



Detailed Drainage Design

Land Rear of Firgrove Gardens, Rochdale, OL16 3AF
Reference: 270 -Rev - V1

Date: Apr-24

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- 3 Discharge Arrangement
- 4 Peak Runoff
- 5 Proposed Sustainable Drainage
- 6 Maintenance and Management Plan

Appendices

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- B Site Characteristics
- C Drainage Calculations
- D Drainage System General Arrangement

London Office

5th Floor, 167, 169 Great Portland St,
London W1W 5PF

Oxford Office

Oxford Innospace, Old Music Hall, 106-108
Cowley Road, Oxford, OX4 1JE

info@urban-water.co.uk

Purpose of this report

- 1.1 The purpose of this statement is to accompany the detailed technical drawings and details showing the proposed Surface Water drainage system.

Site Characteristics

- 2.1 The site background is clearly identified through answers to the questions in table 1 below.

Table 1: Site Characteristics . See appendix B for support documentation

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 results	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 the site at groundwater flood risk?	No
Contaminated land	Are there contaminated soils on site?	Unknown
Source Protection Zone	Is the site within a SPZ 3?	No
Runoff characteristics	Is the development in a high risk flooding area?	No

Existing and Proposed Site

- 2.2 The distribution of catchment areas for existing and proposed site is as per table 2 below. See appendix A for details

Table 2 : Existing and Proposed catchment areas in hectares

Description	Existing Site	Proposed Site
Impermeable Areas	0.058	0.020
Permeable Areas		
Connected to Drainage	0.000	0.000
Self Draining Areas	0.000	0.118
Areas Draining Away from drainage System	0.157	0.077
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

Evaluation of Discharge Point

3.1 The SuDS design takes into account Building Regulations Section H3 and the National Planning Practice Guidance. The aim is to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer.

3.2 The discharge point has been evaluated following the NPPG and Building regulations. The findings are in table 3 below.

Table 3: Drainage Hierarchy evaluation

Superficial geology classification	The British Geological Society records show that the superficial deposits are Glaciofluvial Deposits, Devensian - Sand and Gravel.
Bedrock geology classification	The British Geological Society records of the site show that it is located within the Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone.
Landis Top Soil Infiltration	The SOILSCAPE's records of the site show that it is located within an area of freely draining soils.
Groundwater	The British Geological Survey's flood risk susceptibility maps show that the development has limited susceptibility to ground water flooding. The risk from groundwater flood to the site is considered very low.
Is infiltration feasible?	Soakaway tests were undertaken for the site. The lowest infiltration rate for this site is 2.691 E-05m/s or 0.0968 m/hr. See Appendix B for details.
Is a discharge to a watercourse possible?	There are no watercourses in the proximity to the site.
Is a discharge to a surface water sewer possible?	There is no surface water sewer in the proximity to the site.
Is a discharge to a combined sewer possible?	There is no combined water sewers in the proximity to the site.

Existing and Proposed Peak Run-off Calculations

- 4.1 The current site is a Brownfield. The peak runoff rate for the existing site was calculated as per table 4 and discharge rates as per table 5.

Table 4: Peak run-off rate calculation method for existing site

Method Used	Calculation Method
	Report 124 Flood Estimation for Small Catchments method has been used to estimate the site peak flow rates
✗	This is a brownfield site, runoff rates are calculated in accordance with best practice simulation modelling and using the modified rational method
	This is a brownfield site where the pre-development drainage isn't known. The runoff rates are calculated using the Greenfield model with soil type 5

- 4.2 The runoff flow produced by the development will be controlled as per table 5.

Table 5: Runoff discharge rate control

Control Used	Description of runoff discharge
✗	Water will be discharged into the ground via a SuDS as described in table 6 below
	The peak discharge rate has been reduced to Greenfield Qbar flow
	The peak discharge rate has been taken as 0.7 l/s as it is not possible to reduce it to the Greenfield Qbar rate
	The peak discharge rate has been reduced to Brownfield pre-development 1 in 1 flow
	The peak discharge rate has been reduced by 60% from the existing Brownfield pre-development 1 in 2 flow rate

Run-off flows

- 4.3 The size of the SuDS has been calculated for all events up to the 1 in 100 including an allowance for climate change of 40%. As per tables above, it is proposed to infiltrate all the flows. See table 6 for values and appendix C for calculations.

Table 6: Peak discharge rates for SuDS

Return Period Event	Discharge Rate (l/s)			Infiltration Rate (m/hr)
	Existing Greenfield	Existing Brownfield	Proposed	
Qbar	1.90	N/A	N/A	0.0969
1 in 1	1.60	9.20	0.0	0.0969
1 in 2	1.80	11.80	0.0	0.0969
1 in 30	3.20	21.70	0.0	0.0969
1 in 30 + CC	N/A	N/A	0.0	0.0969
1 in 100	3.90	27.50	0.0	0.0969
1 in 100 + CC	N/A	N/A	0.0	0.0969

Proposed Sustainable Drainage System

- 5.1 The following sustainable drainage systems have been used for this site. The drainage design uses these drainage system through out the site. See table 7 for details.

Table 7: Proposed Drainage System

SuDS Proposed	Feasible	Proposed
Use of green roofs	No	No
Store rainwater for later use	No	No
Use infiltration techniques, for instance soakaways, permeable surfaces	Yes	Yes
Attenuate rainwater in ponds or open water features for gradual release	No	No
Attenuate rainwater by storing in tanks or sealed water features for gradual release	No	No
Discharge Point Proposed		
Discharge rainwater direct to a watercourse	No	No
Discharge rainwater to a surface water sewer/drain	No	No
Discharge rainwater to the combined sewer	No	No

- 5.2 The location and details of the SuDS can be seen drainage layouts in appendix D. Calculations are in appendix C.
- 5.3 The drainage calculations demonstrate:
- 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
- 5.4 The proposed drainage design demonstrates that the development can be sustainably drained to comply with the requirements of the NPPF.

Management of Exceedance Flows

- 5.5 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. The flood risk to the buildings would therefore remain low. See appendix D.

Water Quality Assessment

- 5.6 The pollution hazard indices for this development has been taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2. The tables below shows the mitigation measure for the highest pollution hazard indices presented in the development.

Table 8: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
TOTAL		0.2	0.2	0.05

Table 9: SuDS Mitigation Indices for worst case**

Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Crate Storage/ Soakaway	0.4	0.3	0.3
TOTAL		0.3	0.3

** Values already reduced as per CIRIA C753

- 5.7 It is demonstrated that the proposed sustainable systems exceeds the required pollution indices and provides sufficient treatment as part of the surface water management train in accordance with the 2015 SuDS Manual (CIRIA C753)

Maintenance and Management plan responsibility

6.1 The SuDS will be maintained by The Owner the property

Maintenance and Management plan for proposed SuDS

6.2 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:

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	Frequency
Inlets, outlets and surface control structures	
Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly
Inspection chambers and below ground control chambers	
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial work	Frequency
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
Repair physical damage if necessary.	As required

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

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 glyphosate 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

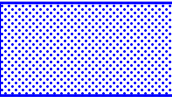
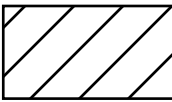
Appendix A

Do not scale from this drawing. Refer to figured dimensions only. RIDA Reports Ltd registered in England and Wales No. 10590566. This drawing is copyright of RIDA Reports Ltd.

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	Chd

Drawing Status:
PRELIMINARY



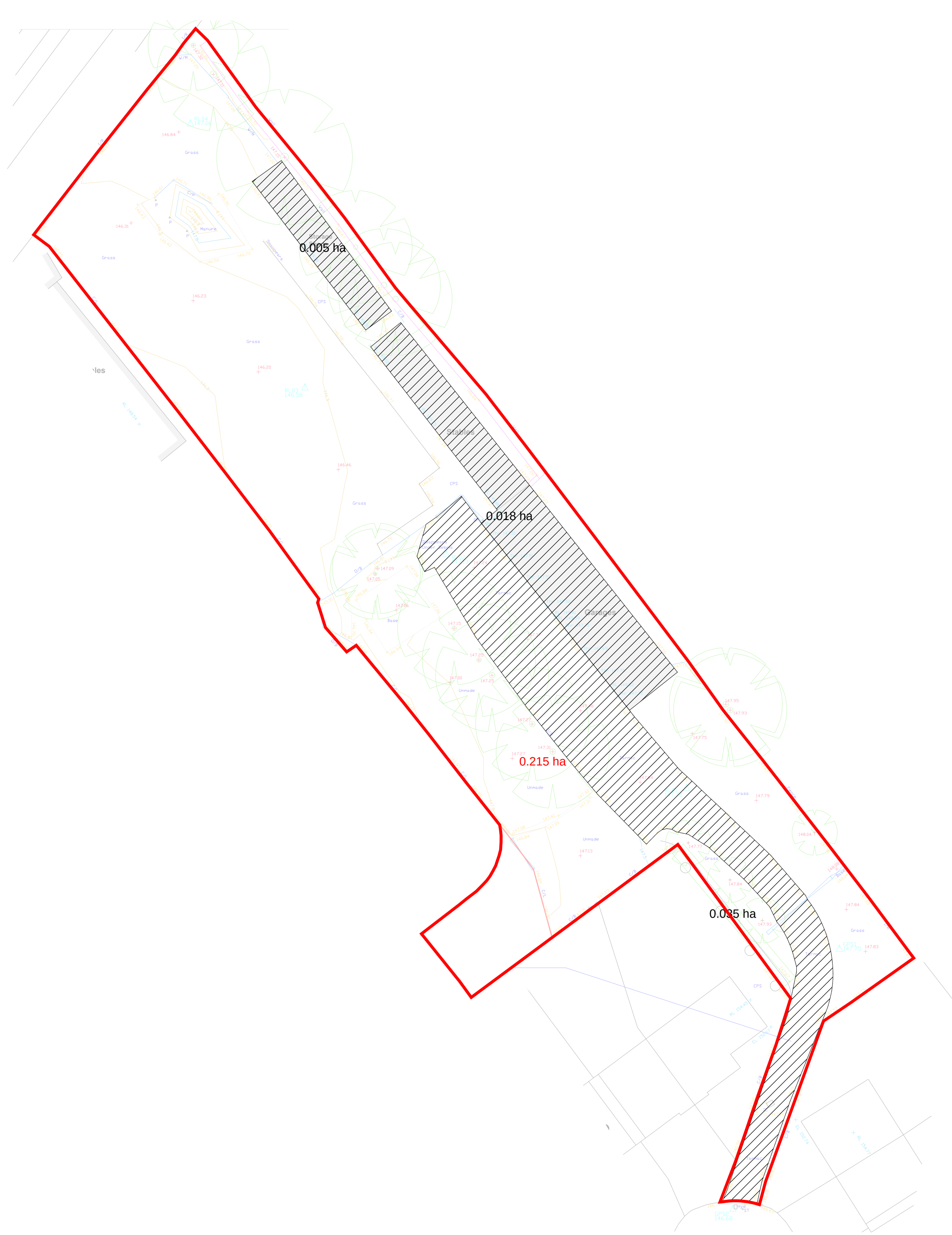
4 Beem Acre Road, Hook Norton, Banbury, Oxfordshire
e: info@rida-reports.co.uk
t: 01608 510 121
www.rida-reports.co.uk

Client:

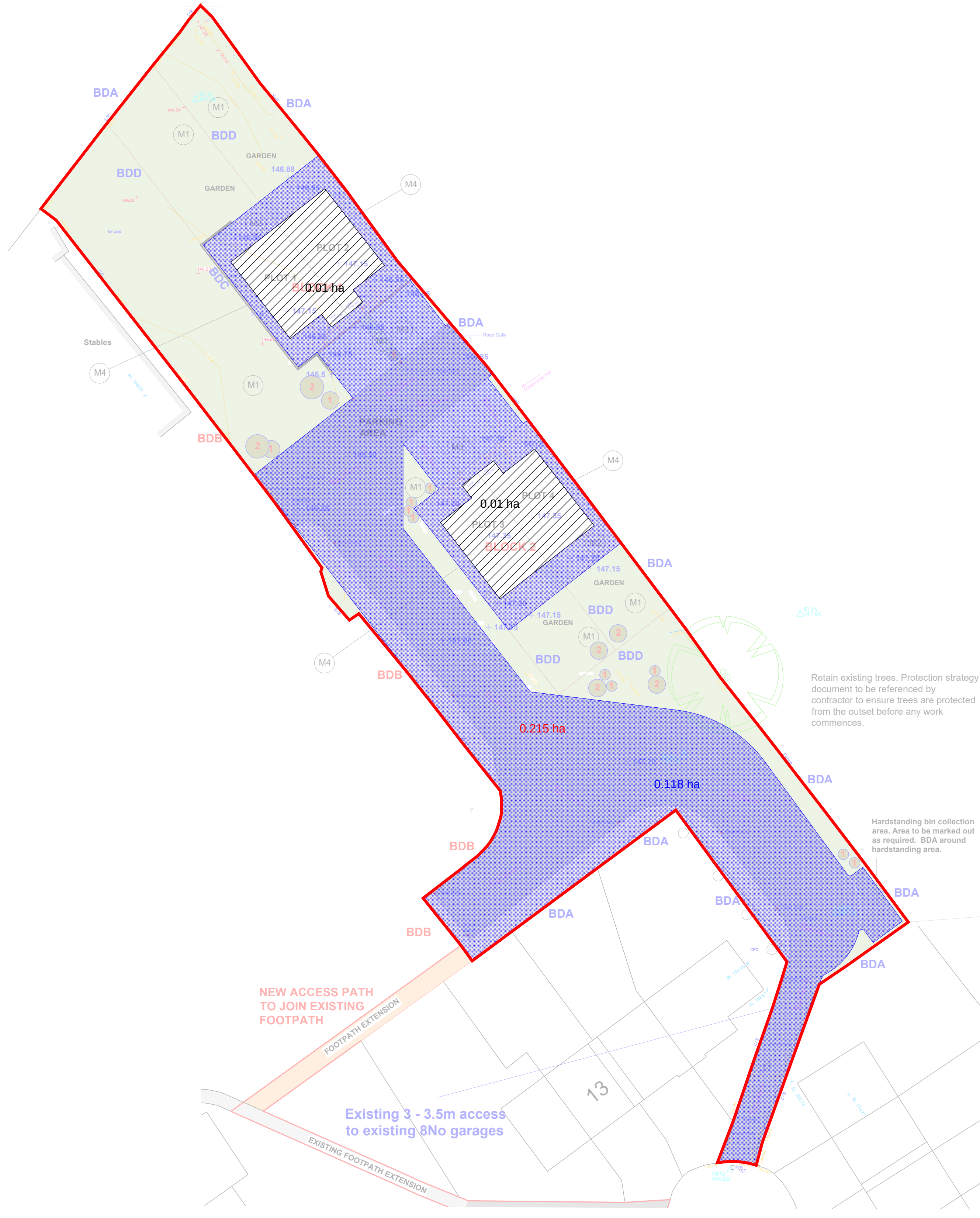
Project:
Land Rear of Firgrove Gardens, Rochdale, OL16 3AF

Drawing:
**Existing and Proposed Areas
Permeable and Impermeable**

Print Size	Project No	Drawing No	Revision
A1	0270	002	P1



EXISTING SITE 1:250



PROPOSED SITE 1:250



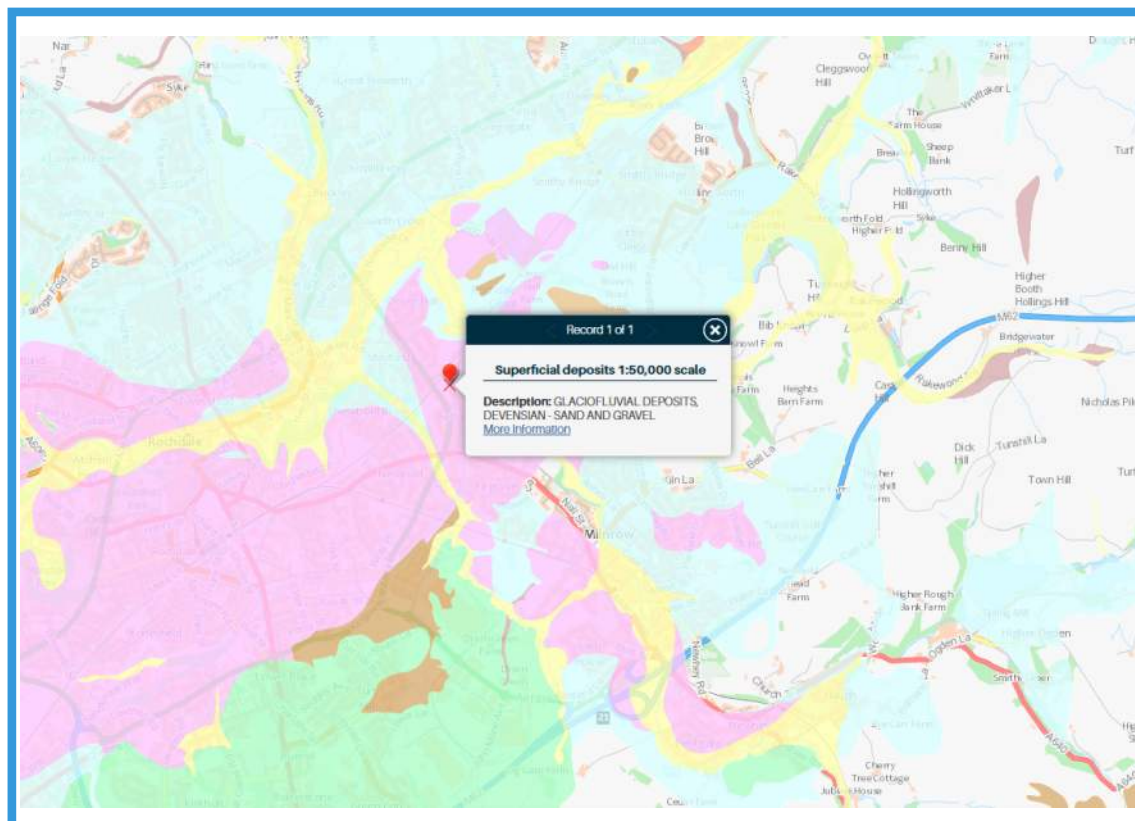
Appendix B

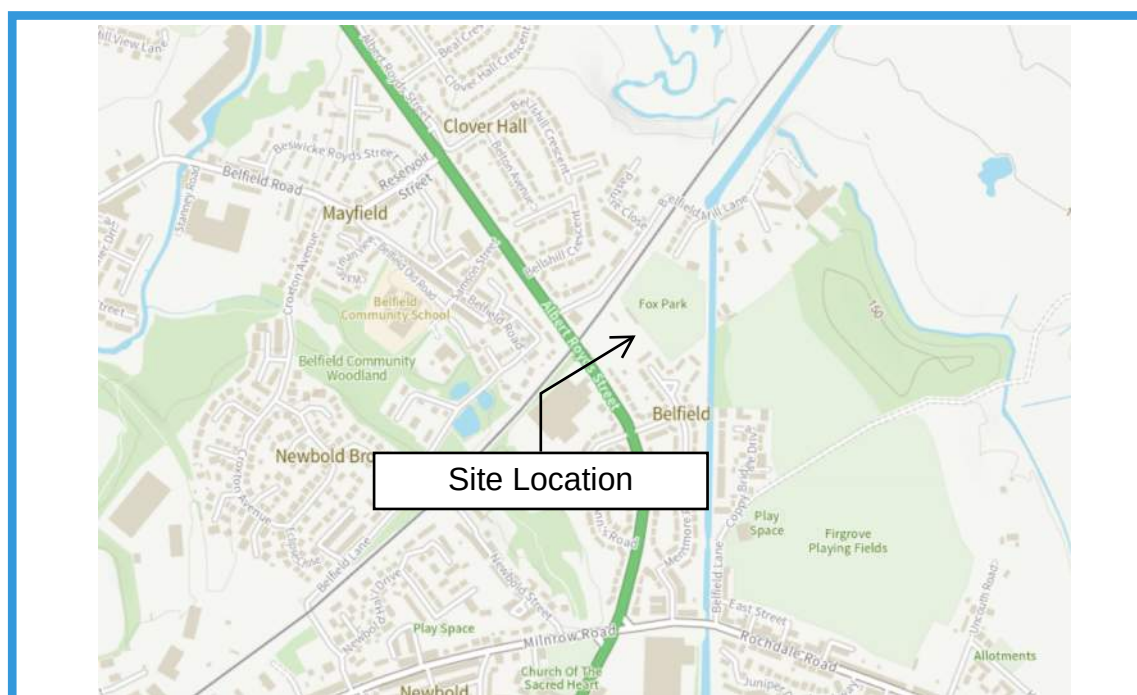
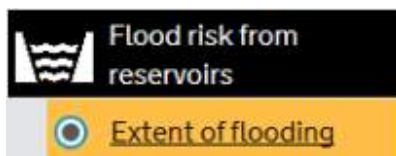
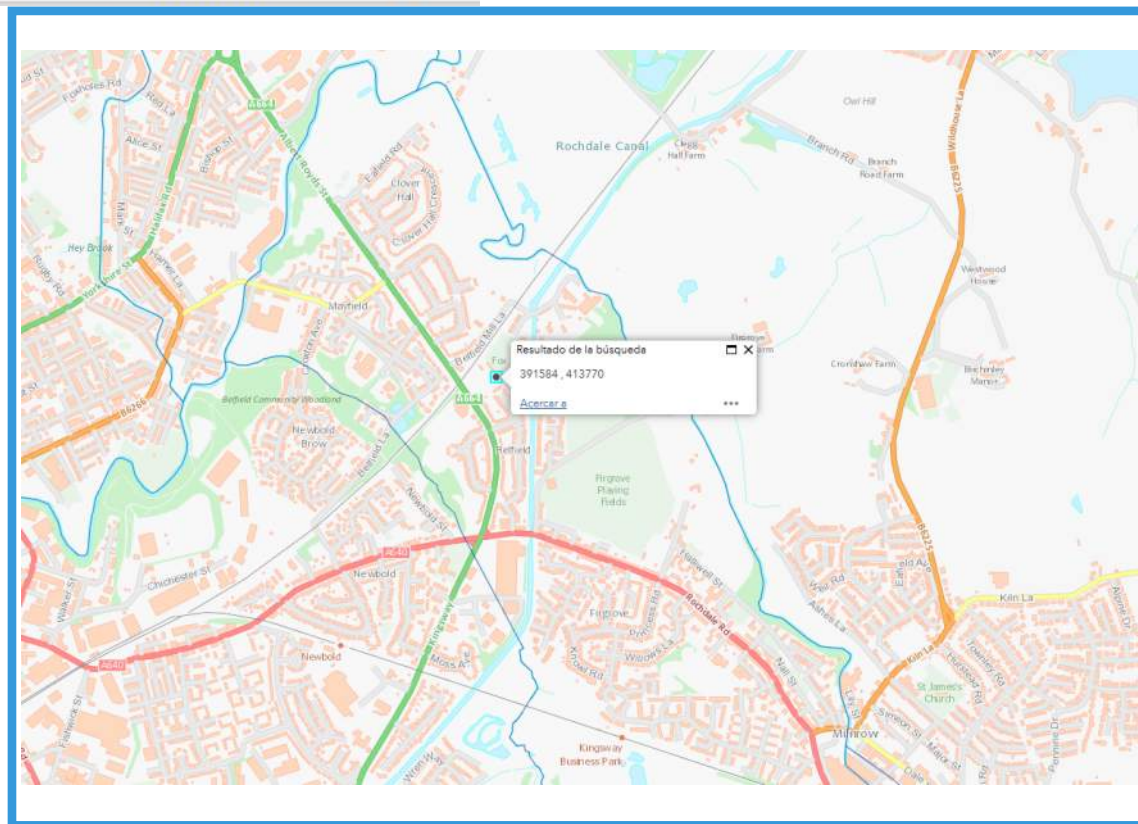


GEOLOGY - BEDROCK - PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE

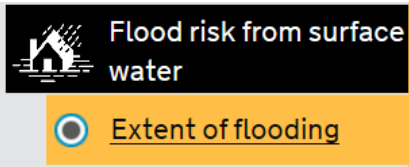


GEOLOGY - SUPERFICIAL DEPOSITS - GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL

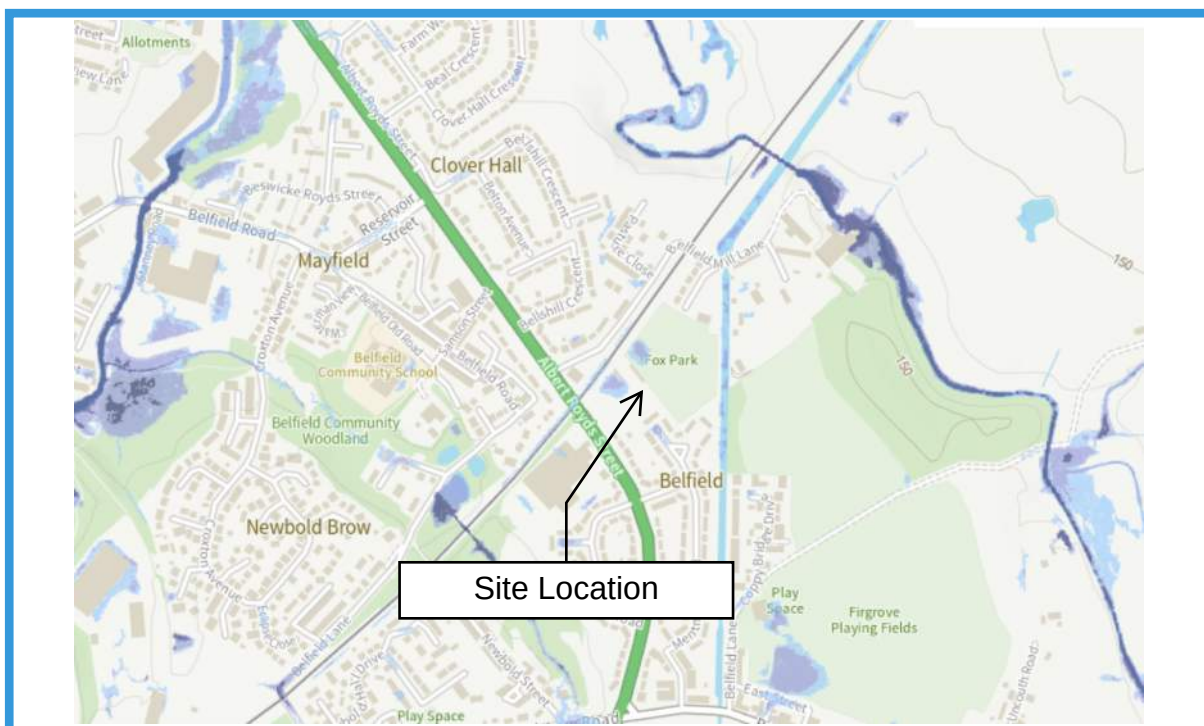
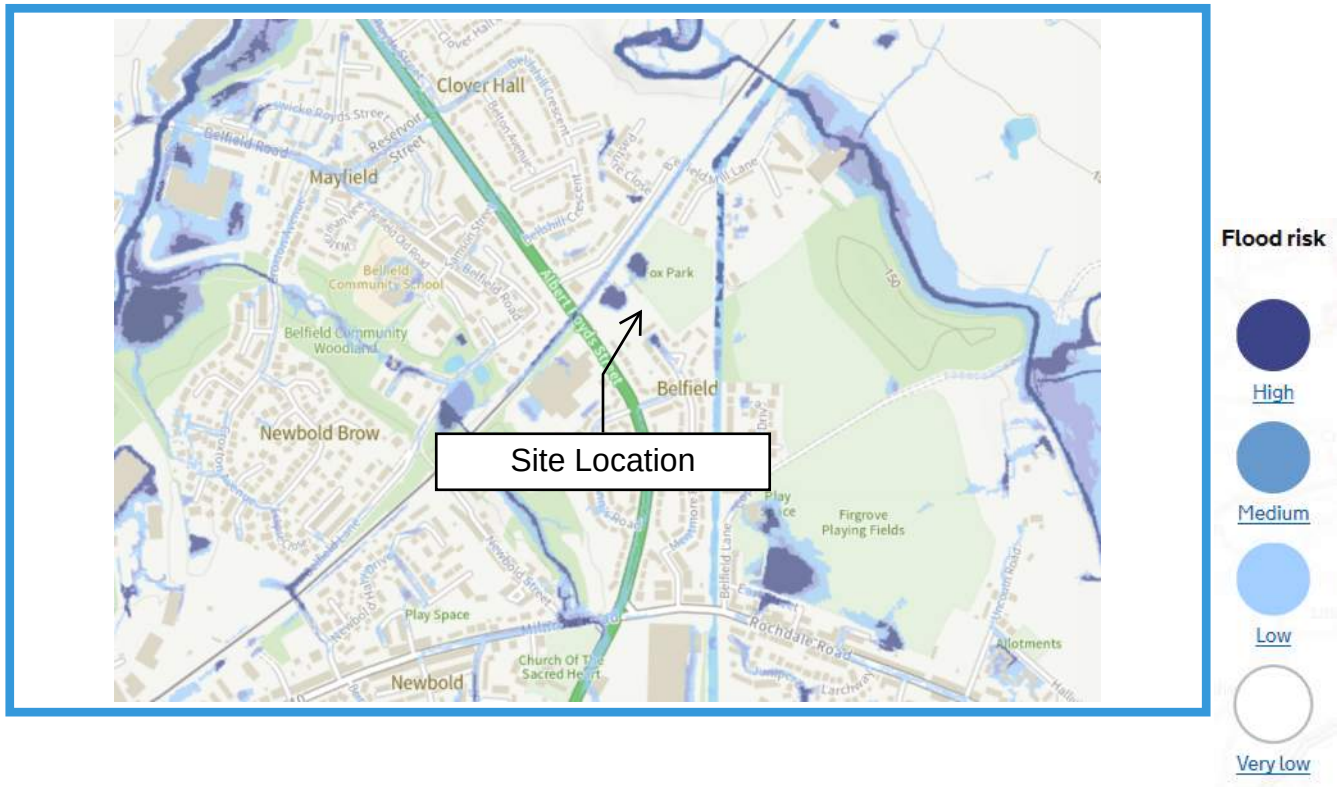




SITE SURFACE WATER FLOOD RISK

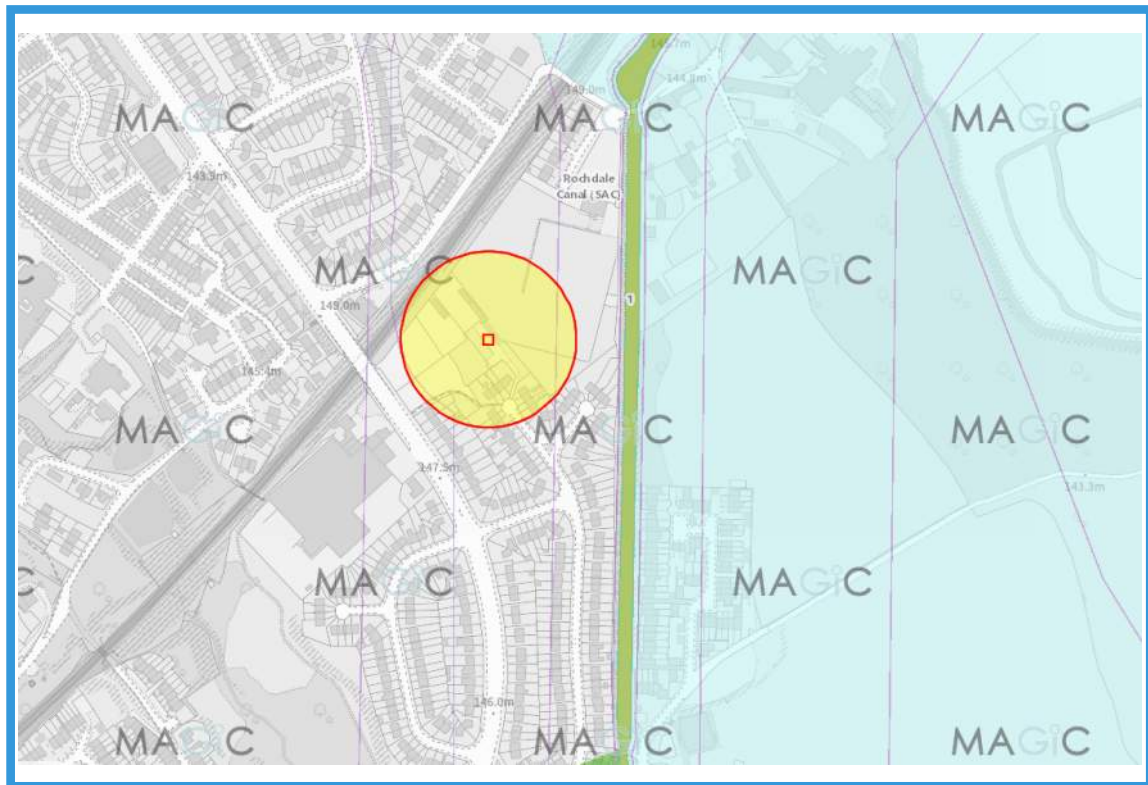


High risk means a chance of flooding greater than 3.3% (1:30)
 Medium risk means a chance of flooding of btw 1% (1:100) and 3.3%
 Low risk means a chance of flooding of btw 0.1% (1:1000) and 1%
 Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast.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



Over 900mm 300 to 900mm Below 300mm

MAGIC RESULTS



Site Check Results

Site Check Report Report generated on Tue Apr 09 2024

You selected the location: Centroid Grid Ref: SD91571377

The following features have been found in your search area:

Aquifer Designation Map (Bedrock) (England)

Typology

Secondary A

Aquifer Designation Map (Superficial Drift) (England)

Typology

Secondary A

Source Protection Zones merged (England)

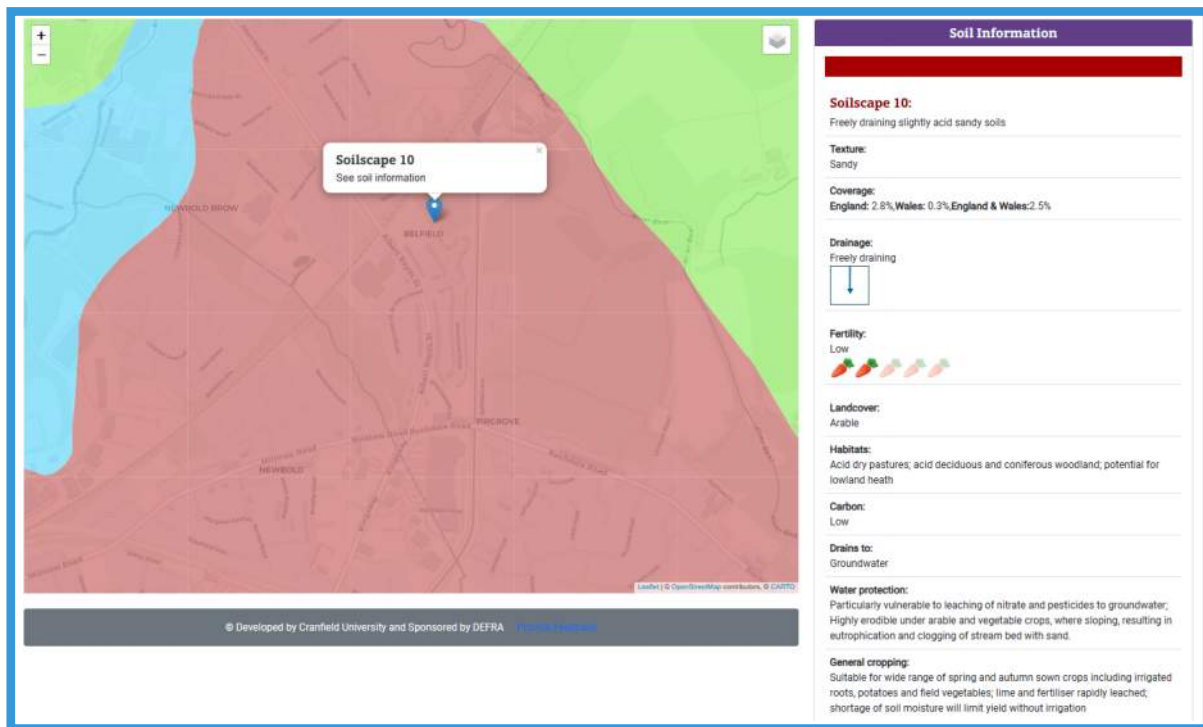
No Features found

OK

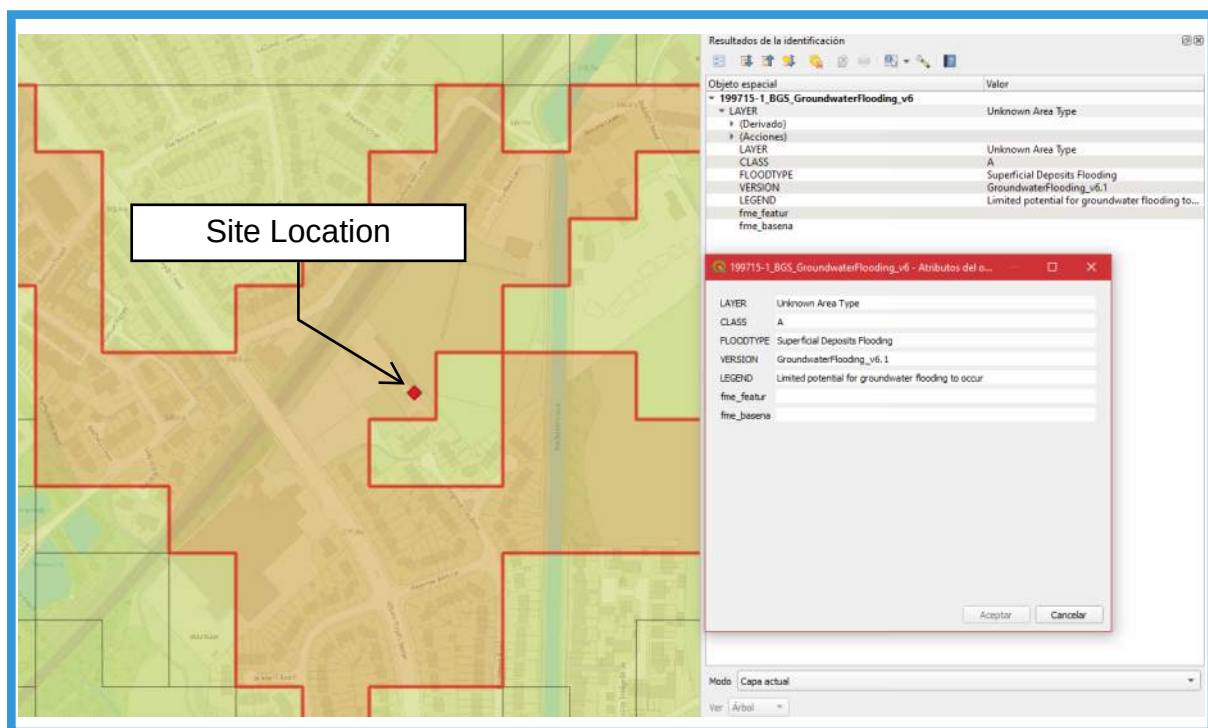
Cancel

Export to CSV

Print



GROUND WATER FLOOD RISK



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
391572/413775

Created
9 Apr 2024 12:08

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

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

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.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
391572/413775

Scale
1:2500

Created
9 Apr 2024 12:08

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area


0 20 40 60m

SSSI Impact Risk Zones - to assess planning applications for likely impacts on SSSIs/SACs/SPAs & Ramsar sites (England)

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?	2. IF YES, CHECK THE CORRESPONDING DESCRIPTION(S) BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:
All Planning Applications	ALL PLANNING APPLICATIONS - EXCEPT HOUSEHOLDER APPLICATIONS.
Infrastructure	
Wind & Solar Energy	
Minerals, Oil & Gas	
Rural Non Residential	
Residential	
Rural Residential	
Air Pollution	
Combustion	
Waste	
Composting	
Discharges	
Water Supply	
Notes 1	
Notes 2	
GUIDANCE - How to use the Impact Risk Zones	/Metadata for magic/SSSI IRZ User Guidance MAGIC.pdf

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?	2. IF YES, CHECK THE CORRESPONDING DESCRIPTION(S) BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:
All Planning Applications	
Infrastructure	Pipelines and underground cables, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals.
Wind & Solar Energy	
Minerals, Oil & Gas	Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction.
Rural Non Residential	
Residential	Residential development of 50 units or more.
Rural Residential	Any residential development of 10 or more houses outside existing settlements/urban areas.
Air Pollution	Any development that could cause AIR POLLUTION or DUST either in its construction or operation (incl: industrial/commercial processes, livestock & poultry units, slurry lagoons & digestate stores, manure stores).
Combustion	All general combustion processes. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.
Waste	Mechanical and biological waste treatment, inert landfill, non-hazardous landfill, hazardous landfill, household civic amenity recycling facilities construction, demolition and excavation waste, other waste management.
Composting	Any composting proposal. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management.
Discharges	
Water Supply	Large infrastructure such as warehousing / industry where net additional gross internal floorspace is > 1,000m² or any development needing its own water supply .
Notes 1	
Notes 2	
GUIDANCE - How to use the Impact Risk Zones	/Metadata for magic/SSSI IRZ User Guidance MAGIC.pdf

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?	2. IF YES, CHECK THE CORRESPONDING DESCRIPTION(S) BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:
All Planning Applications	
Infrastructure	Pipelines and underground cables, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals.
Wind & Solar Energy	
Minerals, Oil & Gas	Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction.
Rural Non Residential	Large non residential developments outside existing settlements/urban areas where net additional gross internal floorspace is > 1,000m² or footprint exceeds 0.2ha.
Residential	Residential development of 50 units or more.
Rural Residential	Any residential development of 10 or more houses outside existing settlements/urban areas.
Air Pollution	Any development that could cause AIR POLLUTION or DUST either in its construction or operation (incl: industrial/commercial processes, livestock & poultry units, slurry lagoons & digestate stores, manure stores).
Combustion	All general combustion processes. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.
Waste	Mechanical and biological waste treatment, inert landfill, non-hazardous landfill, hazardous landfill, household civic amenity recycling facilities construction, demolition and excavation waste, other waste management.
Composting	Any composting proposal. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management.
Discharges	Any discharge of water or liquid waste that is discharged to ground (ie to seep away) or to surface water, such as a beck or stream.
Water Supply	Large infrastructure such as warehousing / industry where net additional gross internal floorspace is > 1,000m² or any development needing its own water supply .
Notes 1	
Notes 2	
GUIDANCE - How to use the Impact Risk Zones	/Metadata for magic/SSSI IRZ User Guidance MAGIC.pdf

Aquifer Designation Map (Bedrock) (England)

Typology	Secondary A
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Aquifer Designation Map (Superficial Drift) (England)

Typology	Secondary A
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Soilscape (England)

Reference	10
Name	FREELY DRAINING SLIGHTLY ACID SANDY SOILS
Main Surface Texture Class	SANDY
Natural Drainage Type	FREELY DRAINING
Natural Fertility	LOW
Characteristic Semi-natural Habitats	ACID DRY PASTURES; ACID DECIDUOUS AND CONIFEROUS WOODLAND
Main Land Cover	ARABLE
Hyperlink	/Metadata_for_magic/soilscape_summary.pdf

Areas of Outstanding Natural Beauty (England)

No Features found

Limestone Pavement Orders (England)

No Features found

Local Nature Reserves (England) - points

No Features found

Local Nature Reserves (England)

No Features found

Moorland Line (England)

No Features found

National Nature Reserves (England) - points

No Features found

National Nature Reserves (England)

No Features found

National Parks (England)

No Features found

Ramsar Sites (England) - points

No Features found

Ramsar Sites (England)

No Features found

Proposed Ramsar Sites (England) - points

No Features found

Proposed Ramsar Sites (England)

No Features found

Sites of Special Scientific Interest Units (England) - points

No Features found

Sites of Special Scientific Interest Units (England)

No Features found

Sites of Special Scientific Interest (England) - points

No Features found

Sites of Special Scientific Interest (England)

No Features found

Special Areas of Conservation (England) - points

No Features found

Special Areas of Conservation (England)

No Features found

Possible Special Areas of Conservation (England) - points

No Features found

Possible Special Areas of Conservation (England)

No Features found

Special Protection Areas (England) - points

No Features found

Special Protection Areas (England)

No Features found

Potential Special Protection Areas (England) - points

No Features found

Potential Special Protection Areas (England)

No Features found

Biosphere Reserves (England) - points

No Features found

Biosphere Reserves (England)

No Features found

Less Favoured Areas (England)

No Features found

Nitrate Vulnerable Zones 2017 Designations (England)

No Features found

Wild Bird General Licence Protected Sites Condition Zone (England)
No Features found

Source Protection Zones merged (England)
No Features found



URBANWATER

TEST 1

L:	1300	mm
W:	1300	mm
D:	1300	mm

Input
Calculation

2.99	m2
500	mm
125	mm of water

Time Water Depth

0	500
15	0

Interpolating Values

0	500
15	0

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	7.5	min or 0.125 hr

Test 1 - Soil Infiltration rate:	3.14E-04	m/s
	1.1304	m/hr

SOAKAWAY TRIAL PIT 1

TEST 2

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
12:00	1.0
12:05	1.2
12:10	1.5
12:15	1.8
12:20	2.0
12:25	2.2
12:30	2.5
12:35	2.8
12:40	3.0
12:45	3.2
12:50	3.5
12:55	3.8
13:00	4.0
13:05	4.2
13:10	4.5
13:15	4.8
13:20	5.0
13:25	5.2
13:30	5.5
13:35	5.8
13:40	6.0
13:45	6.2
13:50	6.5
13:55	6.8
14:00	7.0
14:05	7.2
14:10	7.5
14:15	7.8
14:20	8.0
14:25	8.2
14:30	8.5
14:35	8.8
14:40	9.0
14:45	9.2
14:50	9.5
14:55	9.8
15:00	10.0
15:05	10.2
15:10	10.5
15:15	10.8
15:20	11.0
15:25	11.2
15:30	11.5
15:35	11.8
15:40	12.0
15:45	12.2
15:50	12.5
15:55	12.8
16:00	13.0
16:05	13.2
16:10	13.5
16:15	13.8
16:20	14.0
16:25	14.2
16:30	14.5
16:35	14.8
16:40	15.0
16:45	15.2
16:50	15.5
16:55	15.8
17:00	16.0
17:05	16.2
17:10	16.5
17:15	16.8
17:20	17.0
17:25	17.2
17:30	17.5
17:35	17.8
17:40	18.0
17:45	18.2
17:50	18.5
17:55	18.8
18:00	19.0
18:05	19.2
18:10	19.5
18:15	19.8
18:20	20.0
18:25	20.2
18:30	20.5
18:35	20.8
18:40	21.0
18:45	21.2
18:50	21.5
18:55	21.8
19:00	22.0
19:05	22.2
19:10	22.5
19:15	22.8
19:20	23.0
19:25	23.2
19:30	23.5
19:35	23.8
19:40	24.0
19:45	24.2
19:50	24.5
19:55	24.8
20:00	25.0
20:05	25.2
20:10	25.5
20:15	25.8
20:20	26.0
20:25	26.2
20:30	26.5
20:35	26.8
20:40	27.0
20:45	27.2
20:50	27.5
20:55	27.8
21:00	28.0
21:05	28.2
21:10	28.5
21:15	28.8
21:20	29.0
21:25	29.2
21:30	29.5
21:35	29.8
21:40	30.0
21:45	30.2
21:50	30.5
21:55	30.8
22:00	31.0
22:05	31.2
22:10	31.5
22:15	31.8
22:20	32.0
22:25	32.2
22:30	32.5
22:35	32.8
22:40	33.0
22:45	33.2
22:50	33.5
22:55	33.8
23:00	34.0
23:05	34.2
23:10	34.5
23:15	34.8
23:20	35.0
23:25	35.2
23:30	35.5
23:35	35.8
23:40	36.0
23:45	36.2
23:50	36.5
23:55	36.8
00:00	37.0
00:05	37.2
0	

0	500
15	0

t: **11.25** min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
15	0

t: **3.75** min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	7.5	min or 0.125 hr

Test 2 - Soil Infiltration rate:	3.14E-04	m/s
	1.1304	m/hr

SOAKAWAY TRIAL PIT 1

TEST 3

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
------	-------------

0	500
15	0

t: **11.25** min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time	Water Depth
------	-------------

0	500
15	0

t: **3.75** min. From interpolating values[illegible]

Volume of test Pit between 25% and 75% of water depth: 0.423 m3
Time Taken to drain between 25% and 75% of water depth: 7.5 min or 0.125 hr

Test 3 - Soil Infiltration rate:	3.14E-04	m/s
	1.1304	m/hr

SOAKAWAY TRIAL PIT 1 INFILTRATION RATE	3.14E-04	m/s
	1.1304	m/hr



URBANWATER

TEST 1

L:	1300	mm
W:	1300	mm
D:	1300	mm

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

30	250
80	0

t: 55 min. From interpolating values

10	400
20	300

t: 12.5 min. From interpolating values

Test 1 - Soil Infiltration rate:	5.54E-05	m/s
	0.1995	m/hr

SOAKAWAY TRIAL PIT 2

TEST 2

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
12:00	1.0
12:05	1.2
12:10	1.5
12:15	1.8
12:20	2.0
12:25	2.2
12:30	2.5
12:35	2.8
12:40	3.0
12:45	3.2
12:50	3.5
12:55	3.8
13:00	4.0
13:05	4.2
13:10	4.5
13:15	4.8
13:20	5.0
13:25	5.2
13:30	5.5
13:35	5.8
13:40	6.0
13:45	6.2
13:50	6.5
13:55	6.8
14:00	7.0
14:05	7.2
14:10	7.5
14:15	7.8
14:20	8.0
14:25	8.2
14:30	8.5
14:35	8.8
14:40	9.0
14:45	9.2
14:50	9.5
14:55	9.8
15:00	10.0
15:05	10.2
15:10	10.5
15:15	10.8
15:20	11.0
15:25	11.2
15:30	11.5
15:35	11.8
15:40	12.0
15:45	12.2
15:50	12.5
15:55	12.8
16:00	13.0
16:05	13.2
16:10	13.5
16:15	13.8
16:20	14.0
16:25	14.2
16:30	14.5
16:35	14.8
16:40	15.0
16:45	15.2
16:50	15.5
16:55	15.8
17:00	16.0
17:05	16.2
17:10	16.5
17:15	16.8
17:20	17.0
17:25	17.2
17:30	17.5
17:35	17.8
17:40	18.0
17:45	18.2
17:50	18.5
17:55	18.8
18:00	19.0
18:05	19.2
18:10	19.5
18:15	19.8
18:20	20.0
18:25	20.2
18:30	20.5
18:35	20.8
18:40	21.0
18:45	21.2
18:50	21.5
18:55	21.8
19:00	22.0
19:05	22.2
19:10	22.5
19:15	22.8
19:20	23.0
19:25	23.2
19:30	23.5
19:35	23.8
19:40	24.0
19:45	24.2
19:50	24.5
19:55	24.8
20:00	25.0
20:05	25.2
20:10	25.5
20:15	25.8
20:20	26.0
20:25	26.2
20:30	26.5
20:35	26.8
20:40	27.0
20:45	27.2
20:50	27.5
20:55	27.8
21:00	28.0
21:05	28.2
21:10	28.5
21:15	28.8
21:20	29.0
21:25	29.2
21:30	29.5
21:35	29.8
21:40	30.0
21:45	30.2
21:50	30.5
21:55	30.8
22:00	31.0
22:05	31.2
22:10	31.5
22:15	31.8
22:20	32.0
22:25	32.2
22:30	32.5
22:35	32.8
22:40	33.0
22:45	33.2
22:50	33.5
22:55	33.8
23:00	34.0
23:05	34.2
23:10	34.5
23:15	34.8
23:20	35.0
23:25	35.2
23:30	35.5
23:35	35.8
23:40	36.0
23:45	36.2
23:50	36.5
23:55	36.8
00:00	37.0
00:05	37.2
0	

30	300
80	0

t: **59.17** min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

10	400
20	350

t:	15 min. From interpolating values
----	-----------------------------------

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	44.17	min or 0.736 hr

Test 2 - Soil Infiltration rate:	5.33E-05	m/s
	0.1920	m/hr

SOAKAWAY TRIAL PIT 2

TEST 3

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
------	-------------

30	300
90	0

t: **65** min. From interpolating values

Time at 75% or at **375** mm of water

Interpolating Values

Time Water Depth

10	400
20	350

t: 15 min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	50	min or 0.833 hr

Test 3 - Soil Infiltration rate:	4.71E-05	m/s
	0.1696	m/hr

SOAKAWAY TRIAL PIT 2 INFILTRATION RATE	4.71E-05	m/s
	0.1696	m/hr



URBANWATER

TEST 1

Key

Input
Calculation

Interpolating Values

Time	Water Depth
------	-------------

10	300
20	100

Interpolating Values
Time Water Depth

0	500
10	300

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	12.5	min or 0.208 hr

Test 1 - Soil Infiltration rate:	1.88E-04	m/s
	0.6783	m/hr

SOAKAWAY TRIAL PIT 3

TEST 2

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time Water Depth

10	200
20	80

t: **16.25** min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
10	200

t: **4.167** min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	12.08	min or 0.201 hr

Test 2 - Soil Infiltration rate:	1.95E-04	m/s
	0.7016	m/hr

SOAKAWAY TRIAL PIT 3

TEST 3

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
------	-------------

10	240
----	-----

	20	100
t:	18.21	min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
---	-----

	10	240
t:	4.808	min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth: 0.423 m3
Time Taken to drain between 25% and 75% of water depth: 13.41 min or 0.223 hr

Test 3 - Soil Infiltration rate:	1.76E-04	m/s
	0.6324	m/hr

SOAKAWAY TRIAL PIT 3 INFILTRATION RATE	1.76E-04	m/s
	0.6324	m/hr

Project:	[0270] Land Rear of Firgrove Gardens, Rochdale,OL16 3AF	
Calculation By:	Mario Mora	
Title :	Soakaway Calculation	
Date:	09/04/2024	

SOAKAWAY TRIAL PIT 4

TEST 1

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input

Calculation

[illegible]

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
0	500
15	0

t: **11.25** min. From interpolating values

Time at 75% or at **375** mm of water

Interpolating Values

Time	Water Depth
0	500
15	0

t: **3.75** min. From interpolating values

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	7.5	min or 0.125 hr

Test 1 - Soil Infiltration rate:	3.14E-04	m/s
	1.1304	m/hr

SOAKAWAY TRIAL PIT 4

TEST 2

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
------	-------------

0	500
---	-----

20	0
----	---

t:	15 min. From interpolating values
----	-----------------------------------

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
---	-----

20	0
t: 5	min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth: 0.423 m3
Time Taken to drain between 25% and 75% of water depth: 10 min or 0.167 hr

Test 2 - Soil Infiltration rate:	2.36E-04	m/s
	0.8478	m/hr

SOAKAWAY TRIAL PIT 4

TEST 3

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Diagram illustrating the structure of a neural network layer, showing two components: Input and Calculation.

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time Water Depth

0	500
20	0

t: 15 min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
20	0

t:	5 min. From interpolating values
----	----------------------------------

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	10	min or 0.167 hr

Test 3 - Soil Infiltration rate:	2.36E-04	m/s
	0.8478	m/hr

SOAKAWAY TRIAL PIT 4 INFILTRATION RATE	2.36E-04	m/s
	0.8478	m/hr



URBANWATER

TEST 1

Key

Input
Calculation

Interpolating Values	
Time	Water Depth

10	400
120	0

Interpolating Values

Time	Water Depth
------	-------------

t: **16.88** min. From interpolating values

Test 1 - Soil Infiltration rate:	3.43E-05	m/s
	0.1233	m/hr

SOAKAWAY TRIAL PIT 5

TEST 2

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Diagram illustrating the structure of a neural network layer, showing two components: Input and Calculation.

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
12:00	1.2
12:05	1.5
12:10	1.8
12:15	2.1
12:20	2.4
12:25	2.7
12:30	3.0
12:35	3.3
12:40	3.6
12:45	3.9
12:50	4.2
12:55	4.5
13:00	4.8
13:05	5.1
13:10	5.4
13:15	5.7
13:20	6.0
13:25	6.3
13:30	6.6
13:35	6.9
13:40	7.2
13:45	7.5
13:50	7.8
13:55	8.1
14:00	8.4
14:05	8.7
14:10	9.0
14:15	9.3
14:20	9.6
14:25	9.9
14:30	10.2
14:35	10.5
14:40	10.8
14:45	11.1
14:50	11.4
14:55	11.7
15:00	12.0
15:05	12.3
15:10	12.6
15:15	12.9
15:20	13.2
15:25	13.5
15:30	13.8
15:35	14.1
15:40	14.4
15:45	14.7
15:50	15.0
15:55	15.3
16:00	15.6
16:05	15.9
16:10	16.2
16:15	16.5
16:20	16.8
16:25	17.1
16:30	17.4
16:35	17.7
16:40	18.0
16:45	18.3
16:50	18.6
16:55	18.9
17:00	19.2
17:05	19.5
17:10	19.8
17:15	20.1
17:20	20.4
17:25	20.7
17:30	21.0
17:35	21.3
17:40	21.6
17:45	21.9
17:50	22.2
17:55	22.5
18:00	22.8
18:05	23.1
18:10	23.4
18:15	23.7
18:20	24.0
18:25	24.3
18:30	24.6
18:35	24.9
18:40	25.2
18:45	25.5
18:50	25.8
18:55	26.1
19:00	26.4
19:05	26.7
19:10	27.0
19:15	27.3
19:20	27.6
19:25	27.9
19:30	28.2
19:35	28.5
19:40	28.8
19:45	29.1
19:50	29.4
19:55	29.7
20:00	30.0
20:05	30.3
20:10	30.6
20:15	30.9
20:20	31.2
20:25	31.5
20:30	31.8
20:35	32.1
20:40	32.4
20:45	32.7
20:50	33.0
20:55	33.3
21:00	33.6
21:05	33.9
21:10	34.2
21:15	34.5
21:20	34.8
21:25	35.1
21:30	35.4
21:35	35.7
21:40	36.0
21:45	36.3
21:50	36.6
21:55	36.9
22:00	37.2
22:05	37.5
22:10	37.8
22:15	38.1
22:20	38.4
22:25	38.7
22:30	39.0
22:35	39.3
22:40	39.6
22:45	39.9
22:50	40.2
22:55	40.5
23:00	40.8
23:05	41.1
23:10	41.4
23:15	41.7
23:20	42.0
23:25	42.3
23:30	42.6
23:35	42.9
23:40	43.2
23:45	43.5
23:50	43.8
23:55	44.1
00:00	44.4
00:05	44.7

10	400
120	0

t: **85.63** min. From interpolating values

Time at 75% or at **375** mm of water

Interpolating Values

Time Water Depth

10	400
120	0

t: **16.88** min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	68.75	min or 1.146 hr

Test 2 - Soil Infiltration rate:	3.43E-05	m/s
	0.1233	m/hr

SOAKAWAY TRIAL PIT 5

TEST 3

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Diagram illustrating the structure of a neural network layer, showing two components: Input and Calculation.

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time Water Depth

10	400
150	0

t: **106.3** min. From interpolating values

Time at 75% or at **375** mm of water

Interpolating Values

Time Water Depth

10	400
150	0

t: **18.75** min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	87.5	min or 1.458 hr

Test 3 - Soil Infiltration rate:	2.69E-05	m/s
	0.0969	m/hr

SOAKAWAY TRIAL PIT 5 INFILTRATION RATE	2.69E-05	m/s
	0.0969	m/hr

Project:	[0270] Land Rear of Firgrove Gardens, Rochdale, OL16 3AF	
Calculation By:	Mario Mora	
Title :	Soakaway Calculation	
Date:	09/04/2024	

SOAKAWAY TRIAL PIT 6

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

[illegible]Time at 75% or at mm of water

0	500
20	200

Volume of test Pit between 25% and 75% of water depth: **0.423** m3
Time Taken to drain between 25% and 75% of water depth: **21.04** min or **0.351** hr

SOAKAWAY TRIAL PIT 6

TEST 2

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input

Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
12:00	1.5
12:05	1.5
12:10	1.5
12:15	1.5
12:20	1.5
12:25	1.5
12:30	1.5
12:35	1.5
12:40	1.5
12:45	1.5
12:50	1.5
12:55	1.5
13:00	1.5
13:05	1.5
13:10	1.5
13:15	1.5
13:20	1.5
13:25	1.5
13:30	1.5
13:35	1.5
13:40	1.5
13:45	1.5
13:50	1.5
13:55	1.5
14:00	1.5
14:05	1.5
14:10	1.5
14:15	1.5
14:20	1.5
14:25	1.5
14:30	1.5
14:35	1.5
14:40	1.5
14:45	1.5
14:50	1.5
14:55	1.5
15:00	1.5
15:05	1.5
15:10	1.5
15:15	1.5
15:20	1.5
15:25	1.5
15:30	1.5
15:35	1.5
15:40	1.5
15:45	1.5
15:50	1.5
15:55	1.5
16:00	1.5
16:05	1.5
16:10	1.5
16:15	1.5
16:20	1.5
16:25	1.5
16:30	1.5
16:35	1.5
16:40	1.5
16:45	1.5
16:50	1.5
16:55	1.5
17:00	1.5
17:05	1.5
17:10	1.5
17:15	1.5
17:20	1.5
17:25	1.5
17:30	1.5
17:35	1.5
17:40	1.5
17:45	1.5
17:50	1.5
17:55	1.5
18:00	1.5
18:05	1.5
18:10	1.5
18:15	1.5
18:20	1.5
18:25	1.5
18:30	1.5
18:35	1.5
18:40	1.5
18:45	1.5
18:50	1.5
18:55	1.5
19:00	1.5
19:05	1.5
19:10	1.5
19:15	1.5
19:20	1.5
19:25	1.5
19:30	1.5
19:35	1.5
19:40	1.5
19:45	1.5
19:50	1.5
19:55	1.5
20:00	1.5
20:05	1.5
20:10	1.5
20:15	1.5
20:20	1.5
20:25	1.5
20:30	1.5
20:35	1.5
20:40	1.5
20:45	1.5
20:50	1.5
20:55	1.5
21:00	1.5
21:05	1.5
21:10	1.5
21:15	1.5
21:20	1.5
21:25	1.5
21:30	1.5
21:35	1.5
21:40	1.5
21:45	1.5
21:50	1.5
21:55	1.5
22:00	1.5
22:05	1.5
22:10	1.5
22:15	1.5
22:20	1.5
22:25	1.5
22:30	1.5
22:35	1.5
22:40	1.5
22:45	1.5
22:50	1.5
22:55	1.5
23:00	1.5
23:05	1.5
23:10	1.5
23:15	1.5
23:20	1.5
23:25	1.5
23:30	1.5
23:35	1.5
23:40	1.5
23:45	1.5
23:50	1.5
23:55	1.5
00:00	1.5
00:05	1.5
00:10	1.5
00:15	1.5
00:20	1.5
00:25	1.5
00:	

20	200
40	0

t: **27.5** min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
20	200

t: **8.333** min. From interpolating values[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	19.17	min or 0.319 hr

Test 2 - Soil Infiltration rate:	1.23E-04	m/s
	0.4423	m/hr

SOAKAWAY TRIAL PIT 6

TEST 3

Pit Dimensions:

L:	1300	mm
W:	1300	mm
D:	1300	mm

Key

Input
Calculation

Mean Surface Area	2.99	m2
Depth of water	500	mm
Time at 25% or at	125	mm of water

Interpolating Values

Time	Water Depth
------	-------------

20	200
----	-----

40	0
----	---

t: **27.5** min. From interpolating values

Time at 75% or at mm of water

Interpolating Values

Time Water Depth

0	500
---	-----

	20	200
t:	8.333	min. From interpolating values

[illegible]

Volume of test Pit between 25% and 75% of water depth:	0.423	m3
Time Taken to drain between 25% and 75% of water depth:	19.17	min or 0.319 hr

Test 3 - Soil Infiltration rate:	1.23E-04	m/s
	0.4423	m/hr

SOAKAWAY TRIAL PIT 6 INFILTRATION RATE	1.12E-04	m/s
	0.4029	m/hr

Project:	[0270] Land Rear of Firgrove Gardens, Rochdale,OL16 3AF	
Calculation By:	Mario Mora	
Title :	Soakaway Calculation	
Date:	09/04/2024	

Results

SOAKAWAY TRIAL PIT 1 INFILTRATION RATE

INFILTRATION RATE	3.14E-04	m/s
	1.1304	m/hr

SOAKAWAY TRIAL PIT 2 INFILTRATION RATE

INFILTRATION RATE	4.71E-05	m/s
	0.1696	m/hr

SOAKAWAY TRIAL PIT 3 INFILTRATION RATE

INFILTRATION RATE	1.76E-04	m/s
	0.6324	m/hr

SOAKAWAY TRIAL PIT 4 INFILTRATION RATE

INFILTRATION RATE	2.36E-04	m/s
	0.8478	m/hr

SOAKAWAY TRIAL PIT 5 INFILTRATION RATE

INFILTRATION RATE	2.69E-05	m/s
	0.0969	m/hr

SOAKAWAY TRIAL PIT 6 INFILTRATION RATE

INFILTRATION RATE	1.12E-04	m/s
	0.4029	m/hr

MINIMUM INFILTRATION RATE	2.69E-05
	0.09689

Appendix C



Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	1.6
Summer CV	1.000	2 year (l/s)	1.8
Winter CV	1.000	30 year (l/s)	3.2
Analysis Speed	Normal	100 year (l/s)	3.9
Skip Steady State	x	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	30	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.70
Greenfield Method	IH124	Growth Factor 100 year	2.08
Positively Drained Area (ha)	0.215	Betterment (%)	0
SAAR (mm)	1170	QBar	1.9
Soil Index	4	Q 1 year (l/s)	1.6
SPR	0.47	Q 2 year (l/s)	1.8
Region	10	Q 30 year (l/s)	3.2
Growth Factor 1 year	0.87	Q 100 year (l/s)	3.9
Growth Factor 2 year	0.93		

CAUSEWAY		Rida Reports Limited	File: Land Rear of Firgrove Garc		Page 1
			Network: Storm Network		
			Mario Mora		
			09/04/2024		
Simulation Settings					
Rainfall Methodology	FSR	Drain Down Time (mins)	240		
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0		
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓		
Ratio-R	0.300	1 year (l/s)	9.2		
Summer CV	1.000	2 year (l/s)	11.8		
Winter CV	1.000	30 year (l/s)	21.7		
Analysis Speed	Normal	100 year (l/s)	27.5		
Skip Steady State	x	Check Discharge Volume	x		
Storm Durations					
15	30	60	120	180	240
					360
					480
					600
					720
					960
					1440
Return Period	Climate Change	Additional Area	Additional Flow		
(years)	(CC %)	(A %)	(Q %)		
1	0	0	0		
2	0	0	0		
30	0	0	0		
30	30	0	0		
100	0	0	0		
100	40	0	0		
Pre-development Discharge Rate					
Site Makeup	Brownfield	Betterment (%)	0		
Brownfield Method	MRM	Q 1 year (l/s)	9.2		
Contributing Area (ha)	0.058	Q 2 year (l/s)	11.8		
PIMP (%)	100	Q 30 year (l/s)	21.7		
CV	1.000	Q 100 year (l/s)	27.5		
Time of Concentration (mins)	6.00				
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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE	0.006	6.00	146.200	450	0.170	0.113	0.500
Soakaway			146.200		20.595	0.002	1.500
Dummy			146.200	450	30.112	0.125	1.600

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE	Soakaway	21.300	0.600	145.700	144.700	1.000	21.3	100	6.21	50.0
1.001	Soakaway	Dummy	10.000	0.600	144.700	144.600	0.100	100.0	100	6.43	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.680	13.2	1.1	0.400	1.400	0.006	0.0	19	1.002
1.001	0.769	6.0	1.1	1.400	1.500	0.006	0.0	29	0.579

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	21.300	21.3	100	Circular	146.200	145.700	0.400	146.200	144.700	1.400
1.001	10.000	100.0	100	Circular	146.200	144.700	1.400	146.200	144.600	1.500

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE	450	Manhole	Adoptable	Soakaway		Junction	
1.001	Soakaway		Junction		Dummy	450	Manhole	Adoptable

Node Soakaway Online Pump Control

Flap Valve	x	Invert Level (m)	144.700	Switch on depth (m)	1.100
Downstream Link	1.001	Design Depth (m)	1.100	Switch off depth (m)	0.010
Replaces Downstream Link	✓	Design Flow (l/s)	0.1		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	1.100	0.000

Node Soakaway Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	144.700	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.09689	Time to half empty (mins)		Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	2.000	Number Required	1
Porosity	0.95	Pit Length (m)	3.000		

Approval Settings

Node Size	x	Coordinates	x	Full Bore Velocity	x	Time to Half Empty	✓
Node Losses	x	Crossings	x	Proportional Velocity	x	Return Period (years)	10
Link Size	x	Cover Depth	x	Surcharged Depth	x	Discharge Rates	x
Link Length	x	Backdrops	x	Flooding	x	Discharge Volume	x

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	99.562	28.172	2 year 60 minute summer	61.301	16.200
1 year 15 minute winter	69.868	28.172	2 year 60 minute winter	40.727	16.200
1 year 30 minute summer	67.776	19.178	2 year 120 minute summer	39.487	10.435
1 year 30 minute winter	47.562	19.178	2 year 120 minute winter	26.234	10.435
1 year 60 minute summer	48.435	12.800	2 year 180 minute summer	31.221	8.034
1 year 60 minute winter	32.179	12.800	2 year 180 minute winter	20.295	8.034
1 year 120 minute summer	31.831	8.412	2 year 240 minute summer	25.171	6.652
1 year 120 minute winter	21.148	8.412	2 year 240 minute winter	16.723	6.652
1 year 180 minute summer	25.499	6.562	2 year 360 minute summer	19.759	5.085
1 year 180 minute winter	16.575	6.562	2 year 360 minute winter	12.844	5.085
1 year 240 minute summer	20.693	5.468	2 year 480 minute summer	15.896	4.201
1 year 240 minute winter	13.748	5.468	2 year 480 minute winter	10.561	4.201
1 year 360 minute summer	16.369	4.212	2 year 600 minute summer	13.242	3.622
1 year 360 minute winter	10.640	4.212	2 year 600 minute winter	9.048	3.622
1 year 480 minute summer	13.246	3.501	2 year 720 minute summer	11.973	3.209
1 year 480 minute winter	8.801	3.501	2 year 720 minute winter	8.047	3.209
1 year 600 minute summer	11.089	3.033	2 year 960 minute summer	10.067	2.651
1 year 600 minute winter	7.577	3.033	2 year 960 minute winter	6.669	2.651
1 year 720 minute summer	10.069	2.699	2 year 1440 minute summer	7.548	2.023
1 year 720 minute winter	6.767	2.699	2 year 1440 minute winter	5.073	2.023
1 year 960 minute summer	8.526	2.245	30 year 15 minute summer	243.818	68.992
1 year 960 minute winter	5.648	2.245	30 year 15 minute winter	171.101	68.992
1 year 1440 minute summer	6.448	1.728	30 year 30 minute summer	166.387	47.082
1 year 1440 minute winter	4.334	1.728	30 year 30 minute winter	116.763	47.082
2 year 15 minute summer	128.797	36.445	30 year 60 minute summer	116.589	30.811
2 year 15 minute winter	90.384	36.445	30 year 60 minute winter	77.459	30.811
2 year 30 minute summer	87.307	24.705	30 year 120 minute summer	73.902	19.530
2 year 30 minute winter	61.268	24.705	30 year 120 minute winter	49.099	19.530

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 180 minute summer	57.313	14.749	100 year 60 minute summer	153.288	40.510
30 year 180 minute winter	37.255	14.749	100 year 60 minute winter	101.841	40.510
30 year 240 minute summer	45.598	12.050	100 year 120 minute summer	96.993	25.632
30 year 240 minute winter	30.295	12.050	100 year 120 minute winter	64.440	25.632
30 year 360 minute summer	35.178	9.053	100 year 180 minute summer	74.725	19.229
30 year 360 minute winter	22.867	9.053	100 year 180 minute winter	48.573	19.229
30 year 480 minute summer	27.920	7.379	100 year 240 minute summer	59.126	15.625
30 year 480 minute winter	18.550	7.379	100 year 240 minute winter	39.282	15.625
30 year 600 minute summer	23.001	6.291	100 year 360 minute summer	45.269	11.649
30 year 600 minute winter	15.716	6.291	100 year 360 minute winter	29.426	11.649
30 year 720 minute summer	20.598	5.520	100 year 480 minute summer	35.719	9.439
30 year 720 minute winter	13.843	5.520	100 year 480 minute winter	23.731	9.439
30 year 960 minute summer	17.043	4.488	100 year 600 minute summer	29.283	8.010
30 year 960 minute winter	11.289	4.488	100 year 600 minute winter	20.008	8.010
30 year 1440 minute summer	12.485	3.346	100 year 720 minute summer	26.115	6.999
30 year 1440 minute winter	8.390	3.346	100 year 720 minute winter	17.551	6.999
30 year +30% CC 15 minute summer	316.964	89.690	100 year 960 minute summer	21.458	5.650
30 year +30% CC 15 minute winter	222.431	89.690	100 year 960 minute winter	14.214	5.650
30 year +30% CC 30 minute summer	216.303	61.206	100 year 1440 minute summer	15.553	4.168
30 year +30% CC 30 minute winter	151.792	61.206	100 year 1440 minute winter	10.453	4.168
30 year +30% CC 60 minute summer	151.566	40.054	100 year +40% CC 15 minute summer	441.486	124.925
30 year +30% CC 60 minute winter	100.697	40.054	100 year +40% CC 15 minute winter	309.815	124.925
30 year +30% CC 120 minute summer	96.073	25.389	100 year +40% CC 30 minute summer	304.460	86.152
30 year +30% CC 120 minute winter	63.828	25.389	100 year +40% CC 30 minute winter	213.656	86.152
30 year +30% CC 180 minute summer	74.507	19.173	100 year +40% CC 60 minute summer	214.603	56.713
30 year +30% CC 180 minute winter	48.431	19.173	100 year +40% CC 60 minute winter	142.577	56.713
30 year +30% CC 240 minute summer	59.278	15.665	100 year +40% CC 120 minute summer	135.791	35.885
30 year +30% CC 240 minute winter	39.383	15.665	100 year +40% CC 120 minute winter	90.216	35.885
30 year +30% CC 360 minute summer	45.732	11.768	100 year +40% CC 180 minute summer	104.615	26.921
30 year +30% CC 360 minute winter	29.727	11.768	100 year +40% CC 180 minute winter	68.003	26.921
30 year +30% CC 480 minute summer	36.296	9.592	100 year +40% CC 240 minute summer	82.776	21.875
30 year +30% CC 480 minute winter	24.114	9.592	100 year +40% CC 240 minute winter	54.994	21.875
30 year +30% CC 600 minute summer	29.901	8.179	100 year +40% CC 360 minute summer	63.377	16.309
30 year +30% CC 600 minute winter	20.430	8.179	100 year +40% CC 360 minute winter	41.197	16.309
30 year +30% CC 720 minute summer	26.777	7.177	100 year +40% CC 480 minute summer	50.006	13.215
30 year +30% CC 720 minute winter	17.996	7.177	100 year +40% CC 480 minute winter	33.223	13.215
30 year +30% CC 960 minute summer	22.155	5.834	100 year +40% CC 600 minute summer	40.997	11.214
30 year +30% CC 960 minute winter	14.676	5.834	100 year +40% CC 600 minute winter	28.011	11.214
30 year +30% CC 1440 minute summer	16.230	4.350	100 year +40% CC 720 minute summer	36.560	9.799
30 year +30% CC 1440 minute winter	10.908	4.350	100 year +40% CC 720 minute winter	24.571	9.799
100 year 15 minute summer	315.347	89.232	100 year +40% CC 960 minute summer	30.041	7.911
100 year 15 minute winter	221.296	89.232	100 year +40% CC 960 minute winter	19.900	7.911
100 year 30 minute summer	217.471	61.537	100 year +40% CC 1440 minute summer	21.775	5.836
100 year 30 minute winter	152.611	61.537	100 year +40% CC 1440 minute winter	14.634	5.836



Results for 1 year Critical Storm Duration. Lowest mass balance: 95.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE	11	145.718	0.018	0.9	0.0028	0.0000	OK
960 minute winter	Soakaway	645	144.933	0.233	0.1	1.3274	0.0000	SURCHARGED
15 minute summer	Dummy	1	144.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE	1.000	Soakaway	0.9	0.976	0.068	0.0584	
960 minute winter	Soakaway	Pump	Dummy	0.0				0.0
960 minute winter	Soakaway	Infiltration		0.0				

Results for 2 year Critical Storm Duration. Lowest mass balance: 95.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE	11	145.720	0.020	1.1	0.0031	0.0000	OK
1440 minute winter	Soakaway	930	144.968	0.268	0.1	1.5274	0.0000	SURCHARGED
15 minute summer	Dummy	1	144.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE	1.000	Soakaway	1.1	1.022	0.083	0.0735	
1440 minute winter	Soakaway	Pump	Dummy	0.0				0.0
1440 minute winter	Soakaway	Infiltration		0.0				

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE	11	145.727	0.027	2.1	0.0043	0.0000	OK
480 minute winter	Soakaway	448	145.181	0.481	0.3	2.7400	0.0000	SURCHARGED
15 minute summer	Dummy	1	144.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE	1.000	Soakaway	2.1	1.040	0.159	0.1006	
480 minute winter	Soakaway	Pump	Dummy	0.0				0.0
480 minute winter	Soakaway	Infiltration		0.1				

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 95.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE	11	145.731	0.031	2.8	0.0050	0.0000	OK
720 minute winter	Soakaway	660	145.313	0.613	0.3	3.4926	0.0000	SURCHARGED
15 minute summer	Dummy	1	144.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE	1.000	Soakaway	2.8	1.082	0.212	0.1057	
720 minute winter	Soakaway	Pump	Dummy	0.0				0.0
720 minute winter	Soakaway	Infiltration		0.1				

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RE	18	145.731	0.031	2.8	0.0050	0.0000	OK
600 minute winter	Soakaway	570	145.293	0.593	0.3	3.3813	0.0000	SURCHARGED
15 minute summer	Dummy	1	144.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RE	1.000	Soakaway	2.8	0.959	0.211	0.1056	
600 minute winter	Soakaway	Pump	Dummy	0.0				0.0
600 minute winter	Soakaway	Infiltration		0.1				

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RE	18	145.737	0.037	3.9	0.0059	0.0000	OK
600 minute summer	Soakaway	420	145.500	0.800	0.7	4.5616	0.0000	SURCHARGED
15 minute summer	Dummy	1	144.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RE	1.000	Soakaway	3.9	0.994	0.293	0.1116	
600 minute summer	Soakaway	Pump	Dummy	0.0				0.0
600 minute summer	Soakaway	Infiltration		0.1				

Appendix D

Do not scale from this drawing. Refer to figured dimensions only. RIDA Reports Ltd registered in England and Wales No. 10590566. This drawing is copyright of RIDA Reports Ltd.

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

- All dimensions are in millimetres and levels in m AOD unless stated otherwise.
- Do not scale. If in any doubt, consult Engineer.
- Read in conjunction with the architects and engineers schedule drawings.
- Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.
- 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.
- Concrete structures design sulphate class and ACEC concrete class unknown.
- Pipework to be 110mm Thermoplastics U-PVC (Polypipe or similar) installed at levels marked on this drawing UNO. 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.
- 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.
- Plastic chambers and rings, including demarcation chambers, shall comply with BS EN 3598-1 or BS EN 13598-2 as appropriate.
- Inspection chamber covers and frames shall comply with the relevant provisions of BS EN 124 and should be double sealed.
- All inspection chamber covers shall be the non-ventilating type and shall have closed keyways.
- Testing of pipelines should be as follows:
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.
- Manhole covers to be set square to the building. Covers of existing manholes to be adjusted to match final ground levels.
- 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.

KEY

- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Surface as per architect's details Sub-base 350mm Type 3 Minimum. Detailed desing by suppliers
- Silt Trap
- Check Dam within the sub-base

Drawing Status: **PRELIMINARY**



4 Beam Acre Road, Hook Norton, Banbury, Oxfordshire
e: info@rida-reports.co.uk
t: 01608 510 121
www.rida-reports.co.uk

Client:

Project:

Land Rear of Firgrove Gardens, Rochdale, OL16 3AF

Drawing:

Proposed Drainage Strategy

Print Size: A1 Scale: 1:200 Project No: 0270 Drawing No: 003 Revision: P3

