

Appendix 9-A Estimations of Low Flows (Q95)

9-A.1 Estimation of Low Flows (Q95)

9-A.1.1 The following documents the calculation of the Q95 flow – the flow that can be expected 95% of the time – for the locations listed in Table 9-A.1.

Table 9-A.1 Locations Where Q95 Flows Have Been Estimated

Water course	Grid Reference for Q95 Estimate
Egerton Stream	TQ 740 086
Combe Haven	TQ 748 099
Watermill Stream	TQ 752 107
Powdermill Stream*	TQ 761 107
Drainage Ditch near Decoy Pond Stream	TQ 766 106

Notes:

**it was not possible to discern between the old and new courses of Powdermill Stream*

9-A.1.2 Flow data was not available for any of the sites therefore it was necessary to estimate the Q95 flows using information regarding the hydrological characteristics of their upstream catchments that were obtained from the Flood Estimation Handbook (FEH) CD-ROM. The FEH catchment descriptors used were the standard average annual rainfall, the catchment area and the base-flow index. Information relating to potential evaporation was taken from Gustard et al (1992).

9-A.1.3 The following regression equation was used to estimate a mean flow at each site listed in Table 9-E.1:

$$\text{Mean Flow (m}^3\text{/s)} = 2.7 \times 10^{-7} \times \text{AREA}^{1.02} \times \text{SAAR}^{1.82} \times \text{PE}^{-0.284}$$

Where:

AREA = catchment area (km²)

SAAR = standard annual average rainfall (mm/yr)

PE = potential evaporation (mm/yr)

9-A.1.4 The percentage of the mean flow which forms the Q95 flow can subsequently be estimated using the equation;

$$\text{Q95:\% of Mean Flow} = 44.1 \times \text{BFI}^{1.43} \times \text{SAAR}^{-0.033} \times \text{AREA}^{0.0342}$$

Where:

BFI = baseflow index (dimensionless)

9-A.1.5 Table 9-A.2 presents the catchment characteristics that were used in the analysis and the mean flow and Q95 values that were obtained for the subject sites.

Table 9-A.2 Q95 Estimates

Water course	SAAR (mm/yr)	AREA (km²)	PE (mm/yr)	MF (m³/s)	BFI	Q95: % of MF	Q95 (m³/s)	Q95 (l/s)
Combe Haven	749	2.37	524.5	0.019	0.451	11.7	0.002	2.2
Watermill Stream	786	12.68	524.5	0.113	0.418	11.1	0.013	12.6
Powdermill Stream	806	17.77	524.5	0.167	0.396	10.4	0.017	17.3
Drainage Ditch	786	3.26	524.5	0.028	0.433	11.1	0.003	3.2

9-A.1.6 The Environment Agency have a flow monitoring site located at TQ 764 102 which is in close proximity to the study sites listed in Table 9-A.1 and therefore provides a valuable means of verifying the estimates in Table 9-A.2. Table 9-A.3 presents a comparison between the mean flow and Q95 at the monitoring site as estimated from gauged flow data and from catchment descriptors.

Table 9-A.3 Comparison of Flow Estimates at TQ 764 102

	Flow Data	Catchment Descriptors	Adjustment Factor
Mean Flow (m³/s)	0.13	0.328	0.396
Q95 Flow (m³/s)	0.02	0.037	0.54

9-A.1.7 It is apparent from Table 9-A.3 that the catchment descriptors taken from the FEH CD-ROM are overestimating low flows in comparison to the observed flow data. Consequently it is appropriate to use the flow monitoring site as a donor by which to adjust the Q95 estimates in Table 9-A.2. The adjustment factor of 0.54 (0.02/0.037) in Table 9-A.3 has been used to adjust the Q95 estimates at the study locations and the final Q95 estimates are presented in Table 9-A.4.

Table 9-A.4 Final Q95 Estimates

Water course	Grid Reference for Q95 Estimate	Final Estimate of Q95 Flow (m³/s)
Egerton Stream	TQ 740 086	0.001
Combe Haven	TQ 748 099	0.001
Watermill Stream	TQ 752 107	0.007
Powdermill Stream	TQ 761 107	0.009
Drainage Ditch near Decoy Pond Stream	TQ 766 106	0.002

