FLOOD RISK ASSESSMENTS & DRAINAGE STRATEGIES

Land Rear of Firgrove Gardens, Rochdale,OL16 3AF

Reference: 0207 - DD- 001

DRAINAGE STRATEGY

Oct-21

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Rev 1 Produced by: ARD 079 721 44579 arge@rida-reports.co.uk

Introduction 1

Purpose of this report

1.1 The purpose of this statement is to accompany a full planning application for the Land Rear of Firgrove Gardens, Rochdale,OL16 3AF.

1.2 The NPPF also encourages developers to seek opportunities to reduce the overall level of flood risk through the layout of the development and the application of Sustainable Drainage Systems (SuDS). Adoption of these principles at early stages of the project can ensure that the developments take into account appropriate mitigation which is included within the detailed design of the schemes.

1.3 The Flood and Water Management Act aims to reduce the flood risk associated with extreme weather events. It provides a robust management of flood risk for people, homes and businesses and also encourages the use of SuDS for developments. A robust SuDS strategy takes into account the recommendations given in this Flood Risk Assessment.

Existing and Proposed Site

2.1 The estimated lifetime of this development is: 100 years

2.2 The distribution of catchment areas for existing and proposed site is as per table 1 below. See appendix A for details

Table 1 : Existing and Proposed catchment areas in hectares

Description	Existing Site	Proposed Site
Permeable Areas	0.000	0.055
Impermeable Areas	0.067	0.106
Grass	0.148	0.054
Area Draining away from development	0.000	0.000
Total Development Area	0.215	0.215

2.3 It has been assumed that the positively drained areas will have different runoff coefficients depending on the type of surface as follow:

Impermeable Surface	1.0
Permeable Surfaces	0.5
Grass Areas	0.3

Site Characteristics

2.5 The site background is clearly identified through answers to the questions below

TOPIC	QUESTION	ANSWER
Protected species or habitat	Is the site near to designated sites and priority habitats?	No
Flood Plain	Is the site located in the flood plain?	No
Soils and Geology	Soil permeability? - See appendix B for details	Yes
Space constraints	Space for SuDS components?	Yes
Topography	Sited on a flat site?	Yes
	Sited on a steep slope (5-15%)	No
	Sited on a very steep slope (>15%)	No
Groundwater	Is ground Water less that 3m bgl?- Likely to be very high	Unknown
Contaminated land	Are there contaminated soils on site?	Unknown
Existing Infrastructure	Are there underground utilities in the SuDS area?	No
Runoff characteristics	Is the development in a high risk flooding area?	Low

Evaluation of Discharge Point

2.6 The SuDS design takes into account Building Regulations Section H3. Rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following in order of priority:

Discharge to:	Site Assessment
Adequate infiltration system	The site has potential for infiltration due to gravel and sand soil present in the site. Soakaways are recommended to the undertaken during detailed design. See appendix B
a watercourse	There are no watercourses in the proximity to the site
a surface water sewer	It is not know if there is a surface water public drains in the proximity to the site
a combined sewer system	The sewer system is separated

Peak Runoff and Attenuation Volumes 3

Peak Run-off Rate

3.1 The peak runoff rate for the existing site was calculated as per table 3. Calculation results are in table 5 and appendix C.

Table 3: Peak run-off rate calculation method for existing site

Method Used	Calculation Method
	This is a greenfield site, the Institute of Hydrology(IoH). Report124 Flood Estimation for Small Catchments method has been used.
✓	This is a brownfield site, runoff rates are calculated in accordance with best practice simulation modelling.
	This is a brownfield site where the pre-development drainage isn't known runoff rates are calculated using the Greenfield run-off with soil type 0.45

3.2 The runoff flow produced by the development will be controlled as per table 4.

Table 4: Runoff discharge rate control

Control Used	Description of runoff discharge
✓	Water will be discharged into the ground via a SuDS
	The peak discharge rate has been reduced to pre-development Qbar flow
	The limiting discharge rate requires a flow rate less than % of the current discharge rate
	The peak discharge rate is being agreed with the local water company to be 2 l/s

Run-off Volumes

3.3 Micro Drainage was used to calculate the size of the attenuation based on the available infiltration rate, the size of the soakaways are calculated for all events up to the 1 in 100 including an allowance for climate change of 40%. See table 5 for value and appendix C for calculations.

Table 5: Peak discharge rates and anticipated attenuation volumes for SuDS

Return Period	Peak Discharge Rate (l/s)		Infiltration
Event	Existing	Proposed	Rate (m/hr)
Qbar(1 in 2)	2.80	n/a	0.0360
1 in 30	5.40	n/a	0.0360
1 in 100	7.00	n/a	0.0360
1 in 100 + CC		n/a	0.0360

Drainage Hierarchy Evaluation

4.1 The drainage hierarchy evaluation is set up within the NPPF and the local SuDS documents of the Lead Local Flood Authority. The following drainage strategy is proposed by this development.

Table 6: Drainage Hierarchy Evaluation

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

4.2 The location and details of the SuDS can be seen drainage layouts in appendix D. Calculations are in appendix C.

4.3 The drainage calculations demonstrate:
- The post development runoff volumes have been reduced to the pre-development runoff values by infiltrating all the run-off produced by the development.
- No flooding occurs for the 1 in 30 storm events.
- Any flooding for the 1 in 100 year +40% climate change event can be safely contained on site

4.4 The proposed drainage strategy presents one possible solution to demonstrate that the development can be sustainably drained, to comply with the requirements of the NPPF. Other solutions may be feasible and may prove to be better suited to the site. These will become apparent during the detailed design stage. The strategy above should not therefore be interpreted as the definitive scheme solution.

Management of Exceedance Flows

4.5 The drainage network has been designed to attenuate surface runoff for all events up to and including the 1% AEP + CC(1 in 100 years). However consideration has been given to what may happen when the design capacity of the surface water drainage network is exceeded. Surface water will flow to the lowest points within the site located to the front of the property. The flood risk to the buildings would therefore remain low. See appendix D.

Maintenance and Management Plan 5

Maintenance and Management plan responsibility

5.1 The SuDS will be maintained by The Owner the property

Maintenance and Management plan for proposed SuDS

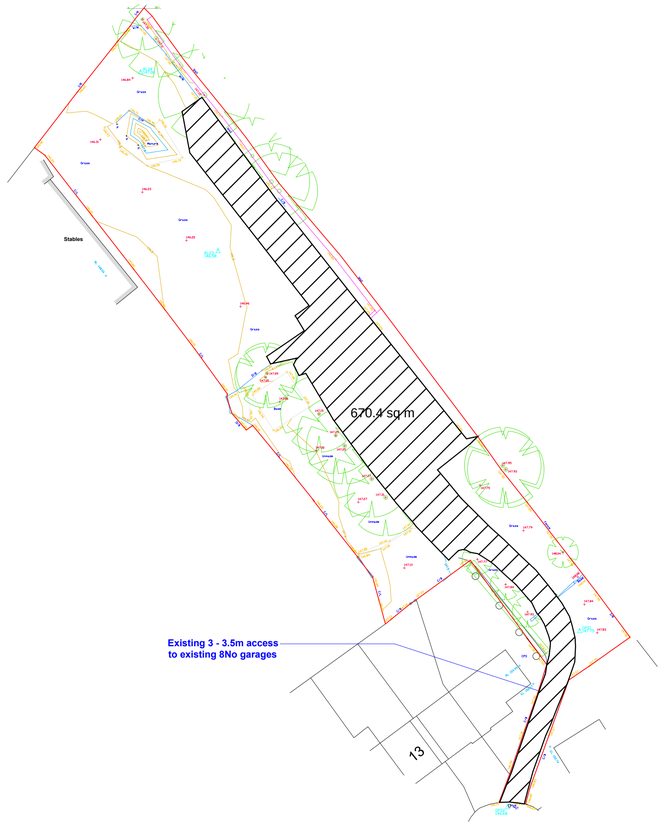
5.2 The maintenance and Management Plan Guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed SuDS techniques outlined above. The maintenance for SuDS structures are as follow:

Operation and maintenance requirements for pervious pavements

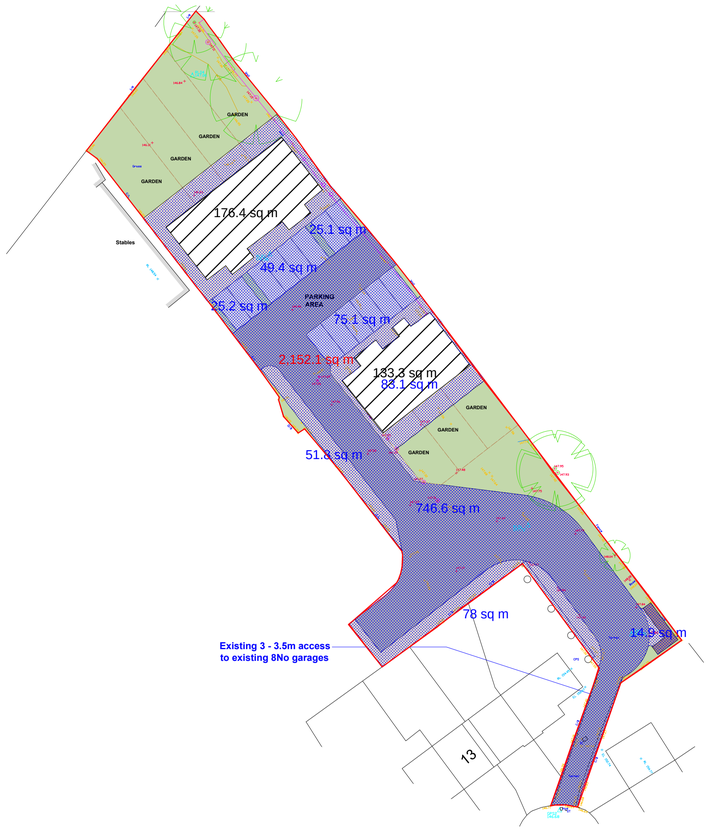
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Operation and maintenance requirements for soakaways		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Appendix A



EXISTING SITE
1:400



PROPOSED SITE
1:400

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Drawing Scale Bar

Drawing scale	Line length	Drawing scale	Line length
1:5 =	0.25 metres	1:200	= 10.0 metres
1:10 =	0.5 metres	1:250	= 12.5 metres
1:20 =	1.0 metres	1:500	= 25.0 metres
1:25 =	1.25 metres	1:1000	= 50.0 metres
1:50	= 2.5 metres	1:1250	= 62.5 metres
1:100	= 5.0 metres	1:2500	= 125 metres

Measure length of line above for checking of scale

GENERAL NOTES

KEY

PERMEABLE AREAS

IMPERMEABLE AREAS

STUDY AREA

Rev	Details	Date	By	Ch'd

Drawing Status:
PRELIMINARY

RIDA
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Client:

Project:
Land Rear of Firgrove Gardens, Rochdale,OL16 3AF

Drawing:
Existing and Proposed Areas
Permeable and Impermeable

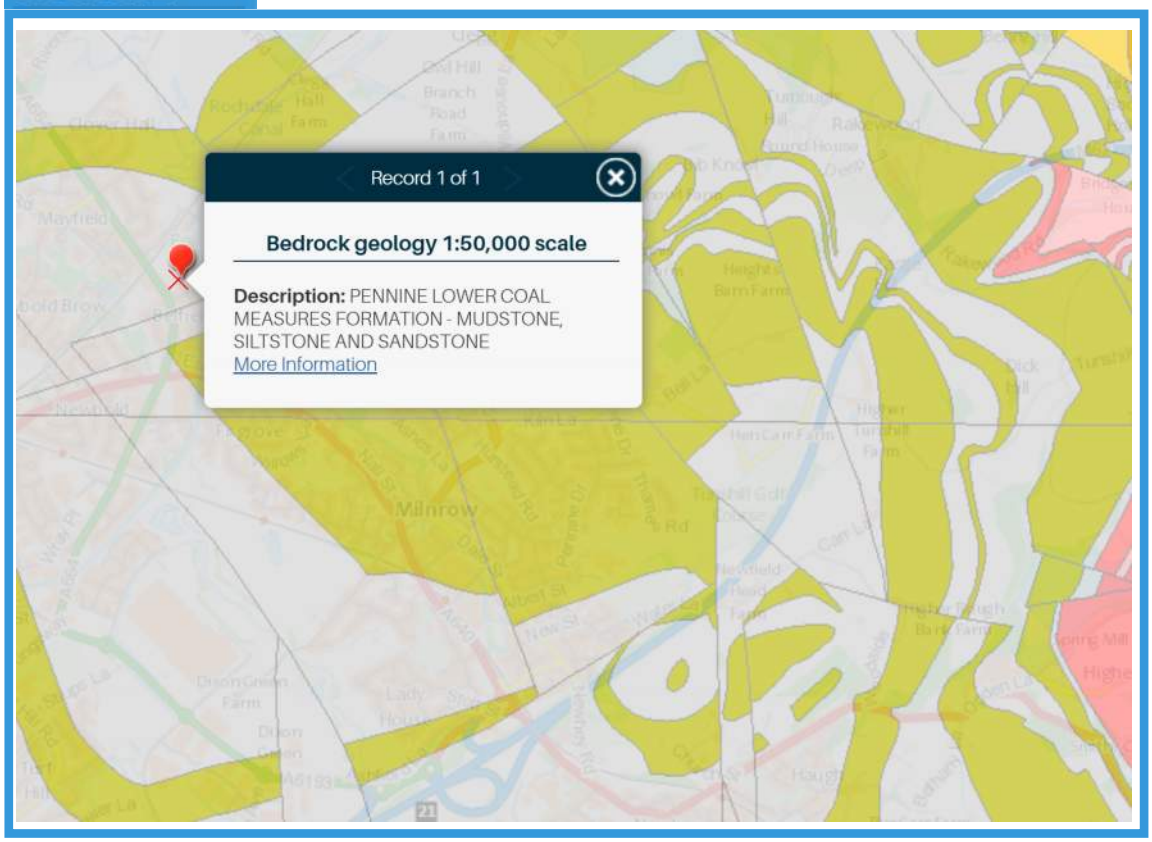
Print Size:	Project No:	Drawing No:	Revision:
A1	0270	002	P1

Appendix C

SITE GEOLOGY

GEOINDEX ONSHORE

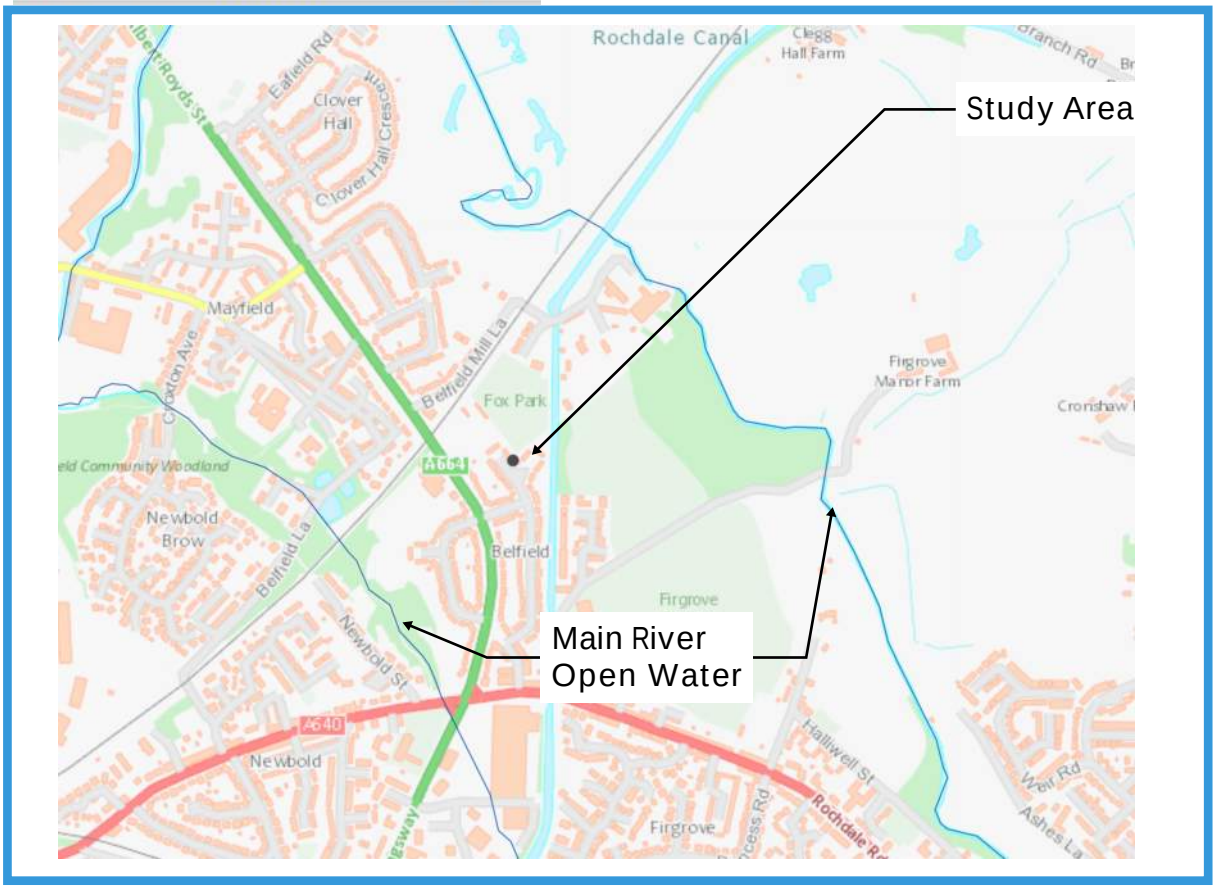
GEOLOGY - BEDROCK - SILT STONE SAND STONE FORMATION



GEOINDEX ONSHORE

GEOLOGY - SUPERFICIAL DEPOSITS - SAND AND GRAVEL

Environment Agency Main River Map

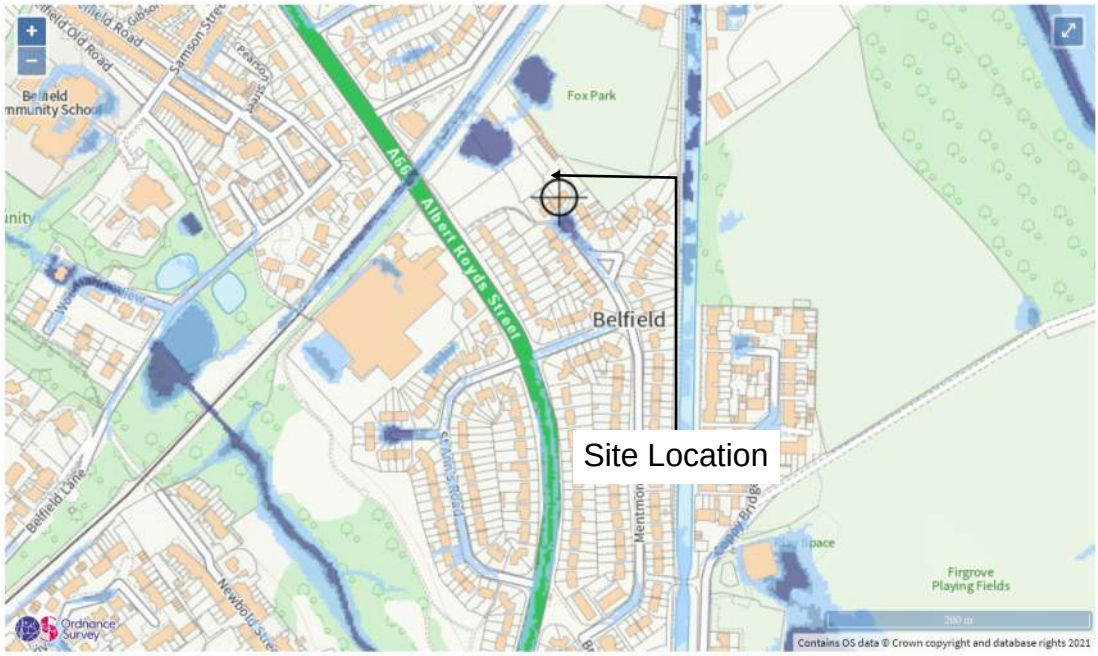


SITE FLOOD RISK

Flood risk from surface water

Extent of flooding

High risk means a chance of flooding greater than 3.3% (1:30)
Medium risk means a chance of flooding of btw 1% (1:100) and 3.3%
Low risk means a chance of flooding of btw 0.1% (1:1000) and 1%
Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding



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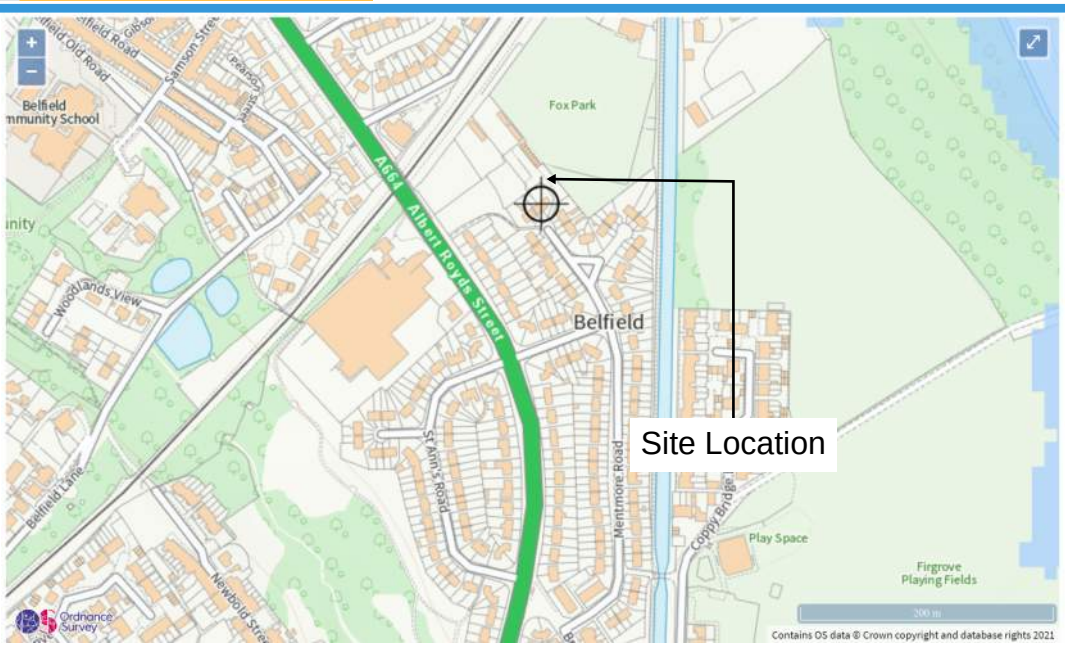
Flood risk

- High
- Medium
- Low
- Very low

Flood risk from reservoirs

Extent of flooding



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Flood risk

- Maximum extent of flooding

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
OL16 3AF	**391594/413754**	**25 Oct 2021 22:16**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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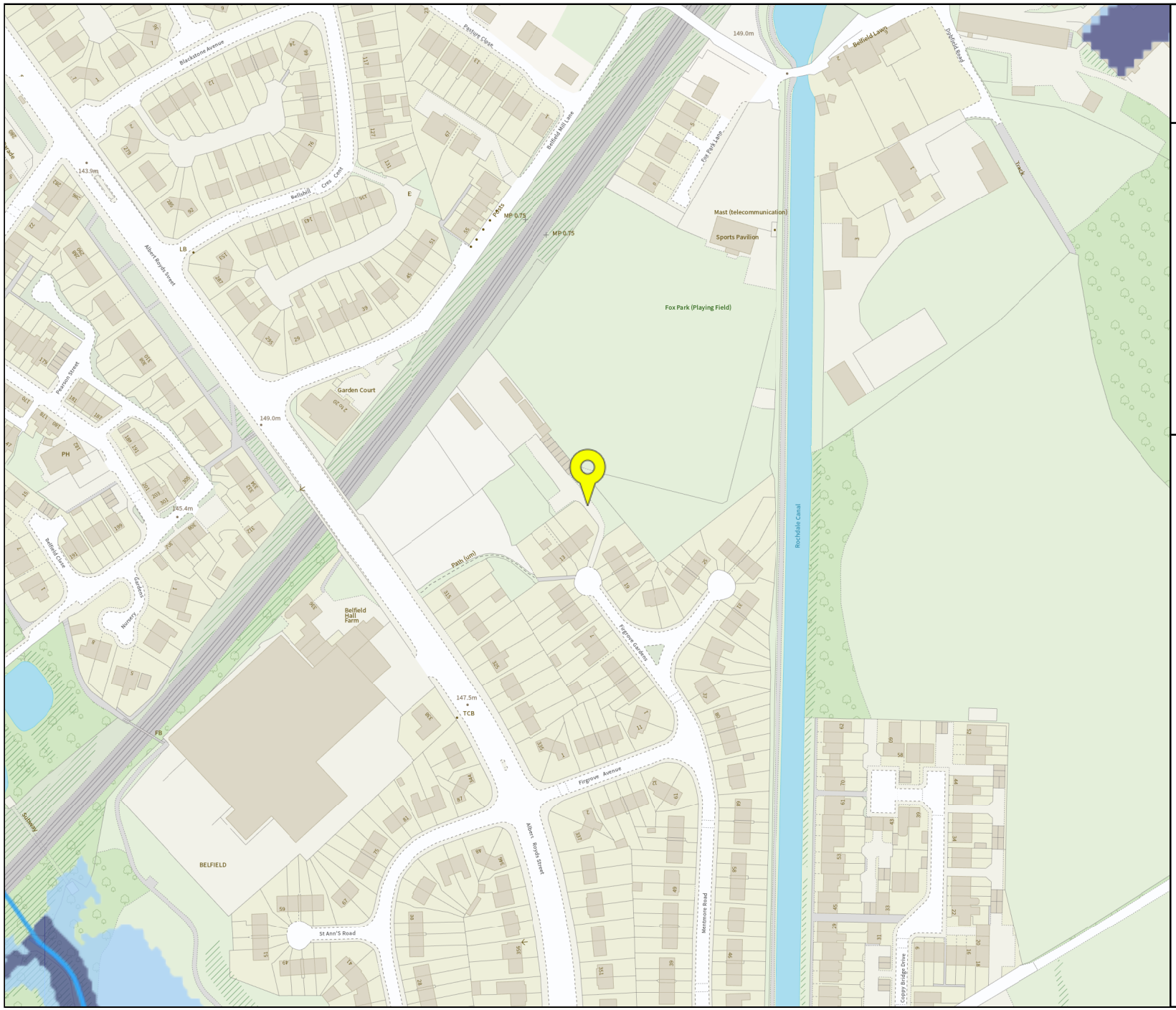

Environment Agency

Flood map for planning

Your reference
OL16 3AF

Location (easting/northing)
391594/413754

Scale
1:2500

Created
25 Oct 2021 22:16

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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Appendix C

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.450
Area (ha)	0.215	Urban	0.000
SAAR (mm)	892	Region Number	Region 10

Results	**l/s**
QBAR Rural	1.3
QBAR Urban	1.3
Q2 years	1.2
Q1 year	1.1
Q30 years	2.1
Q100 years	2.6

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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)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.352	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
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

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.085	58.8	0.003	6.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	5.000	0.085	58.8	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.08	145.600	0.003	0.0	0.0	0.0	1.01	7.9	0.4
1.001	50.00	6.17	145.515	0.003	0.0	0.0	0.0	1.01	7.9	0.4

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		146.200	145.430	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	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	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.352		

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Online Controls for Storm

Pump Manhole: Soakaway, DS/PN: 1.001, Volume (m³): 0.1

Invert Level (m) 145.515

Depth (m)	Flow (l/s)
2.000	0.0000

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Storage Structures for Storm

Cellular Storage Manhole: Soakaway, DS/PN: 1.001

Invert Level (m) 145.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03600

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	3.0	3.0	0.900	0.0	8.6
0.800	3.0	8.6			

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 0.352
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 10.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Plot 1	15 Winter	2	+0%				
1.001	Soakaway	1440 Winter	2	+0%	100/360 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Plot 1	145.616	-0.084	0.000	0.06		0.4	OK	
1.001	Soakaway	145.218	-0.397	0.000	0.00		0.0	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 0.352
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 10.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Plot 1	15 Winter	30	+0%				
1.001	Soakaway	1440 Winter	30	+0%	100/360 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Plot 1	145.623	-0.077	0.000	0.12		0.8	OK	
1.001	Soakaway	145.375	-0.240	0.000	0.00		0.0	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 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 0.352
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 10.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Plot 1	960 Winter	100	+40%				
1.001	Soakaway	960 Winter	100	+40%	100/360 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Plot 1	145.656	-0.044	0.000	0.02		0.1	OK	
1.001	Soakaway	145.656	0.041	0.000	0.00		0.0	SURCHARGED	

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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)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.352	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
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	0.053	4-8	0.009

Total Area Contributing (ha) = 0.062

Total Pipe Volume (m³) = 0.265

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.085	58.8	0.021	6.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.085	58.8	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	5.000	0.085	58.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.06	145.600	0.021	0.0	0.0	0.0	1.31	23.2	2.8
1.001	50.00	6.13	145.515	0.042	0.0	0.0	0.0	1.31	23.2	5.6
1.002	50.00	6.19	145.430	0.042	0.0	0.0	0.0	1.31	23.2	5.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002		146.200	145.345	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	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	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.352		

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Online Controls for Storm

Pump Manhole: Permeable Surf, DS/PN: 1.002, Volume (m³): 0.2

Invert Level (m) 145.430

Depth (m)	Flow (l/s)
2.000	0.0000

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Storage Structures for Storm

Porous Car Park Manhole: Access Road, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.03600	Width (m)	40.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	111.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	145.600	Cap Volume Depth (m)	0.400

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 0.352
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 10.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	All Plots	15 Winter	2	+0%				
1.001	Access Road	240 Winter	2	+0%	100/30 Summer			
1.002	Permeable Surf	240 Winter	2	+0%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	All Plots	145.641	-0.109	0.000	0.17		3.0	OK	
1.001	Access Road	145.618	-0.047	0.000	0.00		0.1	OK	
1.002	Permeable Surf	145.618	0.038	0.000	0.00		0.0	SURCHARGED	

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Date 25/10/2021 23:34 | Designed by Argemiro
File External Surfaces.MDX | Checked by
Innovyze | Network 2018.1.1

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 0.352
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 10.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	All Plots	15 Winter	30	+0%				
1.001	Access Road	120 Winter	30	+0%	100/30 Summer			
1.002	Permeable Surf	120 Winter	30	+0%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	All Plots	145.658	-0.092	0.000	0.31		5.7	OK	
1.001	Access Road	145.643	-0.022	0.000	0.01		0.2	OK	
1.002	Permeable Surf	145.643	0.063	0.000	0.00		0.0	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	0.352
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	10.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	All Plots	120 Winter	100	+40%				
1.001	Access Road	120 Winter	100	+40%	100/30 Summer			
1.002	Permeable Surf	120 Winter	100	+40%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	All Plots	145.703	-0.047	0.000	0.21		3.9	OK	
1.001	Access Road	145.700	0.035	0.000	0.01		0.2	SURCHARGED	
1.002	Permeable Surf	145.838	0.258	0.000	0.00		0.0	SURCHARGED	

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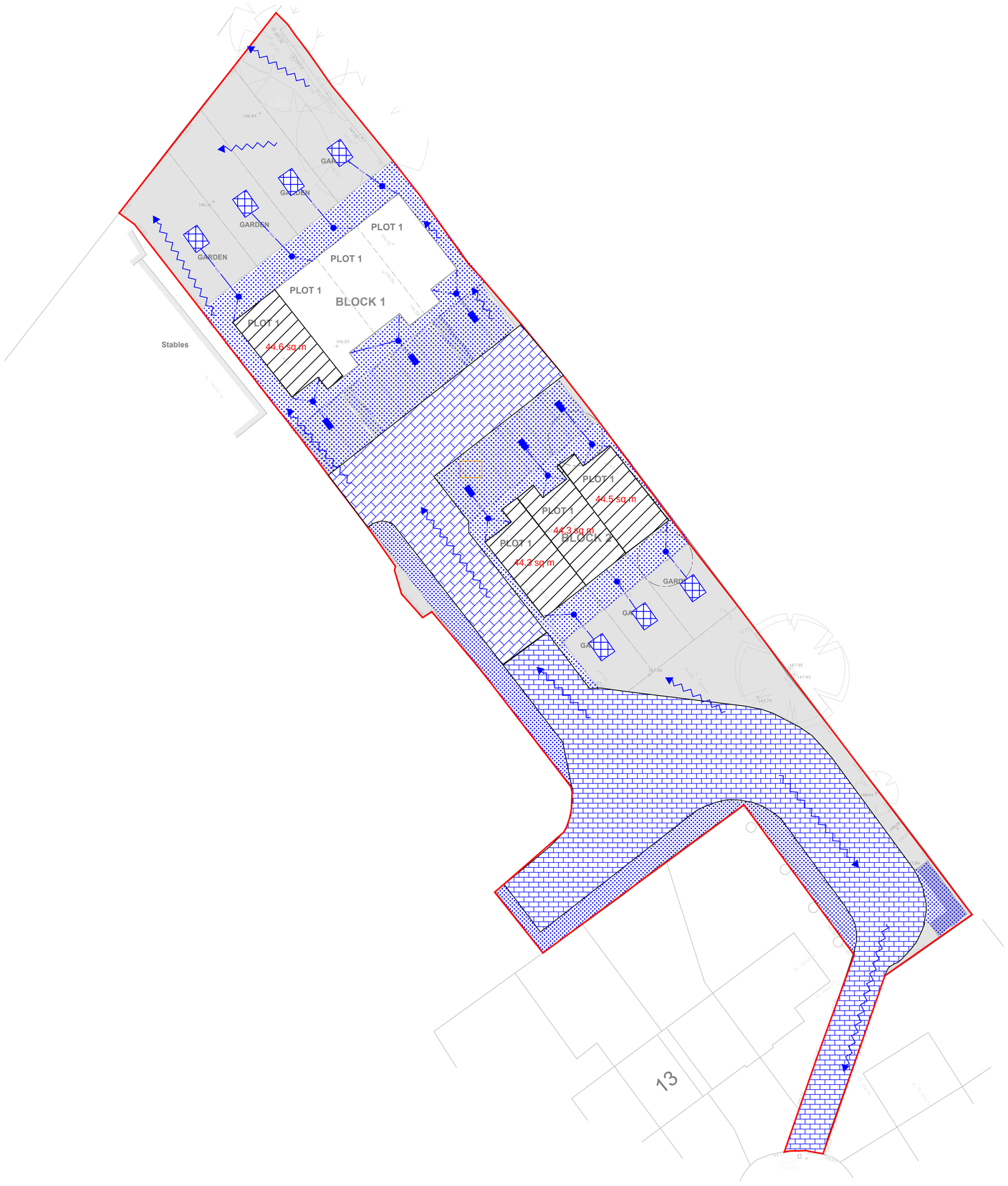
Appendix D



KEY

- Proposed Surface Water Sewer
- Exceedance Flows
- Crate Soakaway 2mx1.5m x 0.8m
- Sump and Dispersion Unit
- Permeable Surface Build-up
  Permeable Topmix
  Tarmac Finish
  400mm Type 3

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Drawing Scale Bar

Drawing scale	Line length	Drawing scale	Line length
1:5 =	0.25 metres	1:200	= 10.0 metres
1:10 =	0.5 metres	1:250	= 12.5 metres
1:20 =	1.0 metres	1:500	= 25.0 metres
1:25 =	1.25 metres	1:1000	= 50.0 metres
1:50	= 2.5 metres	1:1250	= 62.5 metres
1:100	= 5.0 metres	1:2500	= 125 metres

Measure length of line above for checking of scale

GENERAL NOTES

1. All dimensions are in millimetres and levels in m AOD unless stated otherwise.

2. Do not scale. If in any doubt, consult Engineer.

3. Read in conjunction with the architects and engineers schedule drawings.

4. Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.

5. The location of services is shown as indicative. This drawing should be read in conjunction with the utilities drawings. No warranty to their accuracy can be given. The contractor shall take all necessary measures to satisfy himself as to the location of the existing services and connection points. Excavation should be undertaken in compliance with HSG47.

6. Concrete structures design sulphate class and ACEC concrete class unknown.

7. Pipework to be 110mm Thermoplastics U-PVC (Polypipe or similar) installed at levels marked on this drawing. Pipe bedding should be class Z in pipes within 1.5m of the building or shallower than 700mm below ground level. For all other areas the pipe bedding should be class S.

8. Joints and fittings for gravity sewers shall comply with the relevant provisions of BS EN 1401-1, BS EN 1852 and BS EN 12666-1. Pipes shall have a limit of 6% deformation. Pipes shall be SN8 ring stiffness and stamped accordingly. Pipe sections shall not be longer than 3m.

9. Plastic chambers and rings, including demarcation chambers,shall comply with BS EN 3598-1 or BS EN 13598-2 as appropriate.

10. Inspection chamber covers and frames shall comply with the relevant provisions of BS EN 124 and should be double sealed.

11. All inspection chamber covers shall be the non-ventilating type and shall have closed keyways.

12. Testing of pipelines should be as follow:

Gravity Pipework: Air pipe testing. Pipework should withstand a pressure of 100mm water gauge and this should not fall by more than 25mm in a 5minute period. However where traps or gullies are connected they should withstand a pressure of 50mm water gauge and this should not fall by more than 12mm in a 5minute period. It is recommended that pipework installations are tested in sections rather than waiting to complete in one operation.

13. Manhole covers to be set square to the building. Covers of existing manholes to be adjusted to match final ground levels.

14. Granular Bedding for pipes shall be constructed by spreading and compacting granular bedding material over the full width of the pipe trench. After the pipes have been laid, additional granular material shall, if required, be placed and compacted equally on each side of the pipes and, where practicable, this shall be done in sequence with the removal of the trench supports.

Rev	Details	Date	By	Ch'd

Drawing Status:
PRELIMINARY

RIDA
FLOOD RISK ASSESSMENT & DRAINAGE STRATEGIES

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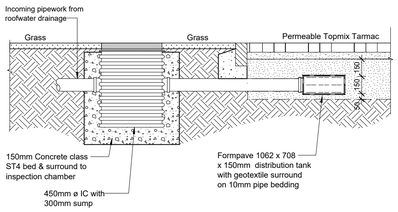
Client:

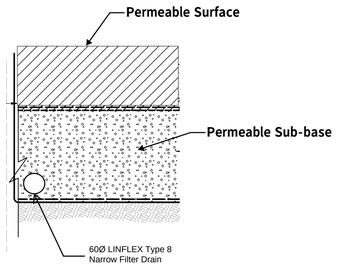
Project:
Land Rear of Firgrove Gardens, Rochdale,OL16 3AF

Drawing:
Proposed Drainage Strategy

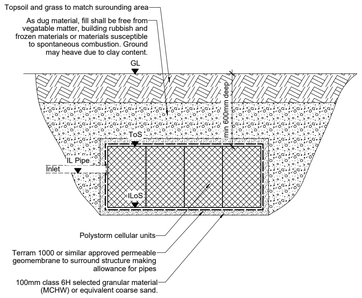
Print Size:	Project No:	Drawing No:	Revision:
A1	0270	003	P1



SD064 - Sump and Dispersion Unit



Perforated Pipe within sub-base



NOTES:

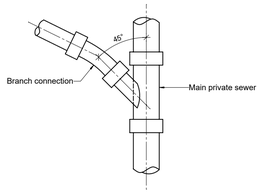
1. Permeable modular storage cell with 95% minimum void ratio. Maximum load 20 tonnes/m².

2. Installation of units as per supplier recommendations.

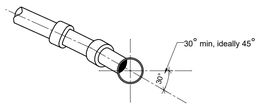
3. Ground may heave due to clay content in the as dug material. Contractor to level ground where required.

4. The area of the infiltration unit and the minimum total storage volume should be as per approved by the local planning authority documents.

Cellular Infiltration System - Landscape Area



PLAN VIEW



SECTION VIEW

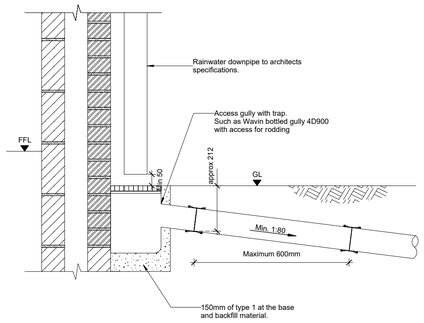
NOTES:

1. The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more than 60°.

2. Where the connection is being made to a sewer with a nominal internal diameter of 300 mm or less, connections should be made using 45° angle, or 90° angle, curved square junctions.

3. Connections made with junction fittings should be made by cutting the existing pipe, inserting the junction fitting and jointing with flexible repair couplings or slip couplers.

Lateral Connection to private sewer

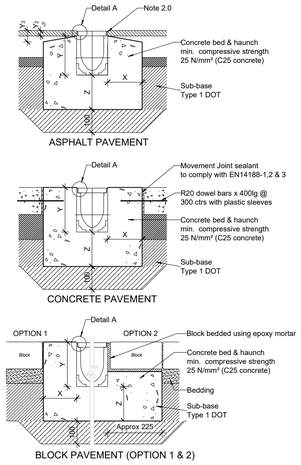


NOTES:

1. This details shows the standard generic arrangement.

2. The pipe and connector details will be different for each manufacturer of the components. They are to be in installed in accordance with the manufacturers recommendations.

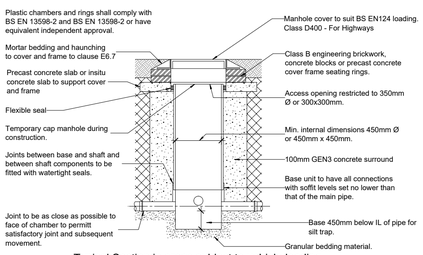
8250 - External Rainwater (High Level)



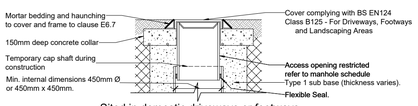
Minimum Dimensions of Concrete Surround

Load Class		A15	B125	C250	D400*	F900
Minimum Dimensions (mm)	X	100	150	150	250	300
	Y	Full Channel Height (Less Y2 where necessary)				
	Z	100	150	150	250	300
Maximum Dimensions (mm)	Y_1	35	35	35	35	35
	Y_2	100	60	60	60	35

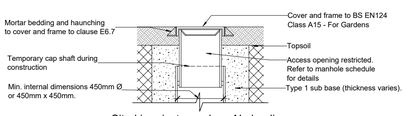
8341 - Linear Drainage Channel Detail (Steel)



Typical Section in areas subject to vehicle loading



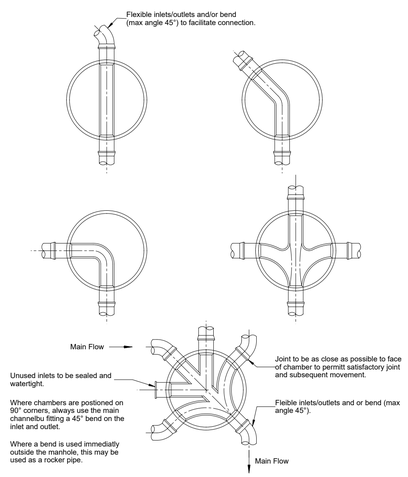
Sited in domestic driveways or footways



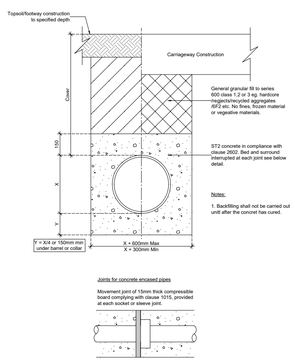
Sited in private garden - No loading

Notes:
1. Refer to drawing 8193 for base layouts.

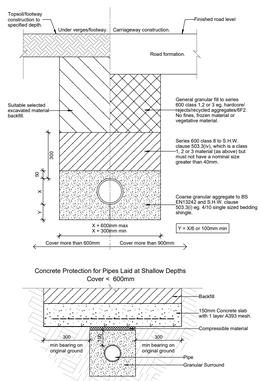
Silt Trap Plastic



Chamber Type 3 Base Layouts



Pipe Bedding Detail Type Z



Pipe Bedding Detail Type S

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Drawing Scale Bar

Drawing scale	Line length	Drawing scale	Line length
1:5 =	0.25 metres	1:200	= 10.0 metres
1:10 =	0.5 metres	1:250	= 12.5 metres
1:20 =	1.0 metres	1:500	= 25.0 metres
1:25 =	1.25 metres	1:1000	= 50.0 metres
1:50 =	2.5 metres	1:1250	= 62.5 metres
1:100 =	5.0 metres	1:2500	= 125 metres

Measure length of line above for checking of scale

GENERAL NOTES

Rev	Details	Date	By	Ch'd

Drawing Status:
PRELIMINARY

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGIES

4 Bean Acre Road, Hook Norton, Banbury, Oxfordshire
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Client:

Project:
Land Rear of Firgrove Gardens, Rochdale,OL16 3AF

Drawing:
Standard Details

Print Size:	Project No:	Drawing No:	Revision:
A1	0270	006	P1