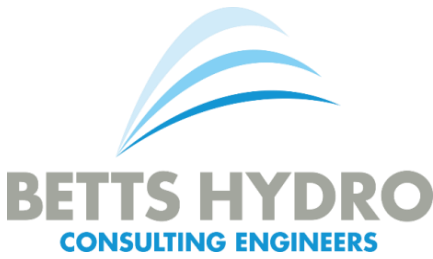


SURFACE WATER RUN-OFF CALCULATION SHEET



Development	KIRKBY VALLEY GOLF CLUB		
Project No.	HYD444		

Revision	C	Completed by	MB
Date	18.02.21	Checked by	KW

Areas			
Total Site	79.781	ha	
Drainage Area ¹	2.878	ha	
Existing Impermeable	0.000	ha	
Existing Impermeable ²	0.000	ha	
Existing Pervious	79.781	ha	
Existing Pervious ²	0.000	ha	
Proposed total impermeable	2.878	ha	100%

Catchment Characteristics			
SAAR	841	mm	
SPR	0.47		
BFI	0.587		
i ₁	16.6	mm/hr	d ₁ 21.0 mm
i ₃₀	30.8	mm/hr	d ₃₀ 50.2 mm
i ₁₀₀	41.0	mm/hr	d ₁₀₀ 62.8 mm

Run-off Rates			
Pre-development			
Impermeable -----	1yr	0.0	l/s
	30yr	0.0	l/s
	100yr	0.0	l/s
	40mm/hr ³	0.0	l/s
Pervious ⁴ -----	1yr	9.4	l/s
	30yr	18.3	l/s
	100yr	22.4	l/s
	QBar ⁵	10.8	l/s
Total -----	1yr	9.4	l/s
	30yr	18.3	l/s
	100yr	22.4	l/s
Post-development (without control)			
Impermeable ⁶ -----	1yr	132.8	l/s
	30yr	246.6	l/s
	100yr+40%CC	459.2	l/s

Volumes			
Pre-development			
Impermeable -----	1yr	0.0	cu.m
	30yr	0.0	cu.m
	100yr	0.0	cu.m
Pervious ⁴ -----	1yr	274.5	cu.m
	30yr	631.3	cu.m
	100yr	856.1	cu.m
Total -----	1yr	274.5	cu.m
	30yr	631.3	cu.m
	100yr	856.1	cu.m
Post-development			
Impermeable ⁶ -----	1yr	60.5	cu.m
	30yr	144.4	cu.m
	100yr+40%CC	180.7	cu.m

Stormwater Storage Estimates				
Based on Greenfield run-off QBar				
Microdrainage Quick Storage Estimates (using FEH catchment data)				
Return Period	Rate	lower	upper	mean
1yr	10.8 l/s	392	657	524.5 cu.m
30yr	10.8 l/s	911	1262	1086.5 cu.m
100yr+10%CC	10.8 l/s	1464	1894	1679 cu.m
100yr+20%CC	10.8 l/s	1632	2103	1867.5 cu.m

1/ The 'development area' removes areas of POS and/or landscaped areas of the wider site that are to remain as existing.
2/ On occasion the existing impermeable area cannot be evidenced to connect and a reduction is applied.
3/ 50mm/hr is used for BRegs calculations and often used by Water Companies when considering allowable post-development rates of discharge. (Rational Method)
4/ The Greenfield rates and of run-off have been calculated using the UK SUDS Calculator
5/ QBar is the estimated flood flow for the 2.33yr return period event and is often used as a post-development rate restriction.
6/ Post-development run-off is only considered from the impermeable area when the proposed post-development impermeable area >50% in accordance with the EA Guidance Preliminary rainfall runoff management for developments (W5-074/A/TR1/1 rev E (2012)).

NB. The catchment characteristics are from the FEH catchment, the UK SUDS Calculator and Microdrainage.
NB. The rainfall intensities and depths are calculated for the 6hr duration rainfall event (peak summer intensity)

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Megan Berry
Site name:	Kirkby Valley Golf Club.
Site location:	Liverpool

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

Site Details

Latitude:	53.47298° N
Longitude:	2.9105° W
Reference:	2002038594
Date:	Feb 18 2021 14:51

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	2.878
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Methodology

Q _{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.587
Q _{MED} (l/s):	
Q _{BAR} / Q _{MED} factor:	1.08

Hydrological characteristics

	Default	Edited
SAAR (mm):	846	846
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is $SPR/SPRHOST \leq 0.3$?

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

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):		10.77
1 in 1 year (l/s):		9.37
1 in 30 years (l/s):		18.31
1 in 100 year (l/s):		22.4
1 in 200 years (l/s):		25.53

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY																												
Date 18/02/2021 14:57 File	Designed by MeganBerry Checked by																											
Micro Drainage		Source Control 2018.1																										
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QUICK STORAGE ESTIMATES

KIRKBY VALLEY GOLF CLUB

1 YEAR RETURN PERIOD STORM EVENT

Micro Drainage		Variables		
Variables Results Design Overview 2D Overview 3D Vt	FEH Rainfall	Cv (Summer)	0.750	
	Return Period (years)	2	Cv (Winter)	0.840
	Version	2013	Point	...
	Site	GB 339428 398090	Impervious Area (ha)	2.878
			Maximum Allowable Discharge (l/s)	10.8
			Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
		Climate Change (%)	0	

Micro Drainage		Results
		Global Variables require approximate storage of between 392 m ³ and 657 m ³ .
		These values are estimates only and should not be used for design purposes.

30 YEAR RETURN PERIOD STORM EVENT

Micro Drainage		Variables		
Variables Results Design Overview 2D Overview 3D Vt	FEH Rainfall	Cv (Summer)	0.750	
	Return Period (years)	30	Cv (Winter)	0.840
	Version	2013	Point	...
	Site	GB 339428 398090	Impervious Area (ha)	2.878
			Maximum Allowable Discharge (l/s)	10.8
			Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
		Climate Change (%)	0	

Micro Drainage		Results
		Global Variables require approximate storage of between 911 m ³ and 1262 m ³ .
		These values are estimates only and should not be used for design purposes.

QUICK STORAGE ESTIMATES

KIRKBY VALLEY GOLF CLUB

100 YEAR RETURN PERIOD STORM EVENT + 10% CLIMATE CHANGE

Variables	
FEH Rainfall	Cv (Summer) 0.750
Return Period (years) 100	Cv (Winter) 0.840
Version 2013 Point	Impemeable Area (ha) 2.878
Site GB 339428 398090	Maximum Allowable Discharge (l/s) 10.8
	Infiltration Coefficient (m/hr) 0.00000
	Safety Factor 2.0
	Climate Change (%) 10

Results	
Global Variables require approximate storage of between 1464 m ³ and 1894 m ³ .	
These values are estimates only and should not be used for design purposes.	

100 YEAR RETURN PERIOD STORM EVENT + 20% CLIMATE CHANGE

Variables	
FEH Rainfall	Cv (Summer) 0.750
Return Period (years) 100	Cv (Winter) 0.840
Version 2013 Point	Impemeable Area (ha) 2.878
Site GB 339428 398090	Maximum Allowable Discharge (l/s) 10.8
	Infiltration Coefficient (m/hr) 0.00000
	Safety Factor 2.0
	Climate Change (%) 20

Results	
Global Variables require approximate storage of between 1632 m ³ and 2103 m ³ .	
These values are estimates only and should not be used for design purposes.	