

Hardstanding play/sports area to north west of site.



View across hardstanding play/sports area towards north western site boundary.



View towards rear of sports hall from outdoor play/sports area.



Site boundary along Plant Hill Road, view looking south west.



Blocked drain within front of school car park showing evidence of surface water ponding.



Overgrown drainage infrastructure to rear of main school building.



Poorly maintained roof guttering on sports hall building – semi mature plant growth within gutter.



Strip drain within lower recreation area to west of main school building, partially blinded but of reasonable operational condition.

Appendix B Calculations

B-1 Greenfield Runoff Rate

Greenfield runoff has been calculated using the Institute of Hydrology (IoH) 124 report methodology, as recommended by the *Interim Code of Practice for Sustainable Drainage Systems*.

Using Institute of Hydrology report 124, *Flood estimation in small catchments.*

$$Q_{bar} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

Where:

AREA	=	0.051km^2	site area (km^2)
SAAR	=	983mm	Standard Annual Average Rainfall (mm) based on data from the FEH CD-Rom
SOIL	=	0.45	

Where SOIL class is determined using 2.1 of IoH report number 126, Hydrology of Soil Types.

Where AREA is <50 hectares (ha) it is recommended to use 50ha and scale result using pro rata calculations based on actual site size.

Q_{bar}	=	$0.00108 \times 0.5^{0.89} \times 983^{1.17} \times 0.45^{2.17}$
Q_{bar}	=	$0.00108 \times 0.540 \times 3171.67 \times 0.177$
Q_{bar}	=	0.3274 m^3/s
$Q_{bar\ Co\text{-}op}$	=	0.3274 / 50 = 0.006548 m^3/s/ha
$Q_{bar\ Co\text{-}op}$	=	**6.55 l/s/ha**

B-2 Rainfall Runoff

Rainfall runoff for a 1% probability (1 in 100 chance) event at the site has been generated using the Flood Estimation Handbook CD-ROM, produced by CEH Institute of Hydrology. Runoff depths for a range of return periods have been calculated using the software and have then been adjusted to account for potential future climate change (additional 20% on peak rainfall intensity).

B-3 Discharge to United Utilities Sewer

The proposed surface water management system will retain combined sewer connections to United Utilities infrastructure in Plant Hill Road. Based on the existing peak runoff rate, proposed discharge rates can be calculated.

B.1.1 Existing site peak runoff

Existing peak runoff from the site for a 1% probability event can be determined, based on Rational Method calculations, using:

Q_{peak} = kCiA

where:

k = conversion factor equal to 0.00278 for metric

C = dimensionless runoff coefficient

i = rainfall intensity (mm/hr)

A = catchment area (ha)

Areas drained	A (ha)	i (mm/h)	C	Q (l/s)
Existing Building	0.61	45.62	1.0	77.36
Hard Standing areas (car park, etc)	1.25	45.62	1.0	158.53
TOTAL	1.96			235.89

Including a peak flow rate of 5.74 l/s foul flow for the existing college population, total peak flow to the combined sewer is 241.63 l/s.

B.1.2 Developed site runoff

Assuming a conservative 100% runoff to public sewer for the hardstanding and roof areas of the developed site, total volume of flow generated from the development can be determined using Rational Method calculations:

Areas to be drained	A (ha)	i (mm/h)	C	Q (l/s)
Building	0.38	54.74	1.0	57.83
Roads and car parks	0.41	54.74	1.0	62.39
Basketball pitches (hardstanding)	0.22	54.74	1.0	33.48
Hardstanding	0.23	54.74	1.0	35.00
TOTAL	1.24			188.70

Including a peak flow rate of 5.74 l/s foul flow for the developed college population, total predicted flow to the combined sewer will be 194.44 l/s.

B.1.3 Attenuation Requirements

Provision of a new stormwater drainage system will provide betterment to the site in terms of a reduction in peak runoff to public sewers. Assuming a 30% reduction from existing peak discharge rates (241.63 l/s), peak runoff rates from the site will be limited to 169.14 l/s. Taking into consideration this reduced discharge rate during a 60 minute duration 1% probability event, volume of attenuation has been determined to be approximately 250 m^3 using Win*Des* hydraulic modelling software.

It should be noted that the calculated attenuation volume takes limited account of storage within the reticulation network at this stage and is to be considered a worst case volume for the 1% probability rainfall event.