	AC-1
WS01	1.20	NS - Clay	8.8	<10.0	DS-1	AC-1
WS01	1.70	NS - Sand	8.0	<10.0	DS-1	AC-1
WS02	1.50	NS - Sand	7.9	<10.0	DS-1	AC-1
WS03	1.25	NS - Clay	6.5	<10.0	DS-1	AC-1
WS04	0.50	MG - Granular	8.2	328	DS-1	AC-1
WS05	1.50	NS - Sand	7.9	26.2	DS-1	AC-1
WS06	2.50	NS - Sand	7.5	<10.0	DS-1	AC-1
WS07	1.50	NS - Sand	7.1	22.6	DS-1	AC-1

ACEC = Aggressive Chemical Environment for Concrete site classification, MG = Made Ground, NS = Natural Strata

From these results the pH values for the samples tested range from 6.5 to 8.8, the amount of soluble sulphate present ranges from <10.0mg/l to 328mg/l.

Therefore, in accordance with the BRE Special Digest 1:2005, the site should be given a classification of DS-1. When considering the nature of the made ground materials and natural strata tested and assuming mobile groundwater the assessment of the Chemical Environment for concrete is AC-1.

ARC ENVIRONMENTAL LIMITED

VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole WS01

4.00 mBGL

SITE Queens Drive, Rochdale

CONTRACT 25-446

WS01

DEPTH 4.00 mBGL

INITIAL CONDITIONS

Bottom of Borehole	4.00	mBGL
Base of casing	0.00	mBGL
Diameter of casing	100.00	mm
Height of casing	0.00	mAGL
Elevation of Borehole		mAOD
Groundwater Level	1.02	mBGL

Operator	SD
Date	05/11/2025
Time	10.00am
Weather	Overcast
Input volume of water	25 litres
Test Zone	1.54 m

TEST CALCULATION

Elapsed (minutes)	Elapsed (seconds)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0	0	0	0.990	0.030	1.000
1	0	60	1.020	0.000	0.000
2	0	120	1.020	0.000	0.000
3	0	180	1.020	0.000	0.000
4	0	240	1.020	0.000	0.000
5	0	300	1.020	0.000	0.000
10	0	600	1.020	0.000	0.000
15	0	900	1.020	0.000	0.000
20	0	1200	1.020	0.000	0.000
25	0	1500	1.020	0.000	0.000
30	0	1800	1.020	0.000	0.000
35	0	2100	1.020	0.000	0.000
40	0	2400	1.020	0.000	0.000
45	0	2700	1.020	0.000	0.000
50	0	3000	1.020	0.000	0.000
55	0	3300	1.020	0.000	0.000
60	0	3600	1.020	0.000	0.000

Intake Factor (F)

$$F = \frac{2 \pi L}{\log_e [(L/D) + \sqrt{1 + (L/D)^2}]} \quad (i)$$

(From BS 5930:1999 for standpipes)

L=length of test zone

D=diameter of borehole

Permeability (k)

$$k = \frac{A}{F(t_2 - t_1)} \times \log_e (H_1/H_2) \quad (ii)$$

or

$$k = \frac{A}{FT} \quad (iii)$$

Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37

L= 1.54 m
D= 0.100 m
L/D= 15.40

t₁= 0 s
t₂= 3600 s
H₁= 1.54 m
H₂= 1.47 m

A= 0.00785 m²
F= 2.8222 From (i)
T= s
k= 3.59616E-08 ms⁻¹ From (ii)
k= ms⁻¹ From (iii)

Remarks

Drainage Characteristics: Poor Permeability
Classification: Very low

ARC ENVIRONMENTAL LIMITED

VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole WS03

4.00 mBGL

SITE Queens Drive, Rochdale

CONTRACT 25-446

WS03

DEPTH 4.00 mBGL

INITIAL CONDITIONS

Bottom of Borehole	4.00	mBGL
Base of casing	0.00	mBGL
Diameter of casing	100.00	mm
Height of casing	0.00	mAGL
Elevation of Borehole		mAOD
Groundwater Level	0.95	mBGL

Operator	SD
Date	05/11/2025
Time	10.00am
Weather	Overcast
Input volume of water	10 litres
Test Zone	1.00 m

TEST CALCULATION

Elapsed (minutes)	Elapsed (seconds)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0	0	0	0.000	0.950	1.000
1	0	60	0.660	0.290	0.305
2	0	120	0.730	0.220	0.232
3	0	180	0.760	0.190	0.200
4	0	240	0.780	0.170	0.179
5	0	300	0.790	0.160	0.168
10	0	600	0.850	0.100	0.105
15	0	900	0.880	0.070	0.074
20	0	1200	0.900	0.050	0.053
25	0	1500	0.910	0.040	0.042
30	0	1800	0.920	0.030	0.032
35	0	2100	0.930	0.020	0.021
40	0	2400	0.950	0.000	0.000
45	0	2700	0.950	0.000	0.000
50	0	3000	0.950	0.000	0.000
55	0	3300	0.950	0.000	0.000
60	0	3600	0.950	0.000	0.000

Intake Factor (F)

$$F = \frac{2 \pi L}{\log_e [(L/D) + \sqrt{1 + (L/D)^2}]} \quad (i)$$

(From BS 5930:1999 for standpipes)

L=length of test zone

D=diameter of borehole

Permeability (k)

$$k = \frac{A}{F(t_2 - t_1)} \times \log_e (H_1/H_2) \quad (ii)$$

or

$$k = \frac{A}{FT} \quad (iii)$$

Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37

L= 1.00 m
D= 0.100 m
L/D= 10.00

t₁= 0 s
t₂= 2400 s
H₁= 0.95 m
H₂= 0.01 m

A= 0.00785 m²
F= 2.0956 From (i)
T= s
k= 7.11122E-06 ms⁻¹ From (ii)
k= ms⁻¹ From (iii)

Remarks

Drainage Characteristics: Poor Permeability
Classification: Very low

ARC ENVIRONMENTAL LIMITED

VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole WS07

4.00 mBGL

SITE Queens Drive, Rochdale

CONTRACT 25-446

WS07

DEPTH 4.00 mBGL

INITIAL CONDITIONS

Bottom of Borehole	4.00	mBGL
Base of casing	0.00	mBGL
Diameter of casing	100.00	mm
Height of casing	0.00	mAGL
Elevation of Borehole		mAOD
Groundwater Level	1.77	mBGL

Operator	SD
Date	05/11/2025
Time	10.00am
Weather	Overcast
Input volume of water	20 litres
Test Zone	1.50 m

TEST CALCULATION

Elapsed (minutes)	Elapsed (seconds)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0	0	0	0.000	1.770	1.000
1	0	60	0.960	0.810	0.458
2	0	120	1.140	0.630	0.356
3	0	180	1.270	0.500	0.282
4	0	240	1.330	0.440	0.249
5	0	300	1.420	0.350	0.198
10	0	600	1.580	0.190	0.107
15	0	900	1.610	0.160	0.090
20	0	1200	1.630	0.140	0.079
25	0	1500	1.650	0.120	0.068
30	0	1800	1.660	0.110	0.062
35	0	2100	1.670	0.100	0.056
40	0	2400	1.680	0.090	0.051
45	0	2700	1.680	0.090	0.051
50	0	3000	1.680	0.090	0.051
55	0	3300	1.680	0.090	0.051
60	0	3600	1.680	0.090	0.051

Intake Factor (F)

$$F = \frac{2 \pi L}{\log_e [(L/D) + \sqrt{1 + (L/D)^2}]} \quad (i)$$

(From BS 5930:1999 for standpipes)

L=length of test zone

D=diameter of borehole

Permeability (k)

$$k = \frac{A}{F(t_2 - t_1)} \times \log_e (H_1/H_2) \quad (ii)$$

or

$$k = \frac{A}{FT} \quad (iii)$$

Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37

L= 1.50 m
D= 0.100 m
L/D= 15.00

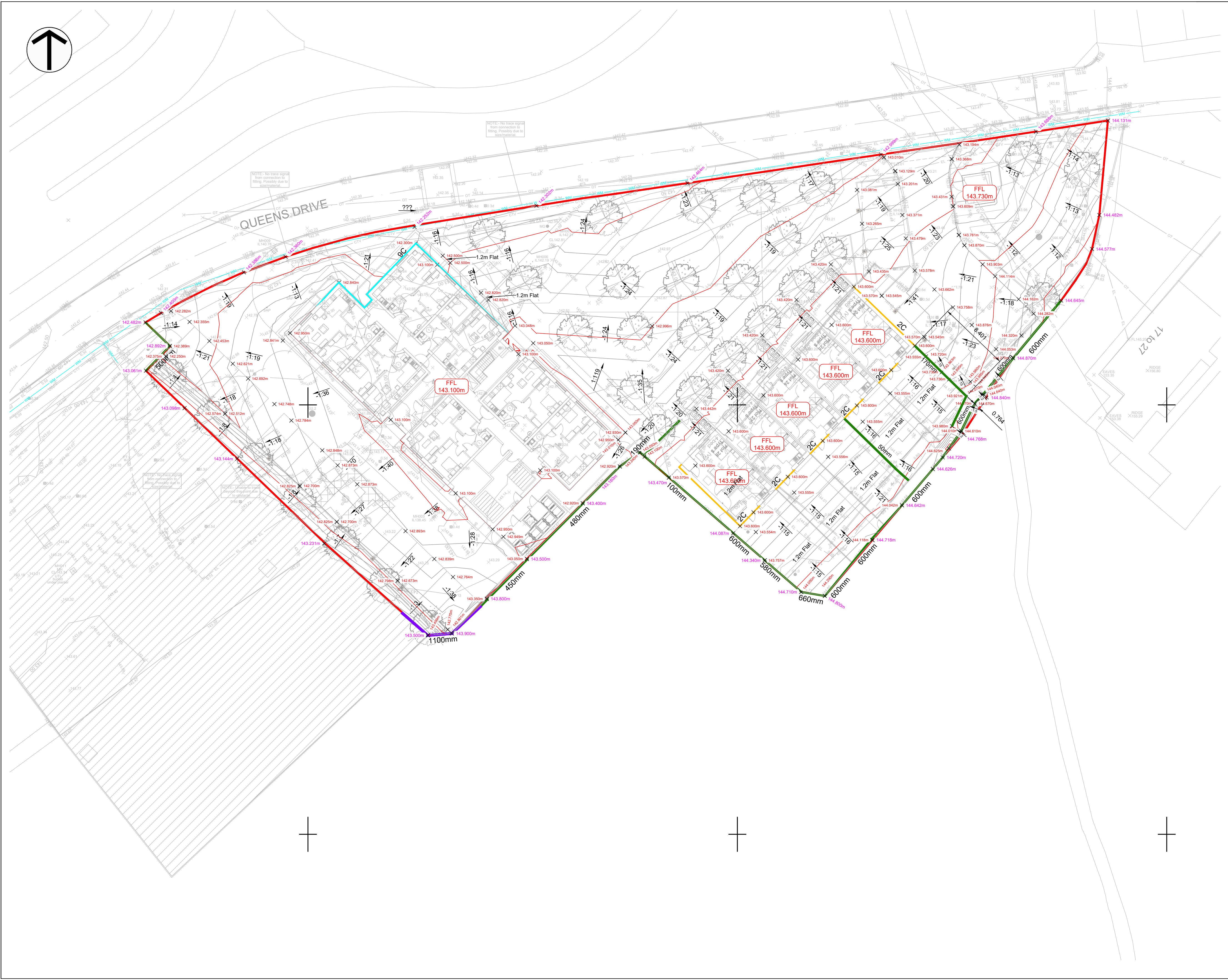
t₁= 0 s
t₂= 2400 s
H₁= 1.68 m
H₂= 0.01 m

A= 0.00785 m²
F= 2.7701 From (i)
T= s
k= 6.05323E-06 ms⁻¹ From (ii)
k= ms⁻¹ From (iii)

Remarks

Drainage Characteristics: Poor Permeability
Classification: Very low

Appendix Q. Proposed Levels Plan



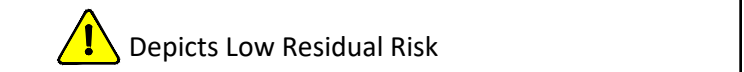
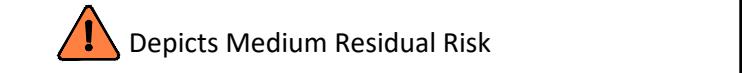
Do Not Scale

Drawing Notes

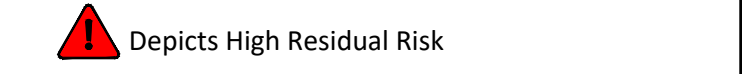
Drawing & schedule based on the following information:

Architect's drawing/model:	Saville Landscape Design 500-01D Landscape GA
Revision:	
Received:	12.12.25
Topographic Survey:	SurveyY Operations - 24B138
Revision:	-
Received:	-

Health, Safety & Environmental Notes

 Depicts Low Residual Risk

 Depicts Medium Residual Risk

 Depicts High Residual Risk

Refer to Designer's Risk Assessment for Control Measures

Key:

 Site Boundary

Retention
 < 600mm - Flag on Edge Type 2a & 2b (FOE)
 Note: Not to be used within Vehicle influence zone

Retention
< 600mm - Flag on Edge Type 2c & 2d (FOE)
Note: Can be used within Vehicle influence zone

Retention
 < 600mm - Gravel Board Type 1a, 1b & 1c(GB)
 Note: Not to be used within Vehicle influence zone
 or
 < 600mm - Flag on edge with sleeves cast in foundation for timber fence posts.
 Types 2a & 2b when not within vehicle influence zone

Retention
 <1500mm - Cavity Filled Wall
 Type 3E/4E/5E Retention
 Note: Not to be used within Vehicle
 influence zone

Underbuild (Extra Facing Brick required)

Overbuild

Contours, Minor (0.1m)

— Contours. Major (0.5m)

× 256.700m Proposed Spot Elevations

× 256.700m Existing Spot Elevations

15.12.25	Revised to suit Landscape Architect's Site Layout	IAB	RR	P03
25.11.25	Revised to suit Architect's comments	IAB	RR	P02
17.11.25	First Issue	IAB	RR	P01

Date	Description	By	Chk	Rev
------	-------------	----	-----	-----

ADEPT

L:\Crisp Patient1\Cr1\307\templateAdept\Templates\T3\Default_Login\styleStructure\template 2023\Stylepage\3675888.png

Web www.adeptcsce.com **Office Address**
Email inbox@adeptcsce.com 1912 Mill, Sunny Bank Mills,
Tel 0113 239 4518 Farsley, Leeds LS28 5UJ

Project
Queens Drive, Kirkholt

Title	Proposed Levels Strategy
-------	--------------------------

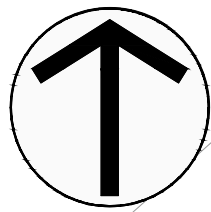
Client
MSV Housing

Scale @ A1	Initial author	Initial checker	Approver	Initial Date
1:200	IAB	RR	RR	Nov 25

Status	Purpose	Adept Project Number
S3	Preliminary	100.25073

Project-Originator-Functional Breakdown-Spatial Breakdown-Form-Discipline-Number	Rev.
100.25073-ACE-ZZ-ZZ-DR-C-3100	P03

Appendix R. Proposed Overland Flow Plan



QUEENS DRIVE

FFL 143.100m

FFL 143.600m

Do Not Scale

Drawing Notes

Drawing & schedule based on the following information:
Architect's drawing/model: Saville Landscape Design
Revision: 500-01D Landscape GA
Received: 12.12.25
Topographic Survey: SurveyY Operations - 24B138
Revision: -
Received: -

Health, Safety & Environmental Notes

⚠

Depicts Low Residual Risk

⚠

Depicts Medium Residual Risk

⚠

Depicts High Residual Risk

Refer to Designer's Risk Assessment for Control Measures

KEY

—

Site Boundary

➡

Overland Flow Arrow

15.12.25	Revised to suit Landscape Architect's site layout	IAB	RR	P02
18.11.25	First Issue	IAB	RR	P01
Date	Description	By	Chk	Rev

ADEPT

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0113 239 4518

Office Address

1912 Mill, Sunny Bank Mills, Farsley, Leeds LS28 5UJ

Project

Queens Drive, Kirkholt

Title

Overland Flow Route Layout

Client

MSV Housing

Scale @ A1	Initial author	Initial checker	Approver	Initial Date
1:200	IAB	RR	RR	Nov 25
Status	Purpose	Adept Project Number		
S3	Preliminary	100.25073		
Project-Originator-Functional Breakdown-Spatial Breakdown-Form-Discipline-Number				Rev.
100.25073-ACE-ZZ-ZZ-DR-C-1210				P02

Appendix S. Proposed Peak Foul Flow Calculations

DU METHOD FOR FOUL WATER DRAINAGE

Project: Queens Drive

Job No. 100.25073

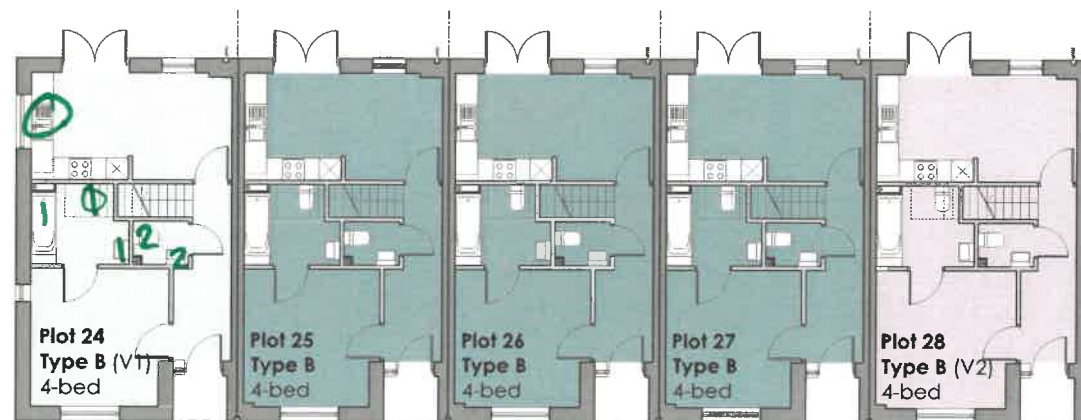
System Type: II BS 12056: Part 2 §4.2
Frequency Factor: 0.5 BS 12056: Part 2 §6.3.2

Discharge Units:	No.	DU (l/s)	n.DU
Wash basin / bidet	43	0.3	12.9
Shower without plug	5	0.4	2
Shower with plug		0.5	0
Single urinal with cistern		0.5	0
Urinal with flushing valve		0.3	0
Slab urinal (per person)		0.2	0
Bath	33	0.6	19.8
Kitchen sink	28	0.6	16.8
Dishwasher (household)	28	0.6	16.8
Washing machine up to 6 kg		0.6	0
Washing machine up to 12 kg	28	1.2	33.6
WC with 4l cistern		1.8	0
WC with 6l cistern		1.8	0
WC with 7.5l cistern	43	1.8	77.4
WC with 9l cistern		2	0
Floor gully DN 50		0.9	0
Floor gully DN 70		0.9	0
Floor gully DN 100	2	1.2	2.4

Σ DU	181.7
-------------	-------

Total off-site discharge	Q	6.739807 l/s
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Proposed Ground Floor Block Plan

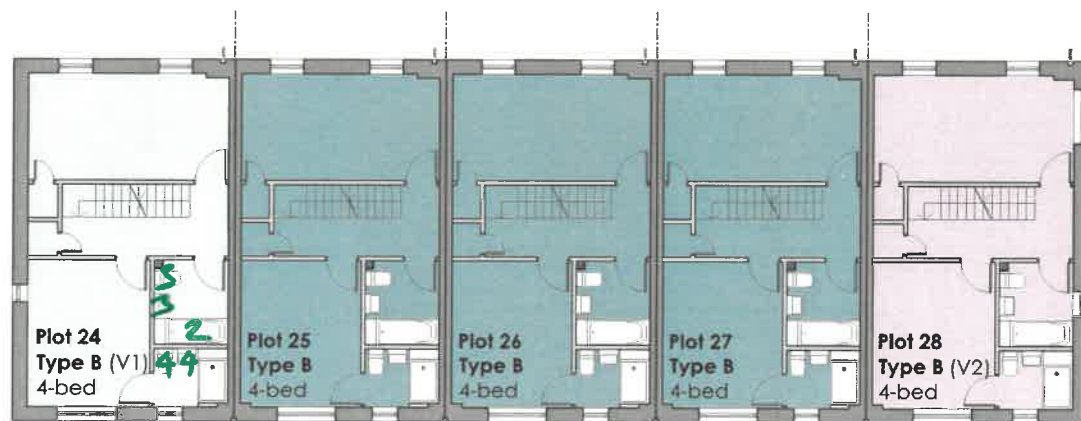
House Block Schedule of Accommodation

Residential Flat Areas	Type	Quantity	Area/m2
House Type B	48.77	1	127.8
House Type B (V1)	48.77	1	129.3
House Type B (V2)	48.77	1	129.3
House Block			
Ground Floor			244.5
First Floor			258.5
Second Floor			172.0
GIFA			675.0

House Type B
 House Type B(V1)
 House Type B(V2)

0m 2m 4m 8m 12m

See dwg. no.: 22-042/SK30 for Individual House Type Layouts

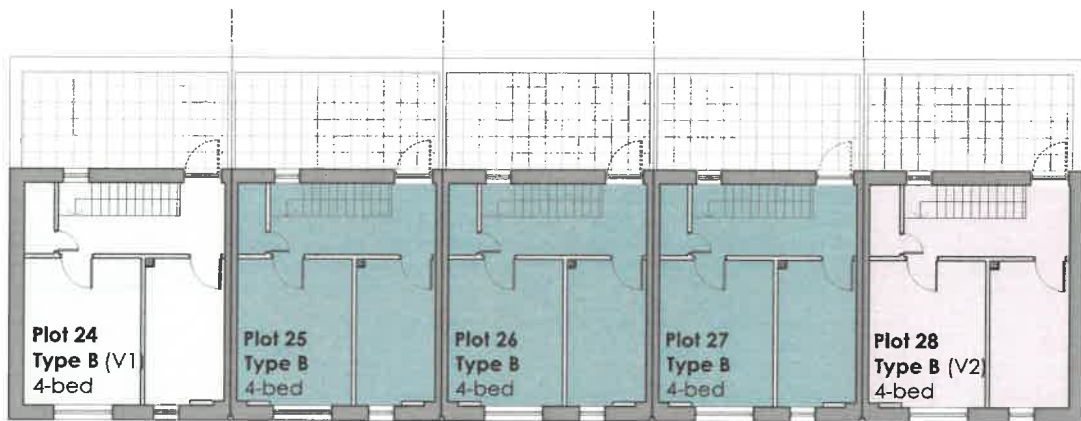


Proposed First Floor Block Plan

Type BV1 → 1x Kitchen Sink.
 → 4x WC
 → 4x WHB
 → 2x Bath.
 → 1x Shower.
 → 1x Dishwasher.
 → 1x Washing Machine.

Same for all 5 houses.

total for houses.



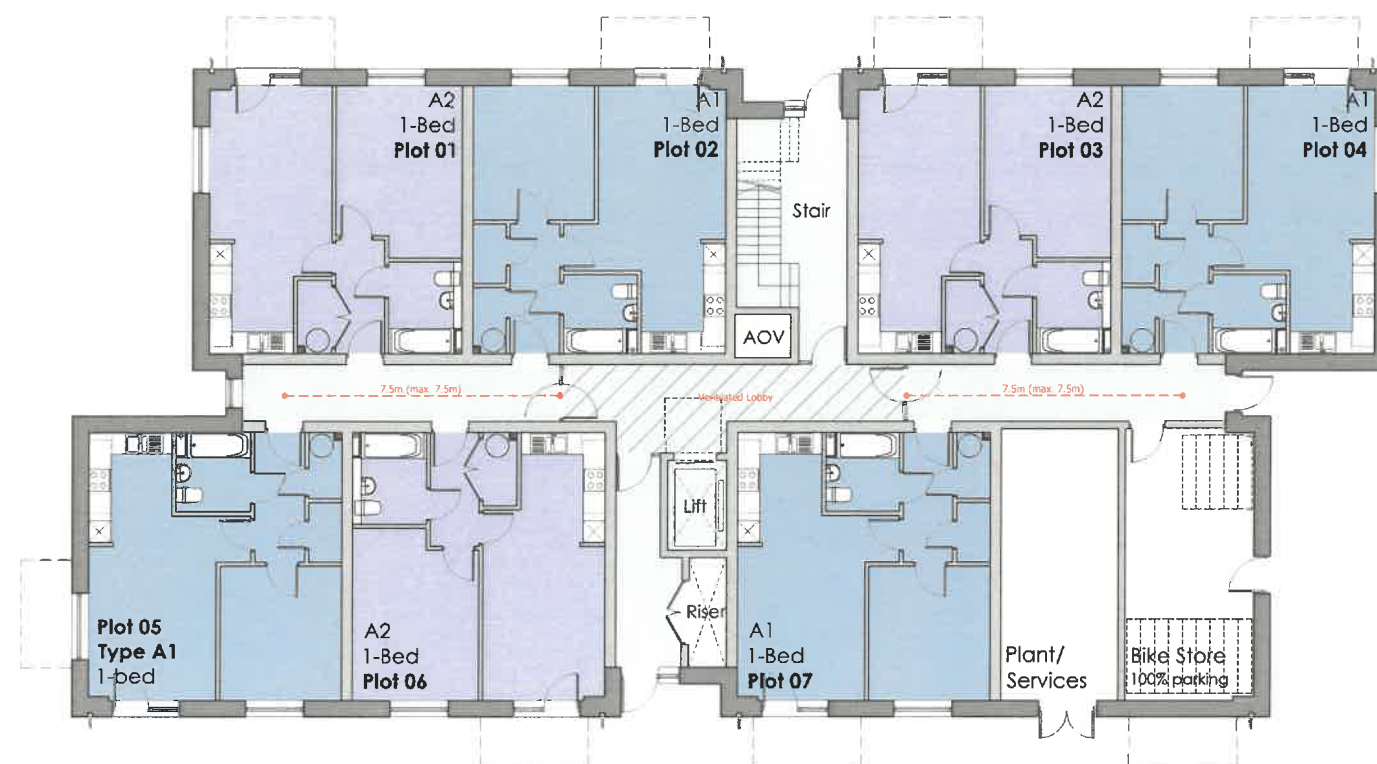
Proposed Second Floor Block Plan

→ 5 x kitchen Sink.
 → 5 x Dishwasher
 → 20 x WC
 → 20 x WHB
 → 10 x Bath.
 → 5 x Shower
 → 5 x washing machine

Peak Foul Flow
Calcs
 15/12

A	04.12.24	OP	Stage 2 Drawing Issue - dwgs updated to suit proposed elevations
Rev	Date	By	Remarks
Client			MSV Building
Project Name			Queens Drive, Kirkham
Drawing Name			Proposed House Block Layouts
Drawing Purpose			INFORMATION
Project Number	Drawing Number	Revision	
22-042	SK32	A	
Project	Origin	Vol/Sys	Level
XX-XX-XX-XX-XX-XX	XX-XX-XX-XX-XX-XX	XX-XX-XX-XX-XX-XX	XX-XX-XX-XX-XX-XX
Status	Scale @ A1:	Drawn	Checked
	1:100	OP	AJD
			Nov 2024

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Proposed Ground Floor Block Plan

Ground Floor Schedule of Accommodation

Residential Flat Areas	Type	Quantity	Area/m2
Flat Type A1	1B2P	4	50.3
Flat Type A2	1B2P	3	50.3
Cycle Store			25.5
Plant / Services			23.5
AOV			1.7
Risers			3.0
Circulation			75.3
GIFA			514.8

- Flat type A1
- Flat type A2
- Service Spaces
- Circulation

0m 2m 4m 8m 12m

See dwg. no.: 22-042/SK31 for Individual Flat Type Layouts

Flats A1 x A2 are the same layout but handed.

total per Flats.

- 1 x kitchen sink
- 1 x Dishwasher
- 1 x WC
- 1 x WTB
- 1 x Bath.
- 1 x Washing Machine.

Plant x Bike

2 x Floor gullies

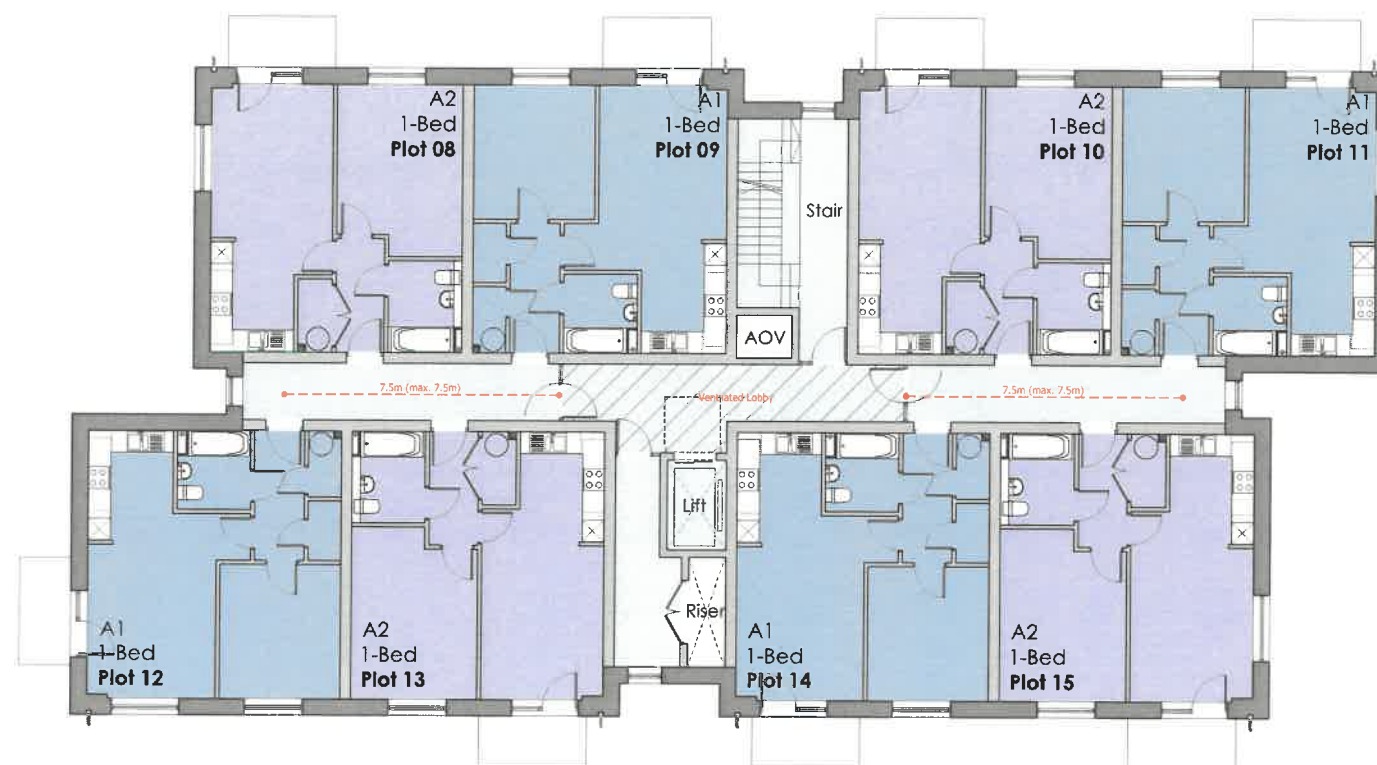
23 x total per flat

- 23 x kitchen sink
- 23 x Dishwasher
- 23 x WC
- 23 x WTB
- 23 x Bath.
- 2 x Floor Gully
- 23 x Washing Machine

Peak Foul Flow
Calcs
15/12

Rev	Date	By	Remarks
A	04.12.24	OP	Stage 2 Drawing Issue - dwgs updated to suit proposed elevations
Client: MSV Housing			
Project Name: ... Drive, ...			
Drawing Name: Proposed Flat Block Ground Floor Layout			
Drawing Purpose: INFORMATION			
g	Project Number: 22-042	Drawing Number: SK33	Revision: A
g	Origin	Vol/Sys	Level
g	Type	Role	Number
g	XX - XX - XX - XX - XX - XX		
Status	Scale @ A1:	Drawn	Checked
	1:100	OP	AJD
			Nov 2024

Same four
→ ground
floor.



First Floor

Schedule of Accommodation

Residential Rat Areas	Type	Quantity	Area/m2
Flat Type A1	1B2H	4	50.3
Flat Type A2	1B2H	4	50.3
AOV			1.7
Risers			3.0
Circulation			75.3
GIFA			514.8

-  Flat Type A1
 Flat Type A2
 Service Space
 Circulation



See dwg. no.: 22-042/SK31 for Individual Flat Type Layouts

Rev	Date	By	Remarks
A	04.12.24	OP	Stage 2 Drawing Issue - dwgs updated to suit proposed elevations

Client _____Client _____MSV HousingProject Name: _____

Queens Drive, Kirkholt

Drawing Name: _____Proposed Flat Block First Floor Layout

Drawing Room:

INFORMATION

Figure 1 is a line graph showing the percentage of respondents who believe that the use of force is justified in various circumstances. The x-axis represents the percentage of respondents who believe that the use of force is justified, ranging from 0 to 100. The y-axis represents the percentage of respondents who believe that the use of force is justified, ranging from 0 to 100. The graph shows a positive correlation between the two variables, with a regression line and a confidence interval.

Project Number:	Drawing Number:	Revision:
22-042	SK34	A

g	Project	Origin	VoltSys	Level	Type	Role	Number
---	---------	--------	---------	-------	------	------	--------

XX.XX.XX.XX.XX.XX.XX

Status:	Scale @ A1:	Drawn:	Checked:	Date:
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1:100 OP AJD Nov 2024

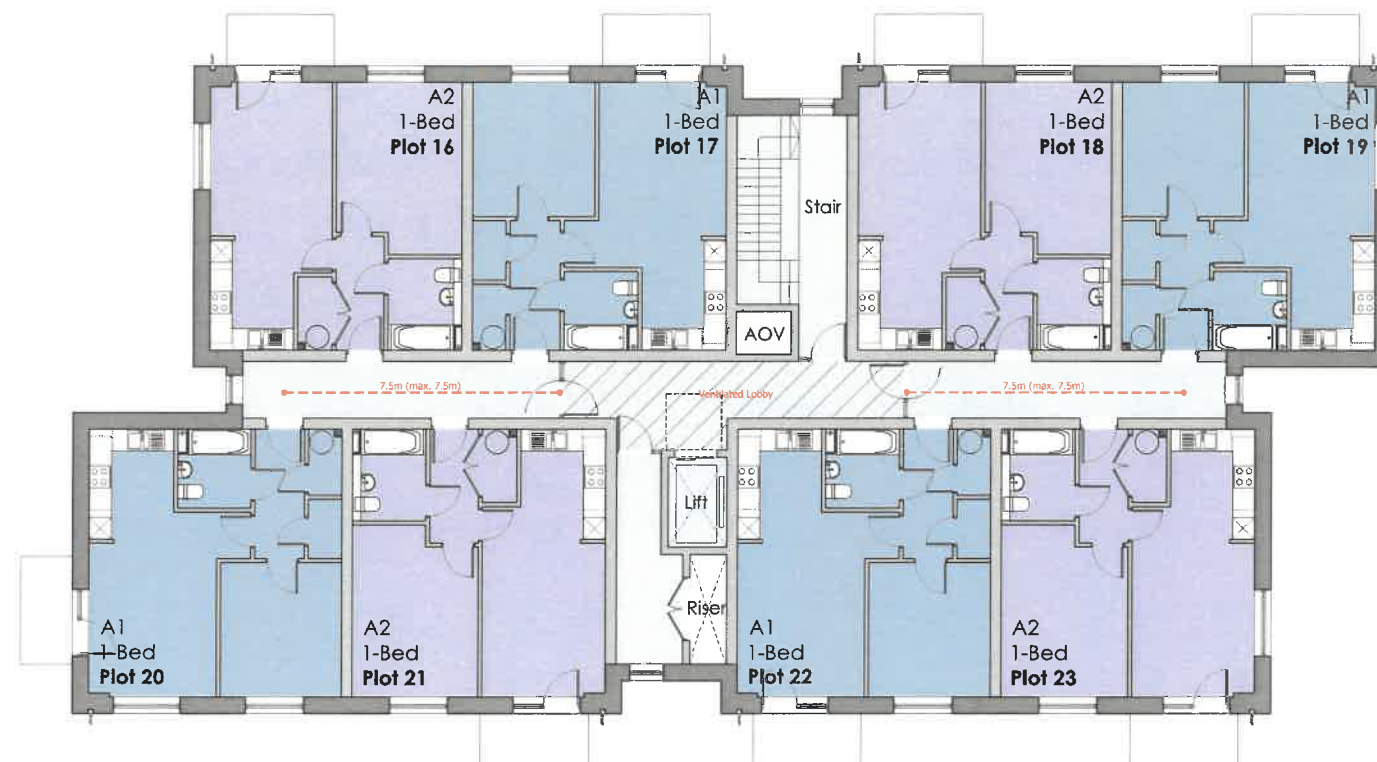
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Web: www.trianglearchitects.co.uk

Twitter: @TriangleArch

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Proposed Second Floor Block Plan

Same foul as ground floor.

Second Floor Schedule of Accommodation

Residential Flat Areas	Type	Quantity	Area/m2
Flat Type A1	1B2P	4	50.3
Flat Type A2	1B2P	4	50.3
AOV			1.7
Risers			3.0
Circulation			75.3
GIFA			514.8

- Flat Type A1
- Flat Type A2
- Service Spaces
- Circulation



See dwg. no.: 22-042/SK31 for Individual Flat Type Layouts

Rev	Date	By	Remarks
A	04.12.24	OP	Stage 2 Drawing Issue - dwgs updated to suit proposed elevations
Client: MSV Housing			
Project Name: Queens Drive, Kirkholt			
Drawing Name: Proposed Flat Block Second Floor Layout			
Drawing Purpose: INFORMATION			
Project Number: 22-042	Drawing Number: SK35	Revision: A	
Project	Origin	Vol/Sys	Level
XX - XX - XX - XX - XX - XX - XX			
Status	Scale @ A1:	Drawn	Checked
	1:100	OP	AJD
Date:			Nov 2024
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Appendix T. Outline Operation and Maintenance Manual

Drainage Asset Maintenance Schedule

 Surface  Foul

Maintenance Activity	Drainage Component	Required Action	Typical Frequency
Visual Inspection	Gully Sump unit Catch pit / silt trap Attenuation structures Channel drain Outlet chamber Flow control chamber Swale Soakaway Pond and wetland Bioretention	Inspect for sediment and debris Inspect inlets and outlets for blockage (where applicable)	Monthly for first year and twice yearly thereafter, after severe storm
	Pipework		Twice yearly
	Full retention interceptor Bypass interceptor Forecourt interceptor		Twice yearly or after severe storm as a minimum, refer to manufacturer guidance. Forecourt interceptor requires emptying after fuel spillage
Monitoring	Attenuation structures	Check attenuation inspection points to ensure emptying is occurring (little to no water should be present after consecutive days of dry weather)	Twice yearly, once after heavy rainfall and once after consecutive dry weather
	Soakaway	Check to ensure emptying is occurring	Annually
	Bioretention	Check operation of underdrains by inspection of flows after rain	Annually
Litter and Debris Removal	Pond and wetland Manhole Pervious paving Swale Soakaway Bioretention	Remove all litter and debris	Twice yearly or after severe storm

Litter and Debris Removal - Continued	All sump units (gullies, channel drains and catch pits) Access chambers and pre-treatment devices Flow control chamber Gutters & leaf guards		Twice yearly (spring, start of winter), or as required
Grass Cutting	Pond and wetland Swale	Grass should be cut to retain grass height within specified design range (typically 75-150mm)	Monthly (during growing season), or as required
Jet Wash	Pipework	High pressure jet-wash any pipe work which has silt accumulation. Care must be taken that any silts within the pipework are not unnecessarily flushed into the attenuation structures (use of bungs and jet-vac of chamber prior to removal of bungs)	Twice yearly, or as required
	Attenuation structures	High pressure jet-wash all perforated pipework and or access points. All water to be jet vac to remove any suspended silts within the water	Five yearly, or as required
Sweeping	Pervious paving	Pervious surfaces need to be regularly cleaned of silt and sediment to preserve their infiltration capacity	Yearly, often less where inspections indicate that it is not required
Silt and Rubber Cleaning	Pervious paving	Jet wash if visible signs of silt and rubber build up. Further maintenance options include locally removing block and geotextile, removing the silt/rubber and replacing as before	Paving to be inspected every spring (when dry)
Repair/Reinstate – Remedial Actions	Soakaway	Remove and reconstruct soakaway and/or replace or clean void fill if performance deteriorates or failure occurs	As required
	Bioretention		As required

			Infill any holes in or remove and replace filter medium	
Vegetation Management	Pond and wetland		Build-up of dead vegetation from previous seasons should be removed to reduce organic silt accumulation	Convenient intervals e.g., every three years at the end of landscape contract periods
	Bioretention		Emergent vegetation may need to be harvested to maintain flood volumes Assess plants for disease infection, poor growth, invasive species etc., and replace as necessary.	Every two – ten years, or as required Quarterly inspection, replacement as required
Sediment Management and Removal	ALL SUDS		Sediment accumulation should be monitored as part of the inspection regime, rate of sediment accumulation noted	Appropriate frequencies determined upon inspection
Inspection	Pipework Manhole		Check if functioning correctly	Once site is fully operational: twice yearly for 1 st year, annually after
	Pumping station/rising main		Impellers will need inspecting and cleaning as required – refer to manufacturer guidance	Refer to manufacturer guidance
	Grease trap		Monthly inspection with removal of grease as required	Monthly
Sediment Removal	Washdown separator		Inspect for build-up of sediment and remove as required. Refer to manufacturer guidance	Quarterly for 1 st year, twice yearly after. Refer to manufacturer guidance

Additional notes:

- Any defects (broken/misaligned pipes, root infestation, damage to soakaways, missing parts, etc.) that are identified during inspections/maintenance should be reported back to the property/site owner so that the remedial actions can be undertaken promptly to repair these defects.
- SuDS maintenance based on CIRIA 2015 Chapter 32 where further information can also be found.
- Refer to manufacturer guidance for maintenance schedules of all propriety treatment systems.