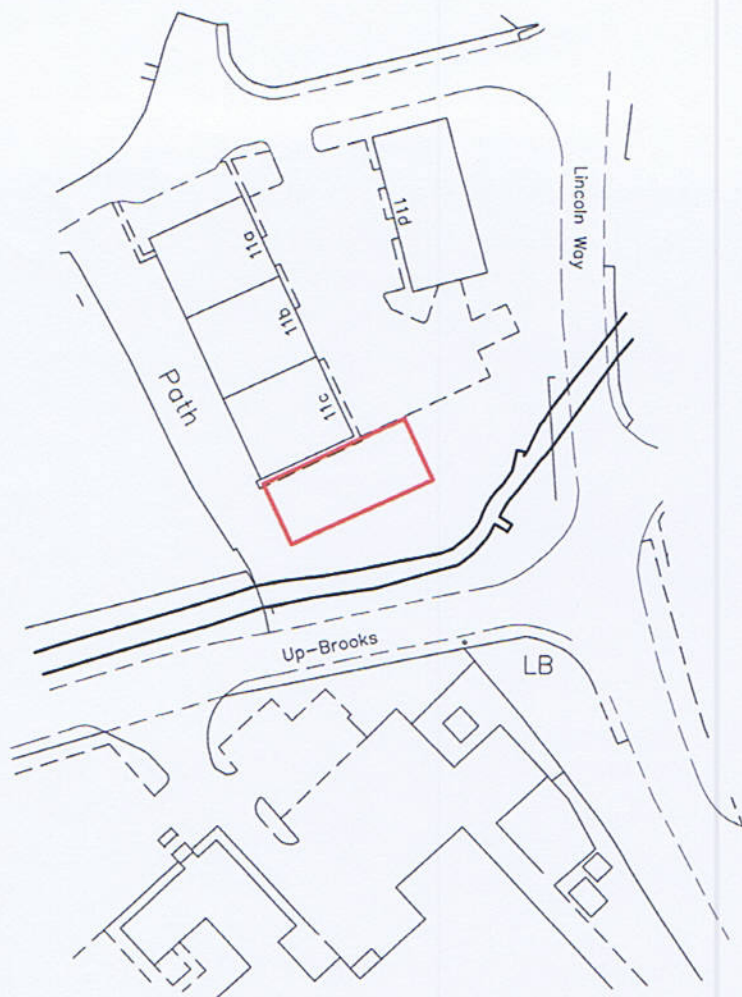


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SITE LOCATION PLAN

Site: Proposed Industrial Unit
Upbrooks/Lincoln Way
Clitheroe

Client: Mr Pozzi

Drawn: DS

Date: 23.07.12

Scale: 1:1250 @ A4

Project No: POZ/08a Dwg 02

Amendments:

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Notes:

All work is to be carried out to the latest current British standards Codes of Practice and recognised working practices. All work and materials should comply with Health and Safety legislation and to be approved by the Local Authority Planning / Building Control Officer.
All dimensions are in millimetres unless where explicitly shown otherwise. The contractor should check and clarify all dimensions as work proceeds and notify the design team of any discrepancies. Do not scale off the drawings, if in doubt ask.
Avalon Chartered Town Planning are not liable for work undertaken prior to Full Planning Consent and/or Building Regulations Approval

Avalon

Chartered Town Planning

Town Planning - Architectural Design - Building Regulations - Surveying

Phone: 01282 834834 **Fax:** 01282 451666

Web: www.avalontp.co.uk Email: planning@avalontp.co.uk
2 Reedley Business Centre, Redman Road, Burnley, Lancashire, BB10 2TY

VERSION	FEH CD-R	Version	3	exported at	08:58:53	GMT	Thu	04-Oct-12			B1302
Parameters				Upbrooks, Clitheroe			04/10/2012				
Calculation	Design rainfall			FEH rain data			mel				
Calculation	Typical point in catchment										
Calculation	Catchment GB	375050	442100	SD 75050	42100						
Catchment	8.37	km**2									
Duration=	6	1 (hours)									
Fixed duration	no										
Return period	100	1 (years)									
Annual max	yes										
c	d1	d2	d3	e	f						
-0.02577	0.41433	0.3738	0.41034	0.30219	2.47561						
An areal reduction factor of 0.958 has been applied to a point rainfall of 81.1 mm to yield a catchment design rainfall of 77.7 mm.											
No warning(s) or note(s) were present for this calculation.											
The data in the following table have been computed using sliding durations.											
			10	20	50	100	200	500			
Duration	Duration	Duration	year rainfall	year rainfall	year rainfall	year rainfall	year rainfall	year rainfall			
minutes	hours	days	mm	mm	mm	mm	mm	mm			
15	0.25	0.010417	12.29	15.67	21.48	27.19	34.39	46.9			
30	0.5	0.020833	16.34	20.57	27.72	34.66	43.3	58.08			
45	0.75	0.03125	19.21	24	32.03	39.76	49.31	65.51			
60	1	0.041667	21.51	26.73	35.43	43.75	53.98	71.24			
75	1.25	0.052083	23.46	29.04	38.28	47.08	57.86	75.96			
90	1.5	0.0625	25.17	31.06	40.76	49.97	61.21	80			
105	1.75	0.072917	26.71	32.86	42.97	52.53	64.17	83.57			
120	2	0.083333	28.12	34.5	44.97	54.84	66.84	86.76			
135	2.25	0.09375	29.41	36.01	46.8	56.96	69.27	89.67			
150	2.5	0.104167	30.61	37.41	48.5	58.91	71.51	92.34			
165	2.75	0.114583	31.74	38.72	50.08	60.73	73.59	94.82			
180	3	0.125	32.8	39.95	51.57	62.44	75.54	97.13			
195	3.25	0.135417	33.81	41.12	52.97	64.04	77.37	99.3			
210	3.5	0.145833	34.77	42.23	54.3	65.57	79.11	101.34			
225	3.75	0.15625	35.69	43.29	55.57	67.01	80.75	103.28			
240	4	0.166667	36.57	44.3	56.78	68.39	82.32	105.13			
255	4.25	0.177083	37.41	45.27	57.94	69.71	83.82	106.89			
270	4.5	0.1875	38.22	46.2	59.05	70.98	85.25	108.57			
285	4.75	0.197917	39	47.1	60.12	72.19	86.63	110.18			
300	5	0.208333	39.76	47.97	61.16	73.37	87.96	111.73			
315	5.25	0.21875	40.49	48.81	62.15	74.5	89.23	113.23			
330	5.5	0.229167	41.2	49.62	63.12	75.59	90.47	114.67			
345	5.75	0.239583	41.89	50.41	64.06	76.65	91.66	116.06			
360	6	0.25	42.56	51.18	64.96	77.68	92.82	117.41			
375	6.25	0.260417	43.22	51.92	65.85	78.68	93.94	118.71			
390	6.5	0.270833	43.85	52.65	66.7	79.64	95.03	119.98			
405	6.75	0.28125	44.47	53.36	67.54	80.59	96.09	121.21			
420	7	0.291667	45.08	54.05	68.35	81.51	97.13	122.41			
435	7.25	0.302083	45.67	54.72	69.15	82.4	98.13	123.57			
450	7.5	0.3125	46.25	55.38	69.92	83.28	99.11	124.71			
465	7.75	0.322917	46.82	56.03	70.68	84.13	100.07	125.81			
480	8	0.333333	47.37	56.66	71.43	84.96	101.01	126.89			
495	8.25	0.34375	47.92	57.28	72.15	85.78	101.92	127.95			
510	8.5	0.354167	48.45	57.88	72.86	86.58	102.81	128.98			
525	8.75	0.364583	48.98	58.48	73.56	87.36	103.69	129.99			
540	9	0.375	49.49	59.06	74.24	88.13	104.55	130.97			
555	9.25	0.385417	49.99	59.63	74.91	88.88	105.39	131.94			
570	9.5	0.395833	50.49	60.19	75.57	89.62	106.21	132.89			
585	9.75	0.40625	50.98	60.75	76.22	90.34	107.02	133.82			
600	10	0.416667	51.46	61.29	76.85	91.05	107.81	134.73			
615	10.25	0.427083	51.93	61.82	77.48	91.75	108.59	135.62			
630	10.5	0.4375	52.4	62.35	78.09	92.44	109.35	136.5			
645	10.75	0.447917	52.85	62.87	78.69	93.11	110.11	137.36			
660	11	0.458333	53.3	63.38	79.29	93.78	110.85	138.21			
675	11.25	0.46875	53.75	63.88	79.87	94.43	111.57	139.04			
690	11.5	0.479167	54.19	64.37	80.45	95.07	112.29	139.86			
705	11.75	0.489583	54.62	64.86	81.01	95.71	112.99	140.67			
720	12	0.5	55.05	65.34	81.57	96.33	113.69	141.46			
735	12.25	0.510417	55.42	65.76	82.05	96.86	114.27	142.12			
750	12.5	0.520833	55.79	66.17	82.53	97.39	114.85	142.77			
765	12.75	0.53125	56.15	66.58	83	97.91	115.42	143.42			
780	13	0.541667	56.51	66.98	83.46	98.42	115.98	144.05			
795	13.25	0.552083	56.87	67.38	83.92	98.92	116.54	144.67			
810	13.5	0.5625	57.22	67.77	84.36	99.42	117.08	145.28			
825	13.75	0.572917	57.56	68.15	84.81	99.9	117.62	145.88			
840	14	0.583333	57.9	68.53	85.24	100.39	118.15	146.48			

Revitalised FSR/FEH rainfall runoff method

Spreadsheet application report

User name	mikel	Catchment name		Date/time modelled	04-Oct-2012 10:28
Company name	mla	Catchment easting	375050	Version	1.4
Project name	upbrooks	Catchment northing	442100		
		Catchment area	8.37		

Summary of model setup

Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	100	C_{max} (mm)	252	T_p (hr)	1.43	BL (hr)	26.3
Duration (hr)	3.3	C_{ini} (mm)	137	U_p	0.65	BR	1.02
Timestep (hr)	0.3	α factor	0.83	U_k	0.8	BF ₀ (m ³ /s)	0.7
Season	Winter						

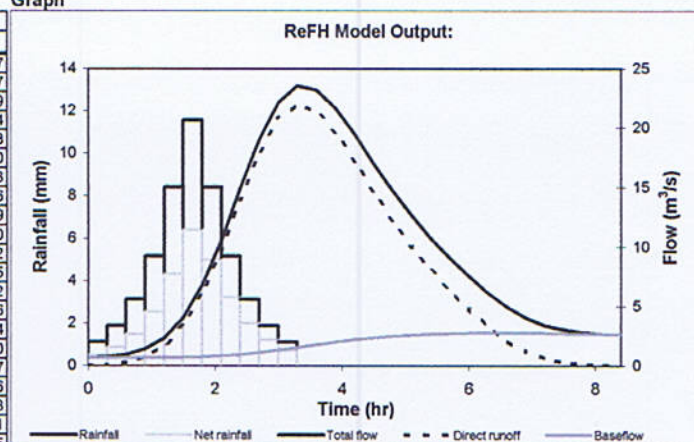
Summary of results

FEH DDF rainfall (mm)	68	Peak rainfall (mm)	11.6
Design rainfall (mm)	50.9	Peak flow (m ³ /s)	23.5

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m ³ /s	m ³ /s	m ³ /s
0.0	1.1	0.5	0.0	0.7	0.7
0.3	1.9	0.9	0.1	0.7	0.7
0.6	3.1	1.5	0.3	0.7	0.9
0.9	5.2	2.5	0.7	0.7	1.4
1.2	8.4	4.3	1.6	0.7	2.3
1.5	11.6	6.4	3.3	0.7	4.0
1.8	8.4	5.0	6.0	0.7	6.8
2.1	5.2	3.2	9.8	0.8	10.6
2.4	3.1	2.0	13.9	1.0	14.9
2.7	1.9	1.2	17.9	1.1	19.0
3.0	1.1	0.7	20.8	1.3	22.2
3.3	0.0	0.0	22.0	1.6	23.5
3.6	0.0	0.0	21.4	1.8	23.2
3.9	0.0	0.0	19.6	2.0	21.6
4.2	0.0	0.0	17.2	2.2	19.4
4.5	0.0	0.0	14.6	2.4	17.0
4.8	0.0	0.0	12.2	2.5	14.7
5.1	0.0	0.0	10.0	2.6	12.6
5.4	0.0	0.0	8.1	2.7	10.8
5.7	0.0	0.0	6.4	2.7	9.1
6.0	0.0	0.0	4.8	2.8	7.5
6.3	0.0	0.0	3.4	2.8	6.1
6.6	0.0	0.0	2.2	2.8	4.9
6.9	0.0	0.0	1.2	2.8	4.0
7.2	0.0	0.0	0.6	2.7	3.4
7.5	0.0	0.0	0.3	2.7	3.0
7.8	0.0	0.0	0.1	2.7	2.8
8.1	0.0	0.0	0.0	2.7	2.7
8.4	0.0	0.0	0.0	2.6	2.6
Total (mm)	50.9	28.2	28.2	7.0	35.2

Graph



Audit comments

Model run with ReFH dll version 1.4.0005

Catchment

Catchment descriptors imported from file
 Catchment descriptor file = 'lincolncatch.csv'
 Catchment descriptor file exported from CD ROM version 3
 Catchment descriptor file exported on 04-Oct-2012 08:58
 BFIHOST value of 0.354 used
 PROPWET value of 0.6 used
 SAAR value of 1294 used
 DPLBAR value of 3.48 used
 DPSBAR value of 139.6 used
 URBEXT value of 0.0038 used
 C value of -0.02577 used
 D1 value of 0.41433 used
 D2 value of 0.3738 used
 D3 value of 0.41034 used
 E value of 0.30219 used
 F value of 2.47561 used

Rainfall

Recommended season is Winter, as URBEXT < 0.125
 ReFH design standard Seasonal Correction Factor of 0.79 applied
 ReFH design standard Areal Reduction Factor of 0.95 applied

Loss Model

C_{max} derived from catchment descriptors
 ReFH design standard C_{ini} used
 ReFH design standard α factor used

Routing Model

T_p derived from catchment descriptors
 ReFH design standard used for U_p
 ReFH design standard used for U_k

Baseflow Model

BL derived from catchment descriptors
 BR derived from catchment descriptors
 ReFH design standard BF₀ used

Revitalised FSR/FEH rainfall runoff method

Spreadsheet application report

es

User name	mikel	Catchment name		Date/time modelled	04-Oct-2012 10:28
Company name	mia	Catchment easting	375050	Version	1.4
Project name	upbrooks	Catchment northing	442100		
		Catchment area	8.37		

Summary of model setup

Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	30	C_{max} (mm)	252	T_p (hr)	1.43	BL (hr)	26.3
Duration (hr)	3.3	C_{int} (mm)	137	U_p	0.65	BR	1.02
Timestep (hr)	0.3	α factor	0.91	U_k	0.8	BF_0 (m ³ /s)	0.7
Season	Winter						

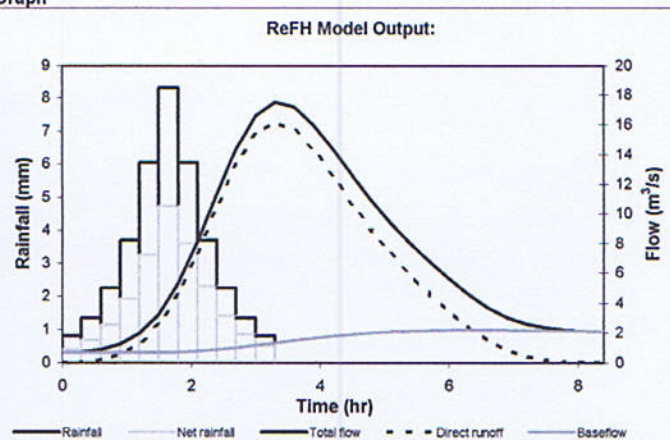
Summary of results

FEH DDF rainfall (mm)	48.9	Peak rainfall (mm)	8.3
Design rainfall (mm)	36.6	Peak flow (m ³ /s)	17.5

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m ³ /s	m ³ /s	m ³ /s
0.0	0.8	0.4	0.0	0.7	0.7
0.3	1.3	0.7	0.0	0.7	0.7
0.6	2.2	1.1	0.2	0.7	0.9
0.9	3.7	1.9	0.6	0.7	1.2
1.2	6.0	3.3	1.3	0.7	2.0
1.5	8.3	4.7	2.6	0.7	3.2
1.8	6.0	3.6	4.6	0.7	5.3
2.1	3.7	2.3	7.4	0.8	8.2
2.4	2.2	1.4	10.5	0.9	11.3
2.7	1.3	0.9	13.3	1.0	14.3
3.0	0.8	0.5	15.4	1.2	16.6
3.3	0.0	0.0	16.2	1.3	17.5
3.6	0.0	0.0	15.7	1.5	17.2
3.9	0.0	0.0	14.3	1.7	16.0
4.2	0.0	0.0	12.6	1.8	14.3
4.5	0.0	0.0	10.7	1.9	12.6
4.8	0.0	0.0	8.9	2.0	10.9
5.1	0.0	0.0	7.3	2.1	9.3
5.4	0.0	0.0	5.9	2.1	8.0
5.7	0.0	0.0	4.6	2.2	6.8
6.0	0.0	0.0	3.5	2.2	5.6
6.3	0.0	0.0	2.4	2.2	4.6
6.6	0.0	0.0	1.5	2.2	3.7
6.9	0.0	0.0	0.9	2.2	3.0
7.2	0.0	0.0	0.5	2.2	2.6
7.5	0.0	0.0	0.2	2.1	2.3
7.8	0.0	0.0	0.1	2.1	2.2
8.1	0.0	0.0	0.0	2.1	2.1
8.4	0.0	0.0	0.0	2.1	2.1
Total (mm)	36.6	20.8	20.8	5.7	26.5

Graph



Audit comments

Model run with ReFH dll version 1.4.0005

Catchment

Catchment descriptors imported from file
 Catchment descriptor file = 'lincolncatch.csv'
 Catchment descriptor file exported from CD ROM version 3
 Catchment descriptor file exported on 04-Oct-2012 08:58
 BFIHOST value of 0.354 used
 PROPWET value of 0.6 used
 SAAR value of 1294 used
 DPLBAR value of 3.48 used
 DPSBAR value of 139.6 used
 URBEXT value of 0.0038 used
 C value of -0.02577 used
 D1 value of 0.41433 used
 D2 value of 0.3738 used
 D3 value of 0.41034 used
 E value of 0.30219 used
 F value of 2.47561 used

Rainfall

Recommended season is Winter, as URBEXT < 0.125
 ReFH design standard Seasonal Correction Factor of 0.79 applied
 ReFH design standard Areal Reduction Factor of 0.95 applied

Loss Model

C_{max} derived from catchment descriptors
 ReFH design standard C_{int} used
 ReFH design standard α factor used

Routing Model

T_p derived from catchment descriptors
 ReFH design standard used for U_p
 ReFH design standard used for U_k

Baseflow Model

BL derived from catchment descriptors
 BR derived from catchment descriptors
 ReFH design standard BF_0 used

Revitalised FSR/FEH rainfall runoff method

Spreadsheet application report

User name: mikel
Company name: mla
Project name: upbrooks

Catchment name: 375050
Catchment easting: 442100
Catchment northing: 8.37

Date/time modelled: 04-Oct-2012 10:28
Version: 1.4

Summary of model setup

Design rainfall parameters		Loss model parameters		Routing model parameters		Baseflow model parameters	
Return period (yr)	1.01	C_{max} (mm)	252	T_p (hr)	1.43	BL (hr)	26.3
Duration (hr)	3.3	C_{ini} (mm)	137	U_p	0.65	BR	1.02
Timestep (hr)	0.3	α factor	1	U_k	0.8	BF_0 (m ³ /s)	0.7
Season	Winter						

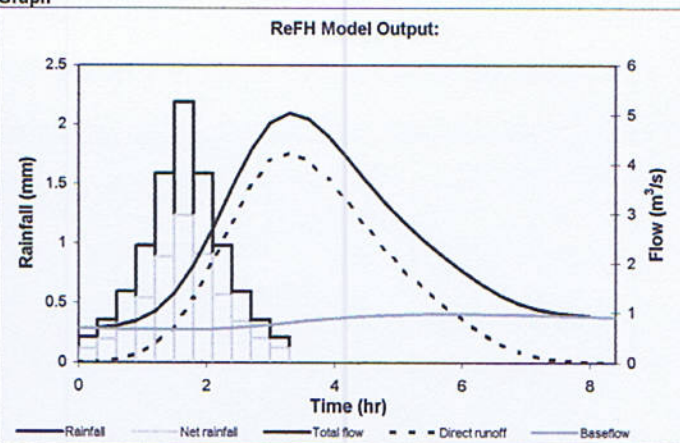
Summary of results

FEH DDF rainfall (mm)	12.9	Peak rainfall (mm)	2.2
Design rainfall (mm)	9.6	Peak flow (m ³ /s)	5

Results

Series	Design Rainfall	Net rainfall	Direct runoff	Baseflow	Total flow
Unit	mm	mm	m ³ /s	m ³ /s	m ³ /s
0.0	0.2	0.1	0.0	0.7	0.7
0.3	0.4	0.2	0.0	0.7	0.7
0.6	0.6	0.3	0.1	0.7	0.7
0.9	1.0	0.5	0.2	0.7	0.8
1.2	1.6	0.9	0.4	0.7	1.0
1.5	2.2	1.2	0.7	0.7	1.4
1.8	1.6	0.9	1.3	0.7	2.0
2.1	1.0	0.6	2.0	0.7	2.7
2.4	0.6	0.3	2.8	0.7	3.5
2.7	0.4	0.2	3.6	0.7	4.3
3.0	0.2	0.1	4.1	0.8	4.8
3.3	0.0	0.0	4.2	0.8	5.0
3.6	0.0	0.0	4.1	0.8	4.9
3.9	0.0	0.0	3.7	0.9	4.6
4.2	0.0	0.0	3.2	0.9	4.1
4.5	0.0	0.0	2.7	0.9	3.7
4.8	0.0	0.0	2.3	0.9	3.2
5.1	0.0	0.0	1.9	1.0	2.8
5.4	0.0	0.0	1.5	1.0	2.5
5.7	0.0	0.0	1.2	1.0	2.1
6.0	0.0	0.0	0.9	1.0	1.8
6.3	0.0	0.0	0.6	1.0	1.6
6.6	0.0	0.0	0.4	1.0	1.3
6.9	0.0	0.0	0.2	1.0	1.2
7.2	0.0	0.0	0.1	0.9	1.1
7.5	0.0	0.0	0.1	0.9	1.0
7.8	0.0	0.0	0.0	0.9	0.9
8.1	0.0	0.0	0.0	0.9	0.9
8.4	0.0	0.0	0.0	0.9	0.9
Total (mm)	9.6	5.4	5.4	3.1	8.6

Graph



Audit comments

Model run with ReFH dll version 1.4.0005

Catchment

Catchment descriptors imported from file
Catchment descriptor file = 'lincolncatch.csv'
Catchment descriptor file exported from CD ROM version 3
Catchment descriptor file exported on 04-Oct-2012 08:58
BFHOST value of 0.354 used
PROPWET value of 0.6 used
SAAR value of 1294 used
DPLBAR value of 3.48 used
DPSBAR value of 139.6 used
URBEXT value of 0.0038 used
C value of -0.02577 used
D1 value of 0.41433 used
D2 value of 0.3738 used
D3 value of 0.41034 used
E value of 0.30219 used
F value of 2.47561 used

Rainfall

Recommended season is Winter, as URBEXT < 0.125
ReFH design standard Seasonal Correction Factor of 0.79 applied
ReFH design standard Areal Reduction Factor of 0.95 applied

Loss Model

C_{Max} derived from catchment descriptors
ReFH design standard C_{ini} used
ReFH design standard α factor used

Routing Model

T_p derived from catchment descriptors
ReFH design standard used for U_p
ReFH design standard used for U_k

Baseflow Model

BL derived from catchment descriptors
BR derived from catchment descriptors
ReFH design standard BF_0 used

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Surface Water Storage Requirements for Sites

Use the map to find your site location and then click on your site to extract the hydrological characteristics. If you wish to produce a report of findings, please ensure that you have switched off any Pop-up blockers that are enabled in your browser.

Site Details

[Site name:](#)

[Site location:](#)

Site coordinates

[Latitude:](#)

[Longitude:](#)

Site Characteristics

[Total site area \(ha\):](#)

[Significant public open space \(ha\):](#)

[Area positively drained \(ha\):](#)

[Impermeable area \(ha\):](#)



Site for new building



Lincoln Way road bridge



Footbridge from downstream



Footbridge from upstream

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[Maintenance](#)
[Cost Calculator](#)
[\(under](#)
[Construction\)](#)



Percentage of drained area that is impermeable (%): 50
 Impervious area drained via infiltration (ha): 0
 Return period for infiltration system design: 10 year 100 year
 Impervious area drained to rainwater harvesting systems (ha): 0
 Return period for rainwater harvesting system design: 10 year 100 year
 Compliance factor for rainwater harvesting system design (%): 70
 Net site area for storage volume design (ha): 0.1

Methodology

Greenfield runoff method: ☐ IH 124 ☒ FEH ☐ User-defined Qmed

Volume control approach: ☒ Long Term Storage ☐ Flow control to 2 l/s/ha

Hydrological Characteristics Automatic values

Soil Type (Based on FSR): 3

HOST: 24

SPR (%): 0.37

Editable values

3

24

0.37

b3

<u>SPRHOST (%)</u> :	0.397	0.397
<u>BFIHOST</u> :	0.311	0.311
<u>Qmed (m³/s)</u> :	0.002	0.002
<u>Qbar/Qmed conversion factor</u> :	0.93	0.93
<u>SAAR (mm)</u> :	1241	1241
<u>M5-60 Rainfall Depth (mm)</u> :	20	20
<u>'r' Ratio M5-60/M5-2 day</u> :	0.3	0.3
<u>FEH/FSR conversion factor</u> :	0.87	0.87
<u>Hydrological region</u> :	10	10
<u>Growth curve factor: 1 year</u> :	0.87	0.87
<u>Growth curve factor: 30 year</u> :	1.7	1.7
<u>Growth curve factor: 100 year</u> :	2.08	2.08
Design Criteria		
<u>Climate change allowance factor</u> :	1.3	1.3
<u>Urban creep allowance factor</u> :	1.1	1.1
<u>Interception rainfall depth (mm)</u> :	5	5
Estimated Site Discharges		
<u>Qbar (l/s)</u> :	1.41	1.41
<u>1 in 1 year (l/s)</u> :	5	5
<u>1 in 30 years (l/s)</u> :	5	5
<u>1 in 100 years (l/s)</u> :	5	5
Estimated Storage Volumes		

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<u>Interception storage (m³):</u>	2
<u>Attenuation storage (m³):</u>	19.58
<u>Long term storage (m³):</u>	0.21
<u>Treatment storage (m³):</u>	6
<u>Total storage (m³):</u>	21.79

Please note that a minimum flow of 5 l/s applies to any site

Report

Help Information

Surface Water Storage Requirements for Sites

The aim of the tool is to provide flow rate and storage volume information based on a minimum amount of data so that anybody can use the tool. t that a flow rate discharge constraint is needed for storm water runoff from a site, resulting in attenuation volume being needed. In addition, current drainage criteria include the requirement for the 100 year 6hr volume to be controlled, and this information is also calculated. (HRW 2004) to provide a simple nationally available consistent methodology for estimating limiting discharges and therefore attenuation storage requirements for drainage systems. The methodology (which is a manual system designed to avoid the need for any software tools) is also available in the Defra/ Environment Agency document 'Preliminary rainfall runoff management for developments' (2011), W5-074/A/TR/1 rev. E.

The current national procedure for estimating rainfall and river flow in the UK is the Flood Estimation Handbook (FEH) software package and subsequently the more recent ReFH (2007). This package superseded FSR when it came out in 1999. FEH is a digitally based methodology and has 7 unique data values for parameters at approximately one kilometre resolution across the country. It is aimed at providing tools for hydrologists to use and its use by engineers who are unfamiliar with the package is not recommended. FEH subdivides the country into catchments and uses an average of the data values to generate flow rate information rather than calculating a value from the parameter values at a specific point, thus aiming at providing river flow information rather than runoff from a specific site.

FSR is a paper map based system delivered in 1975 and rainfall is a simple function of two principal parameters, M560 and Rainfall Ratio 'r'. When using FSR based information it allows for a correction factor (which is location specific) to take account of the difference in rainfall depth between FSR and FEH where this is known.

More detailed information on elements of the storage calculation tool is available when using the tool.