Defra / Environment Agency
Flood and Coastal Defence R&D Programme

PRELIMINARY RAINFALL RUNOFF MANAGEMENT FOR DEVELOPMENTS

R&D Technical Report W5-074A/TR1
Appendix – Figures 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 9, 10, 11 and 12

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Research contractor: HR Wallingford

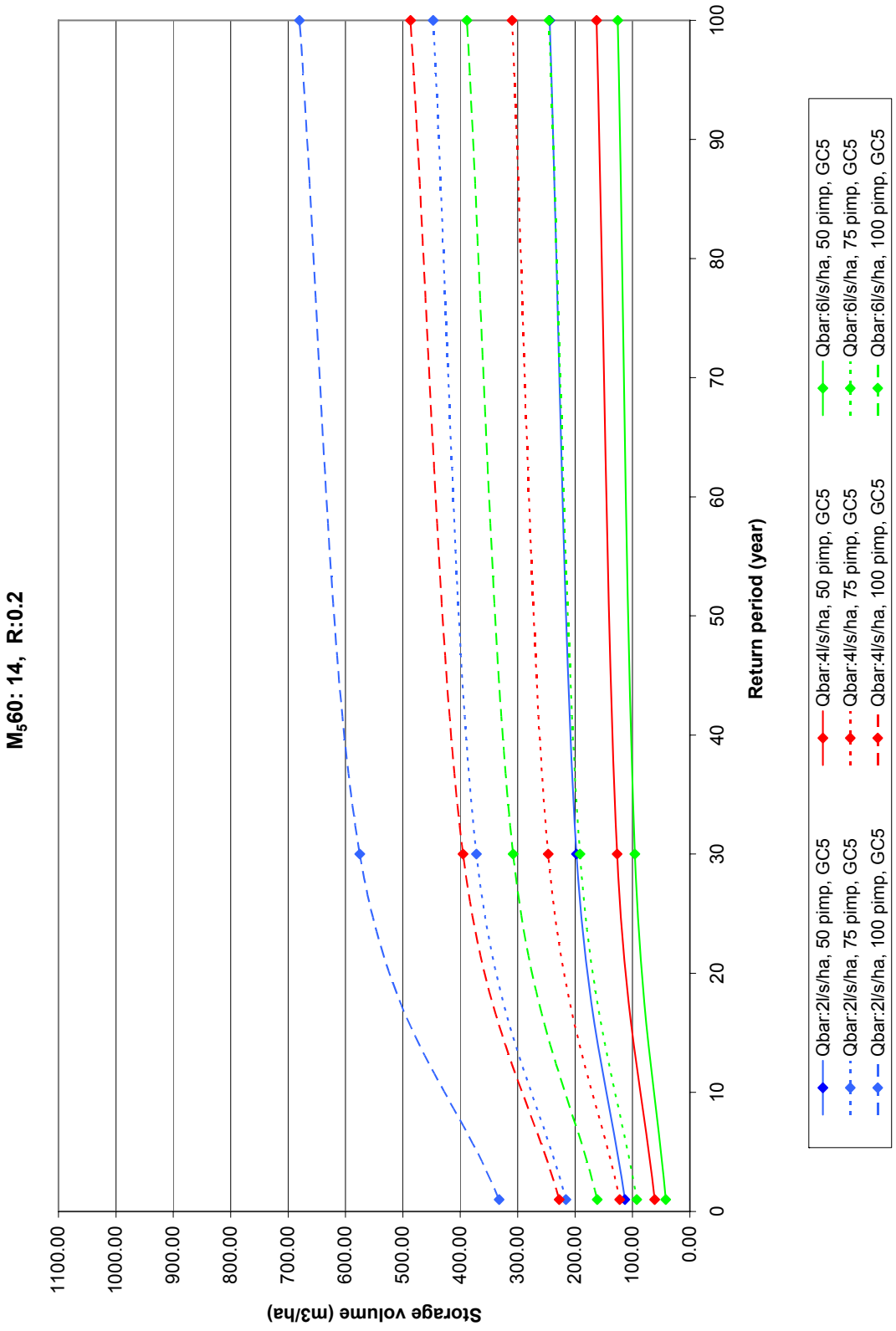

Figure 7.1 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:14, "r":0.2)

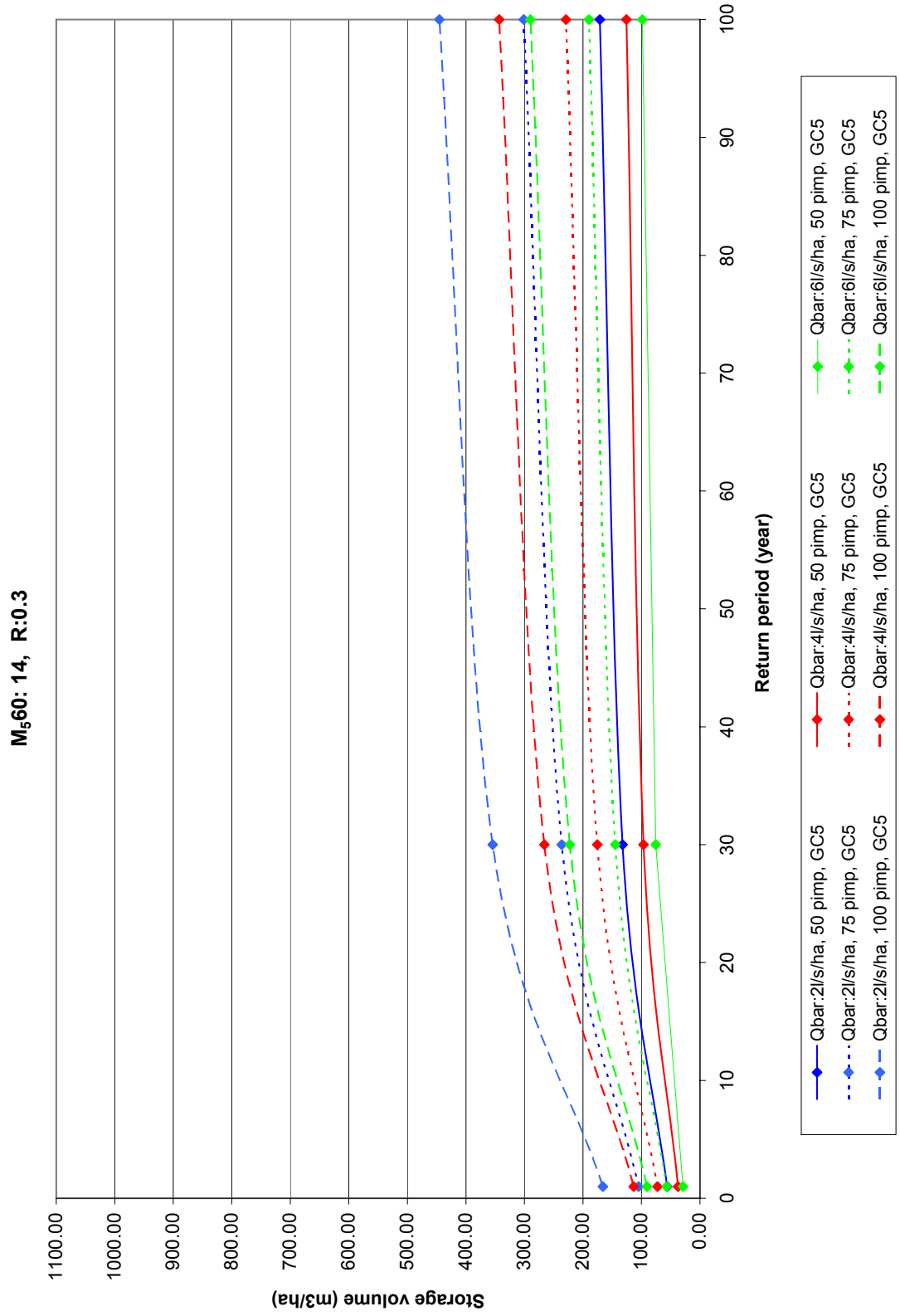

Figure 7.2 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:14, "r":0.3)

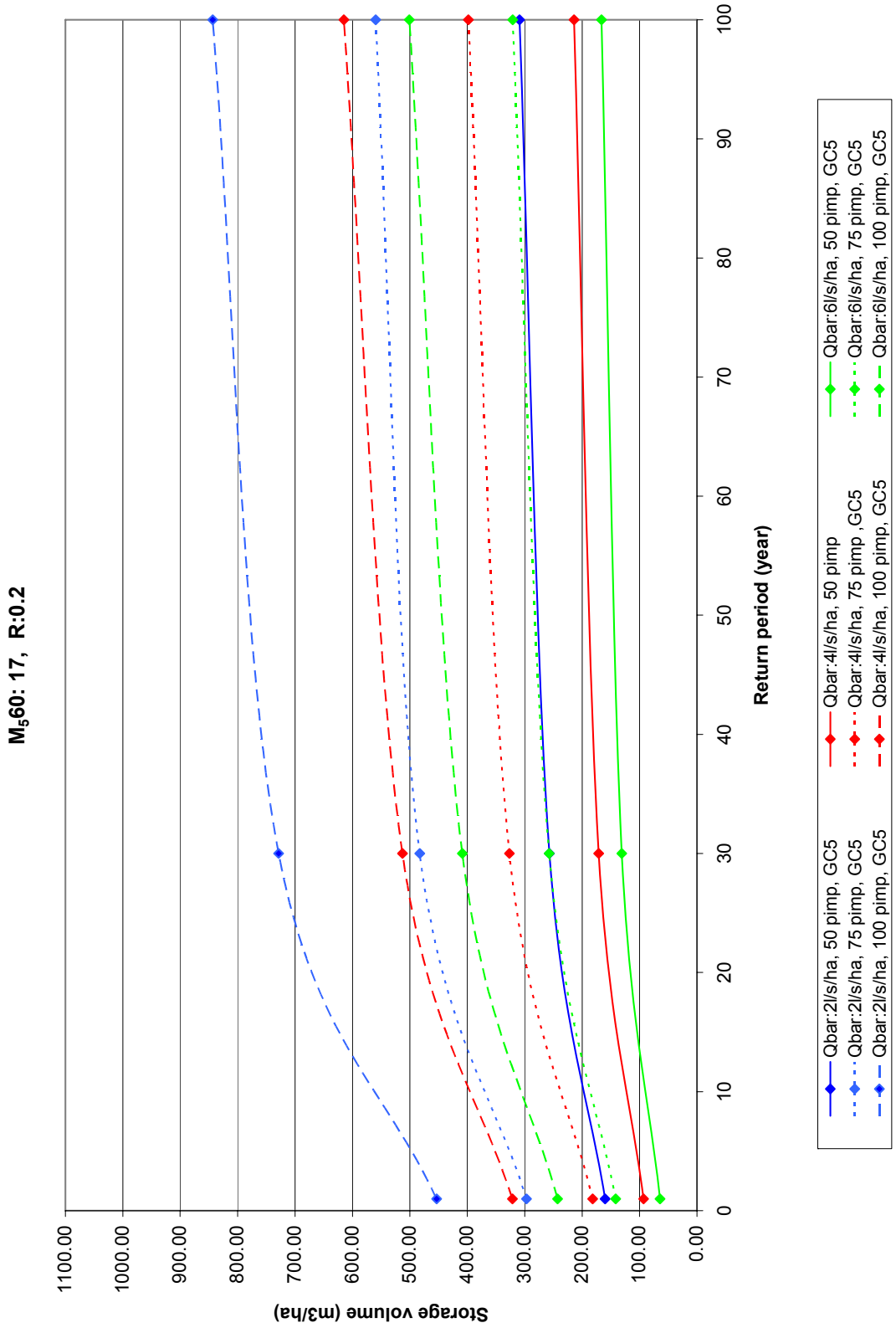

Figure 7.3 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:17, "r":0.2)

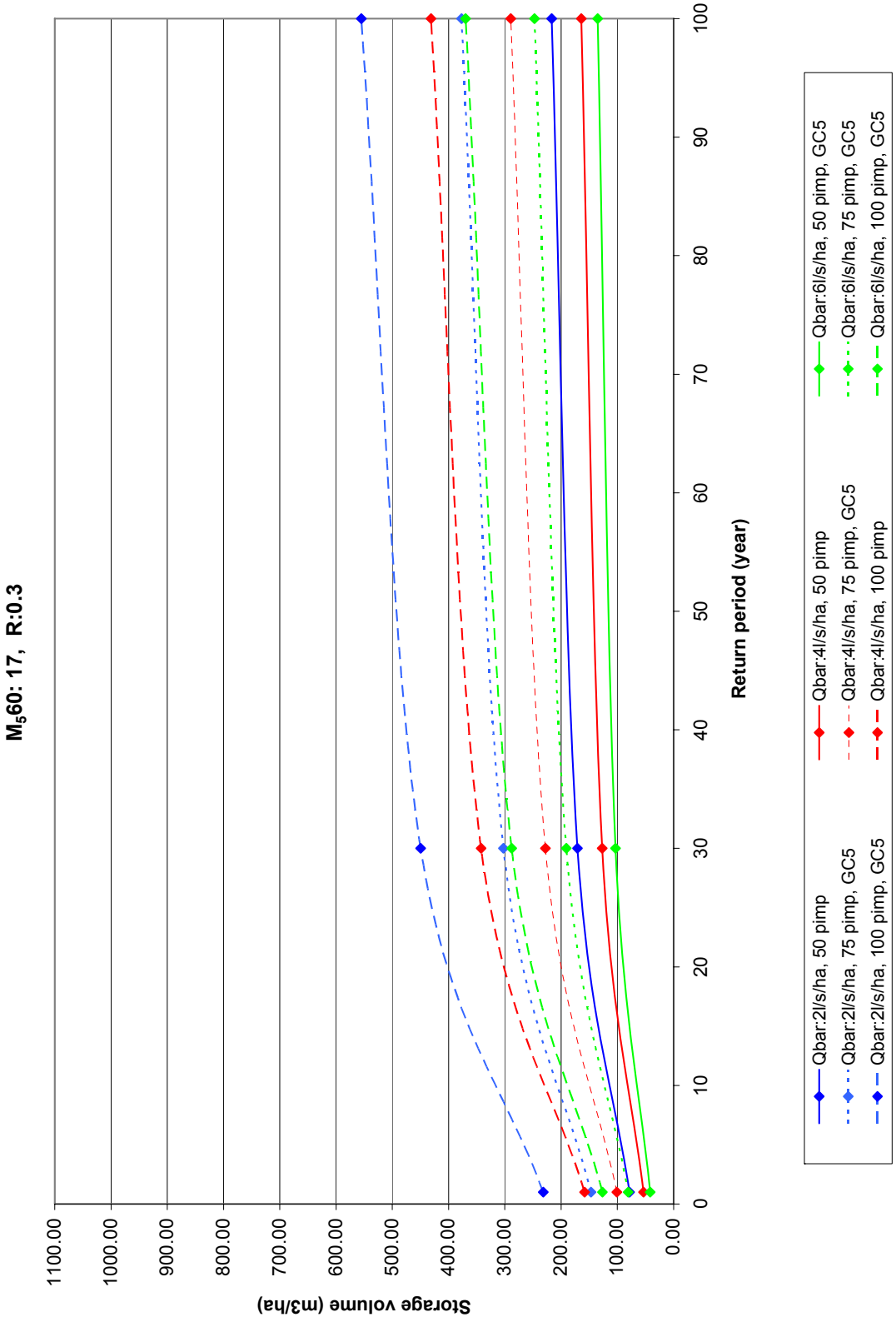

Figure 7.4 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:17, "r":0.3)

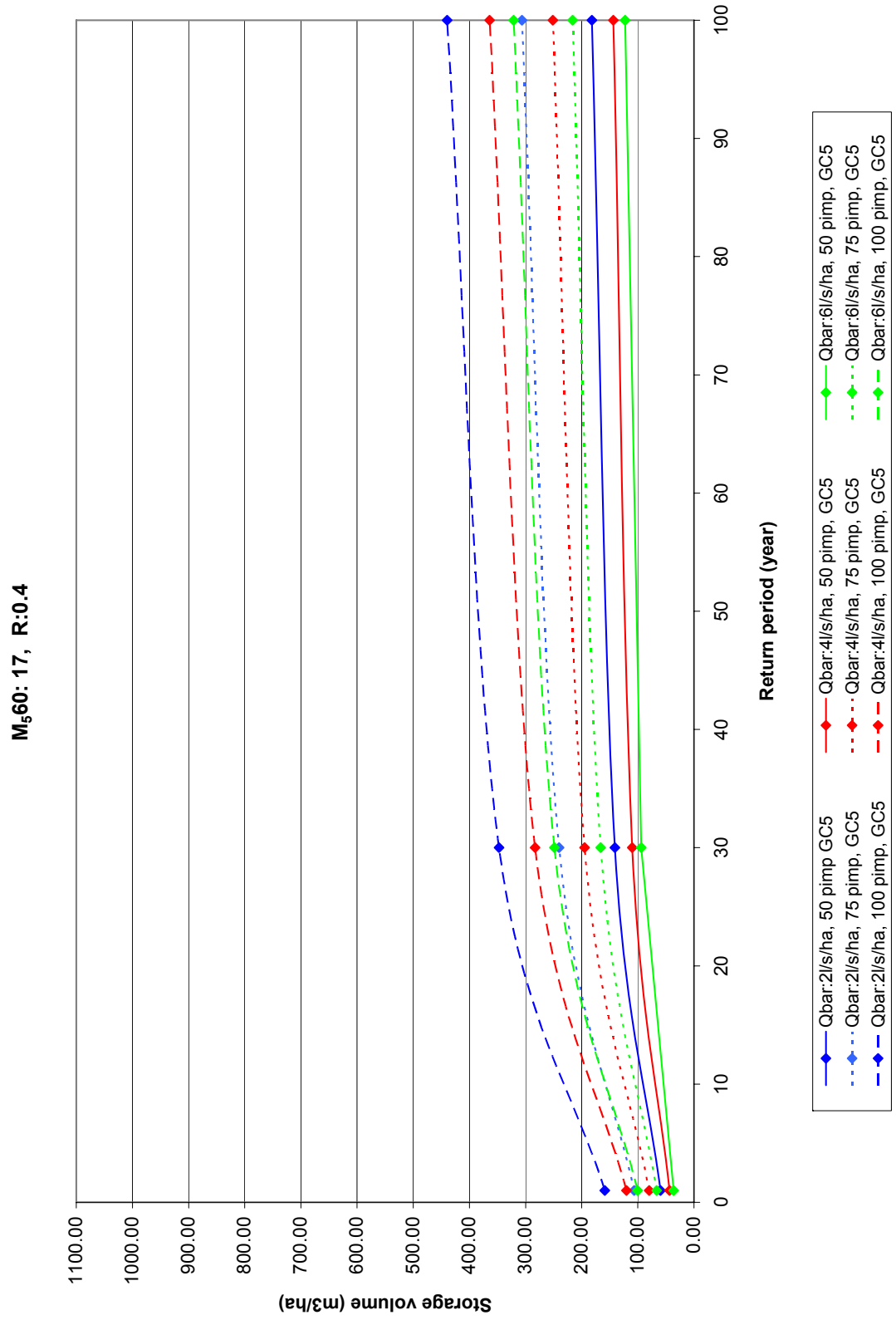

Figure 7.5 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:17, "r":0.4)

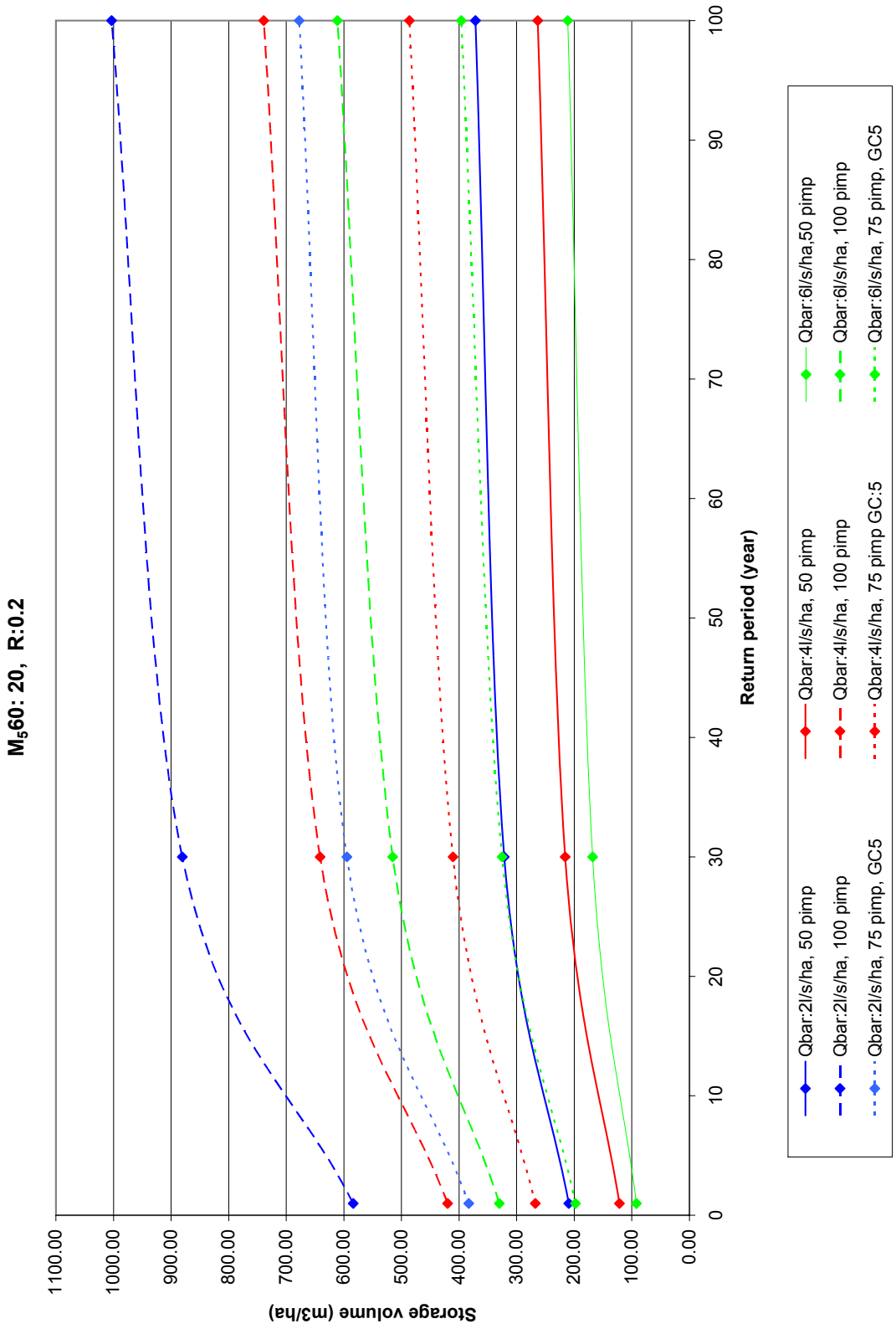

Figure 7.6 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:20, "r":0.2)

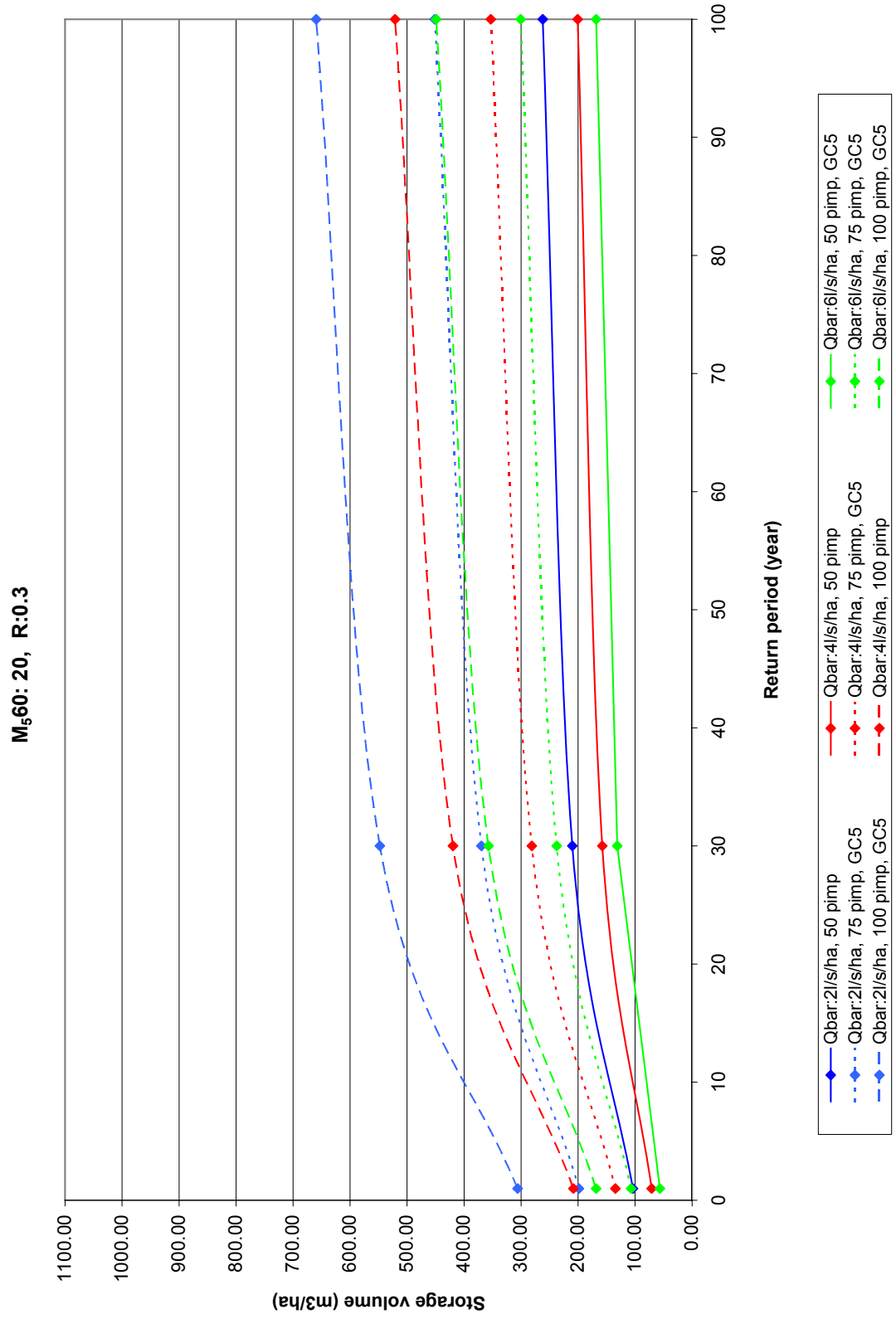

Figure 7.7 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:20, "r":0.3)

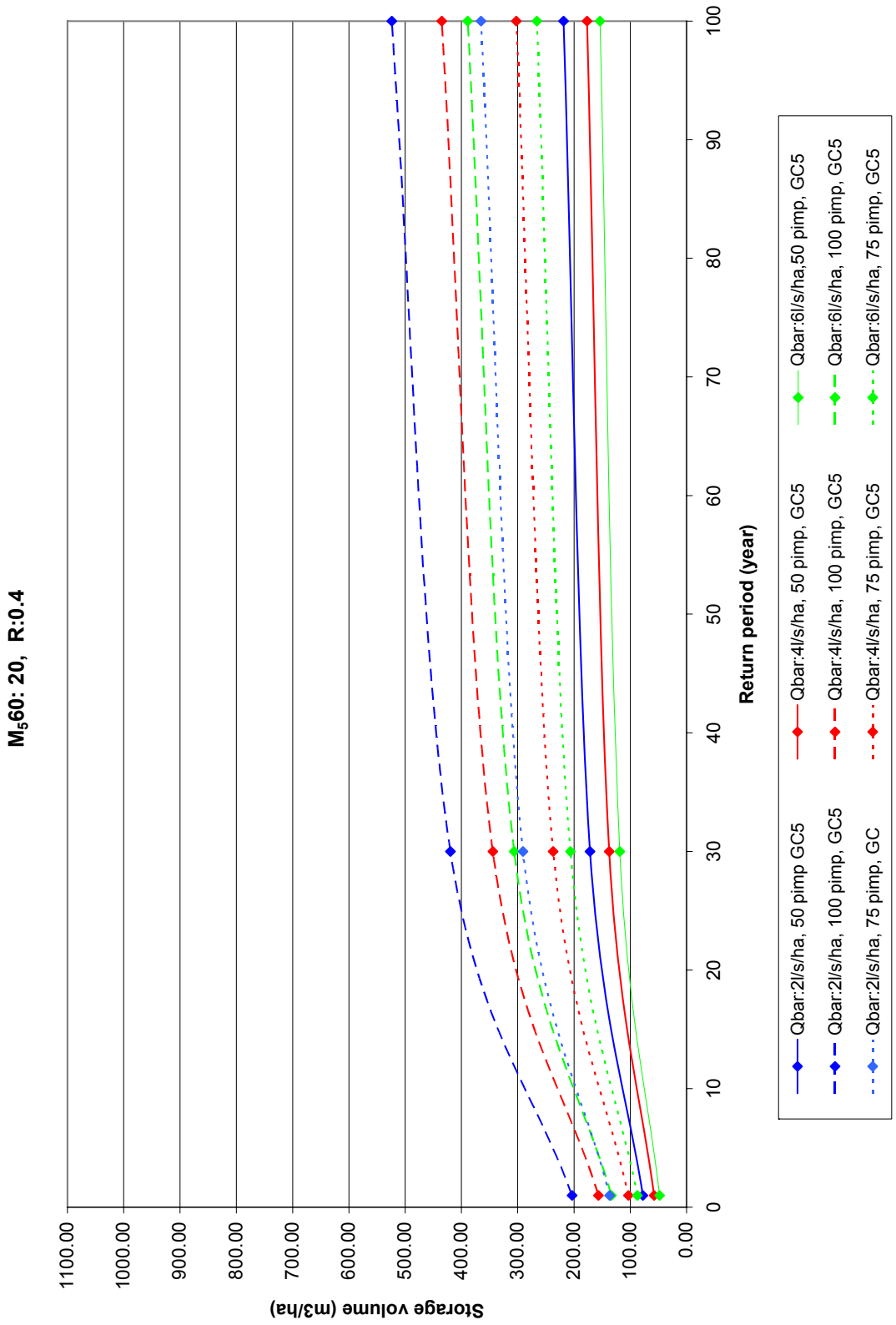

Figure 7.8 Attenuation storage volume as a function of Q_{BAR}/A and PIMP ($M_5$60:20, "r":0.4)

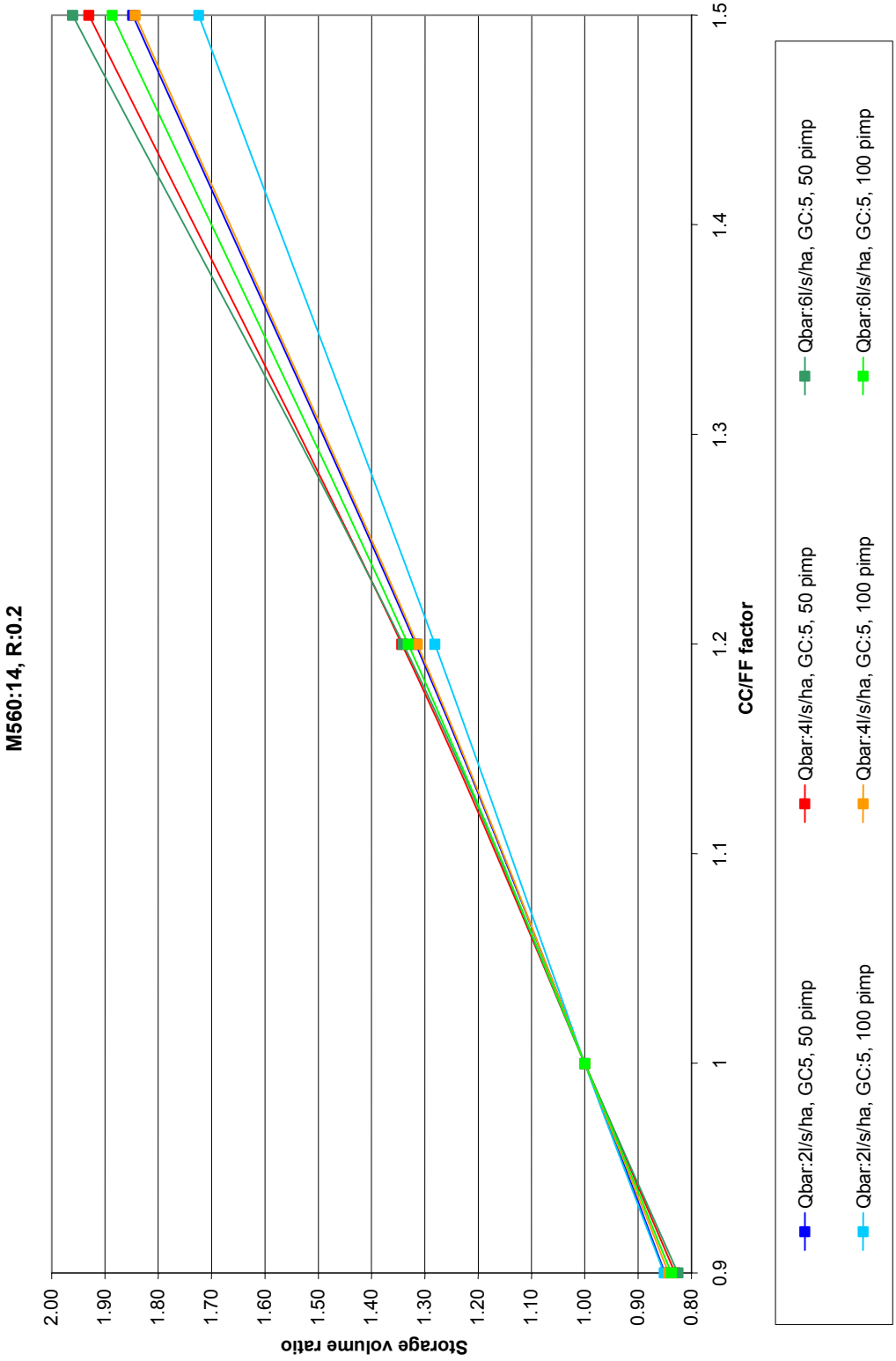

Figure 8.1 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios ($M_5$60:14, "r":0.2)

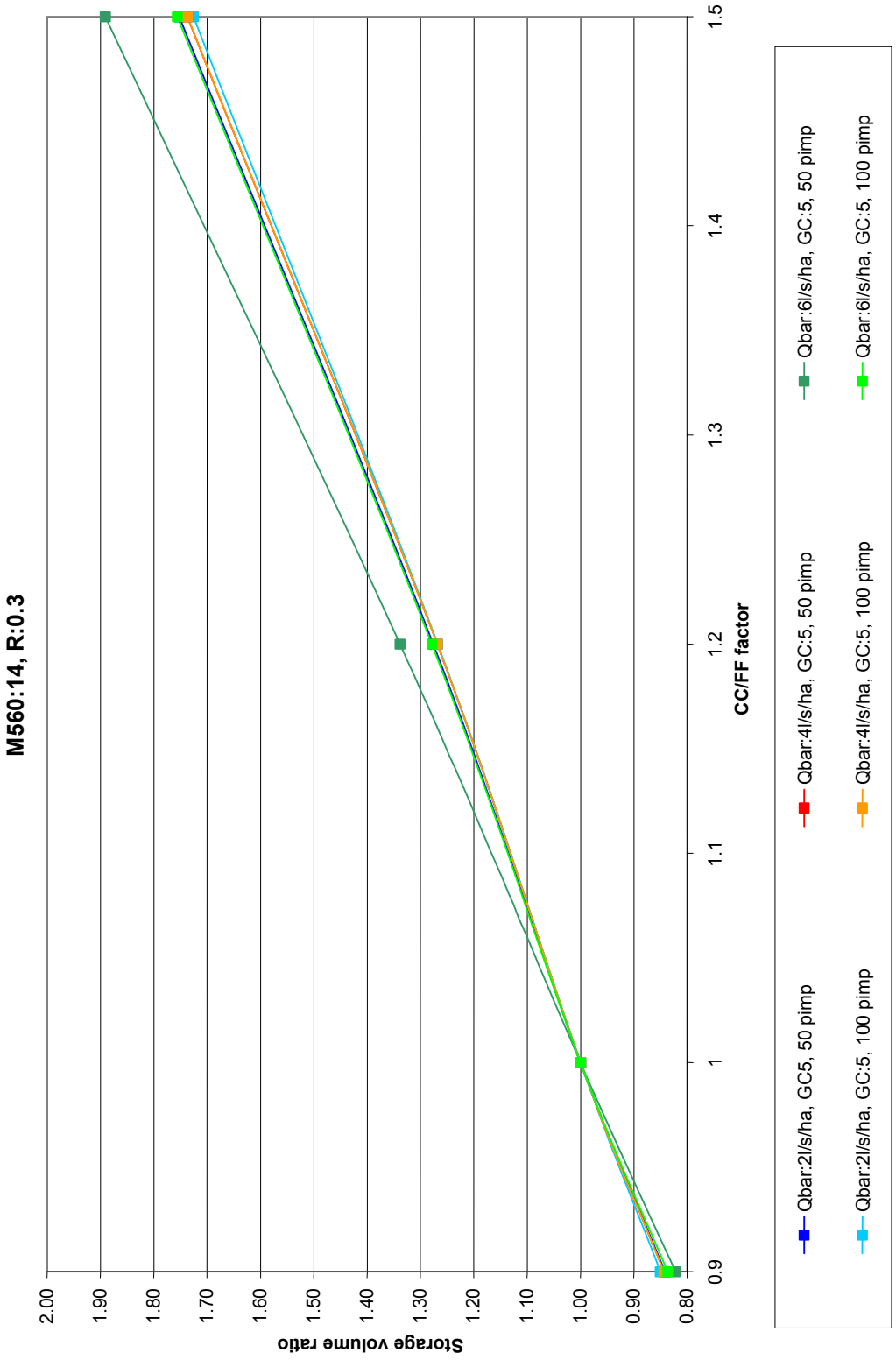

Figure 8.2 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios ($M_5$60:14, "r":0.3)

Figure 8.3 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios (M560:17, R:0.2)

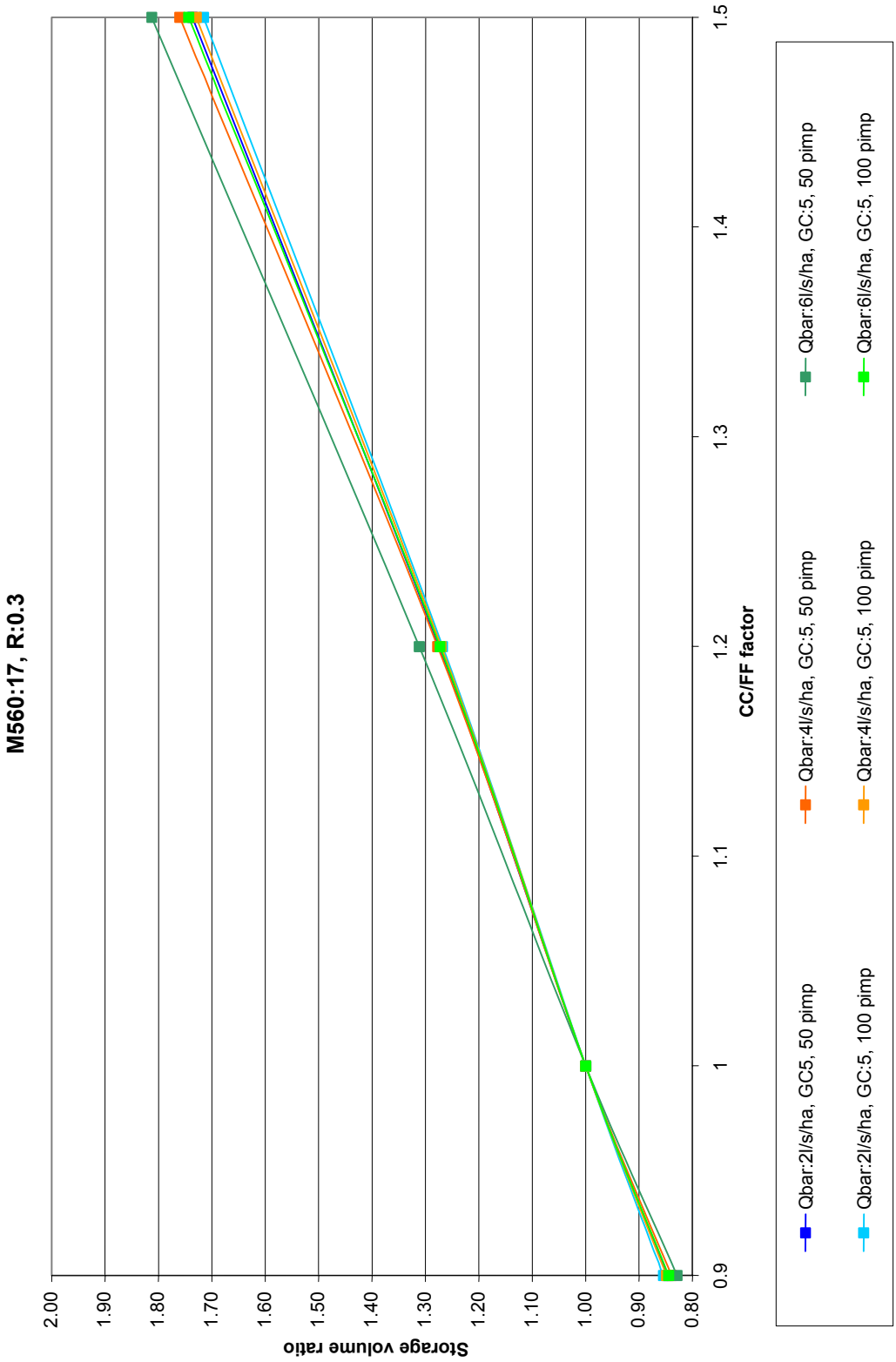

Figure 8.4 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios (M560:17, R:0.3)

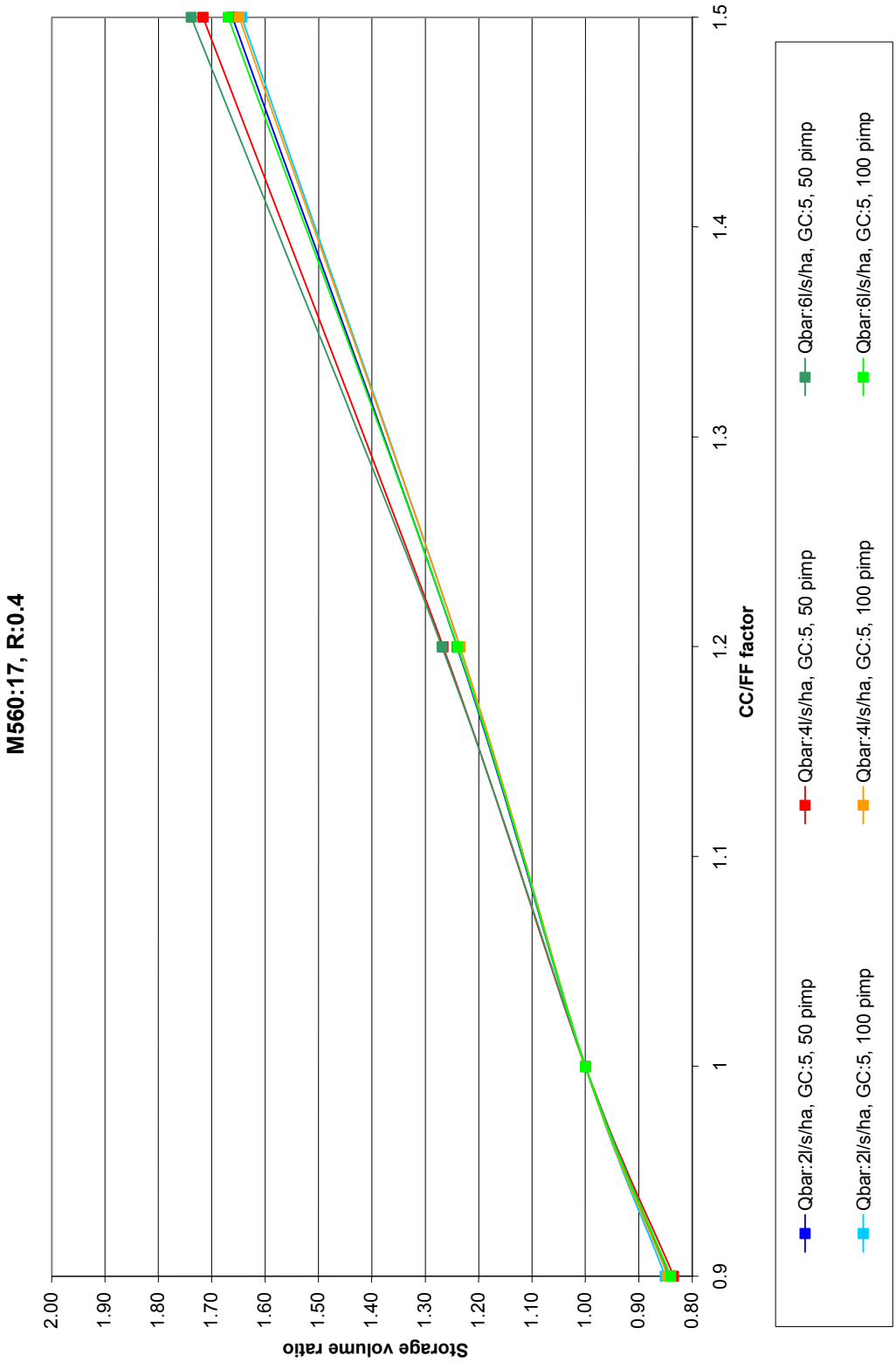

Figure 8.5 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios (M560:20, R:0.4)

Figure 8.6 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios (M560:20, R:0.2)

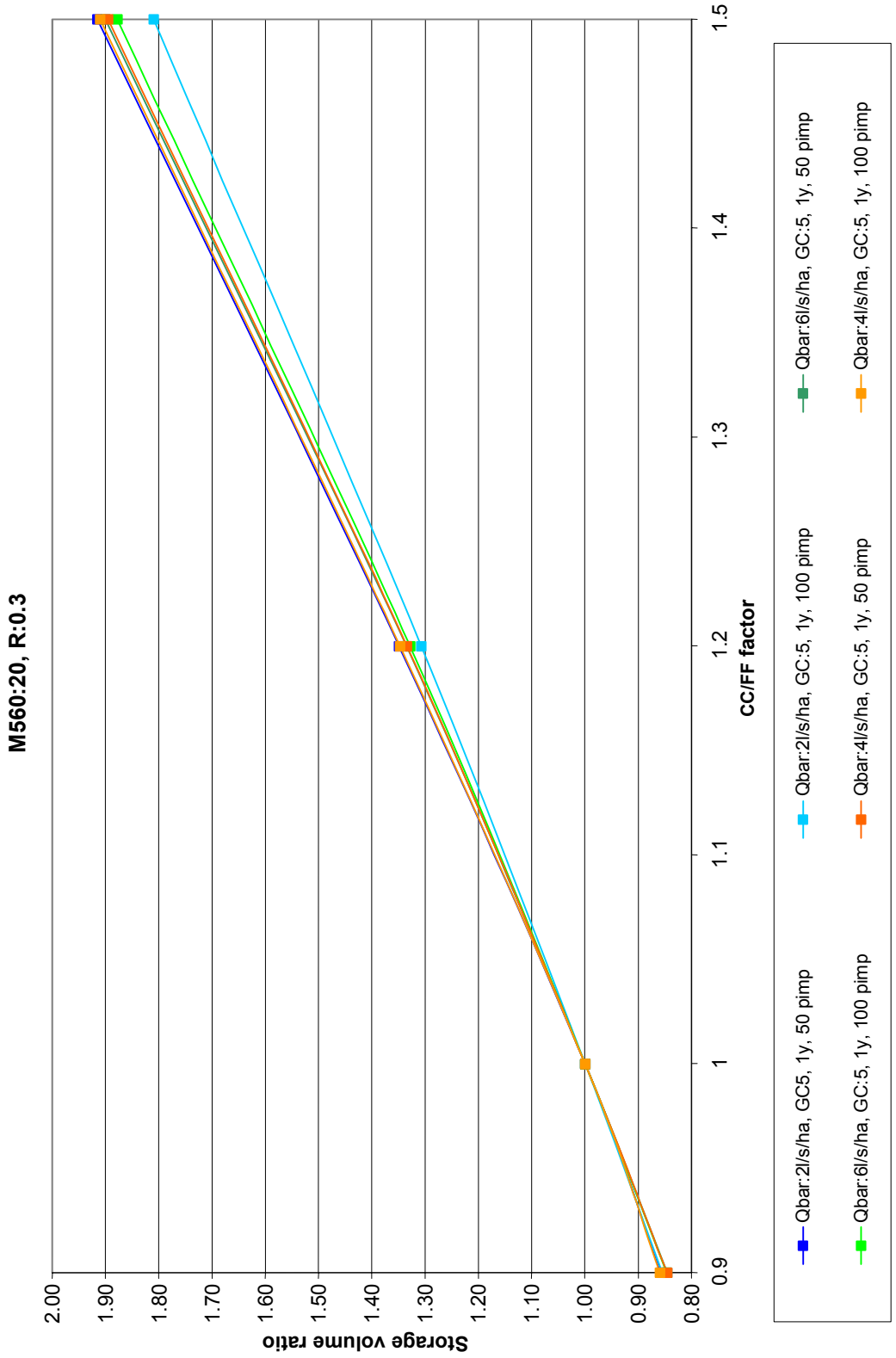

Figure 8.7 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios (M560:20, R:0.3)

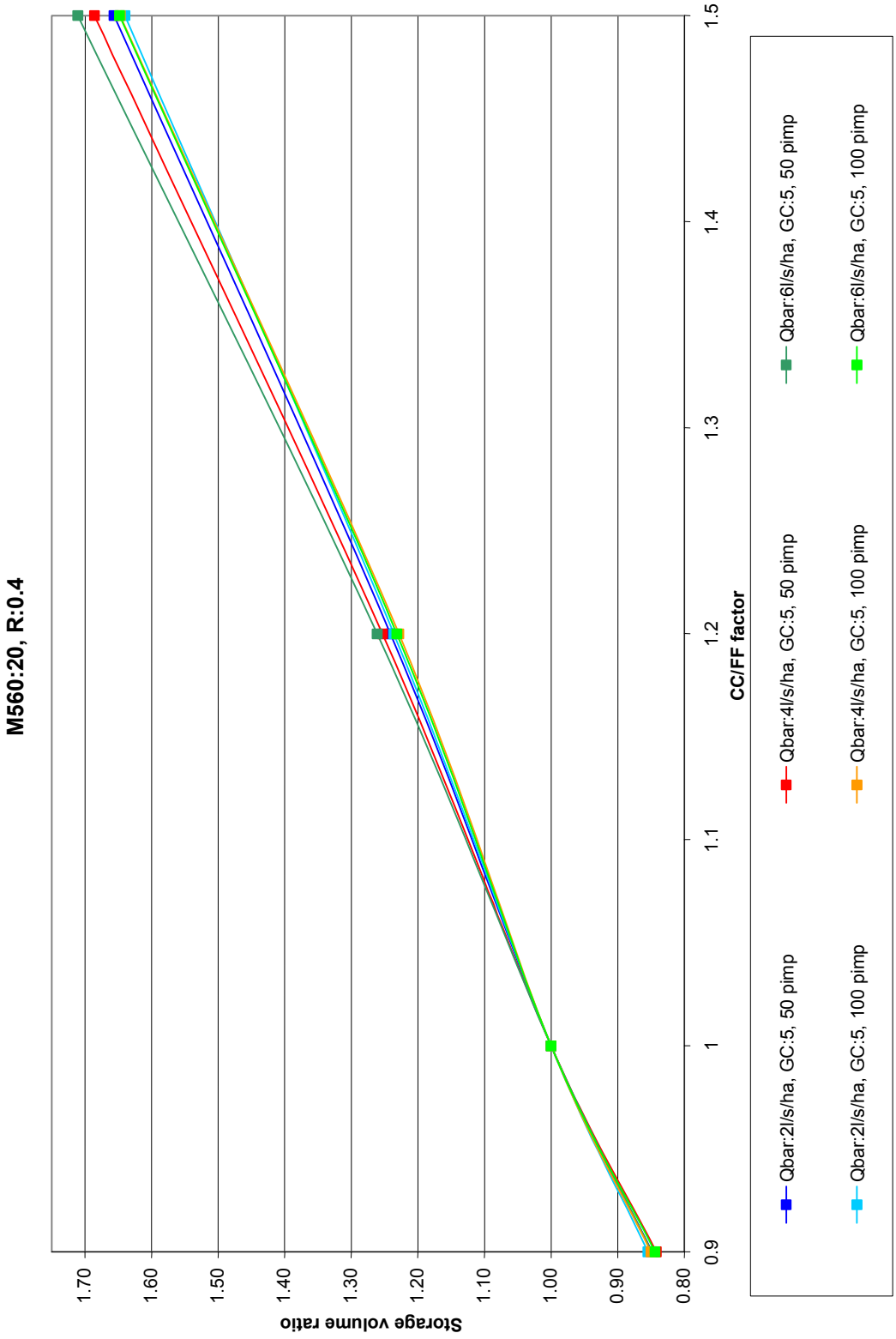

Figure 8.8 Attenuation storage volume adjustment factor to allow for climate change and FEH rainfall depth ratios (M560:20, R:0.4)

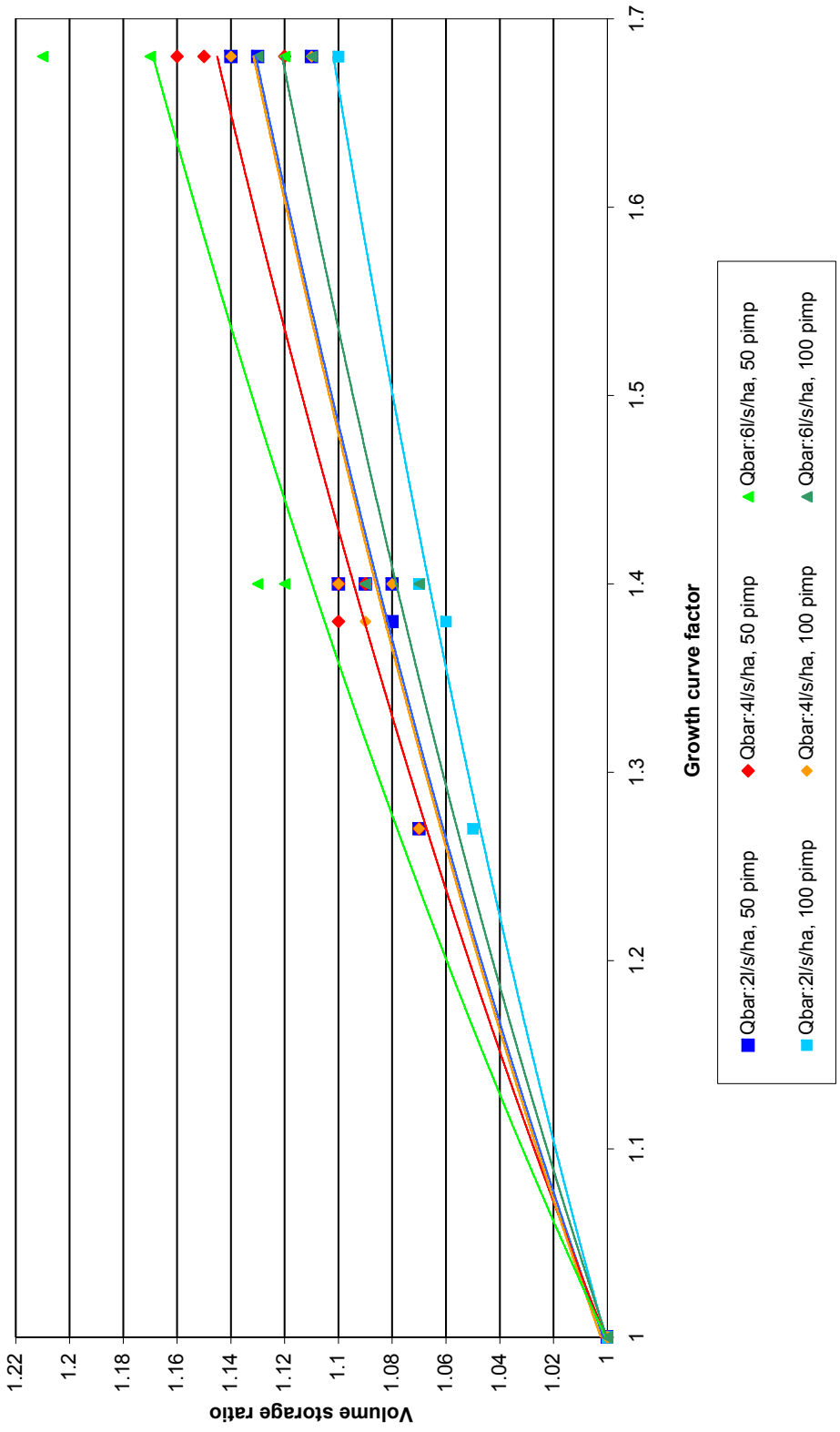

Figure 9 Attenuation storage growth curve adjustment factor hydrological regions of UK (all hydrological zones)

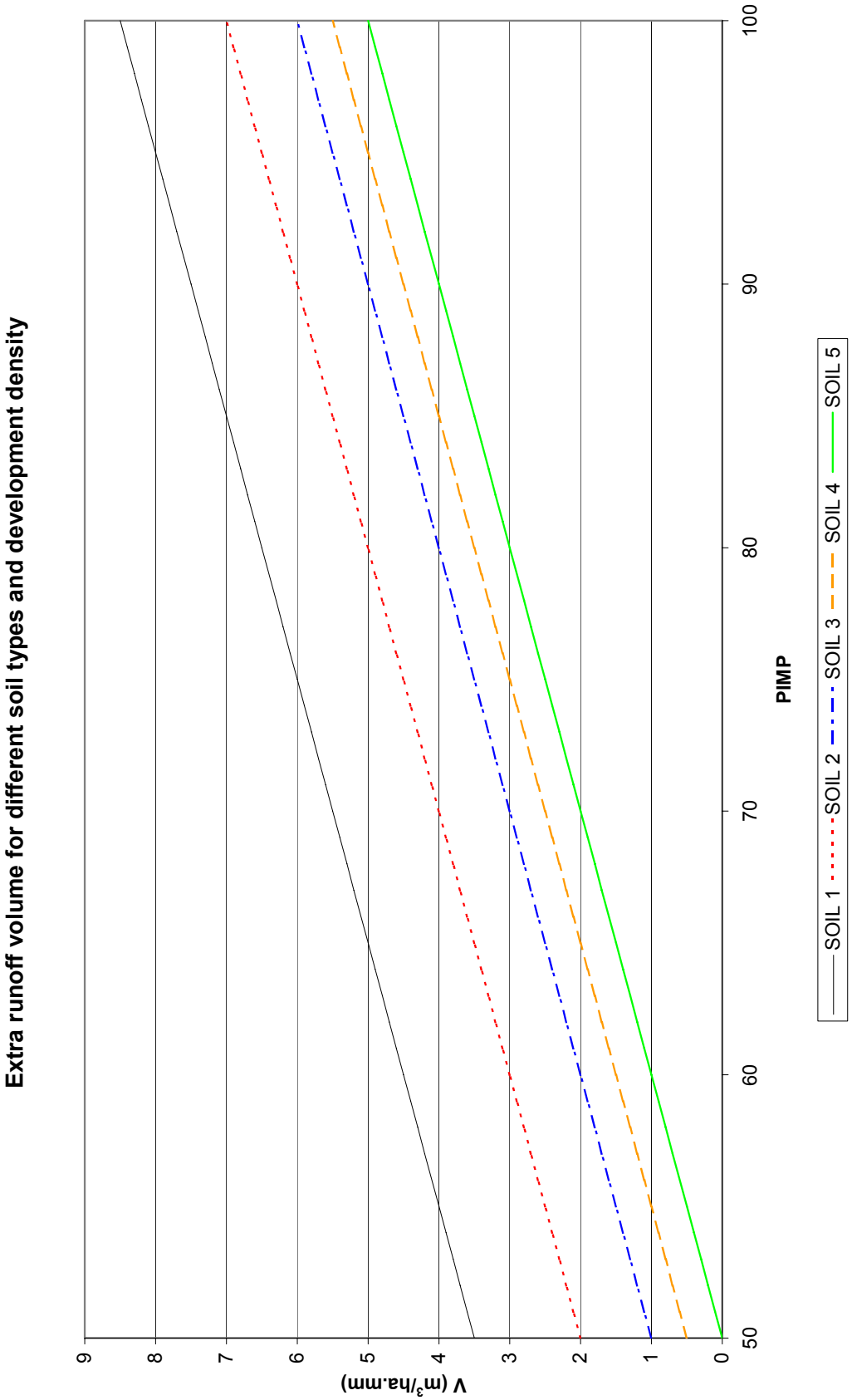

Figure 10 Long Term storage volume based on SOIL type

FEH factor: 1.1	Critical durations for each hydrological zone (hours)							
Qbar (l/s/ha)	Hydrological Zones							
	M560:14 R:0.2	M560:14 R:0.3	M560:17 R:0.2	M560:17 R:0.3	M560:17 R:0.4	M560:20 R:0.2	M560:20 R:0.3	M560:20 R:0.4
2 (50pimp/ 100pimp)	28/48	9/26	30/48	13/32	7/12	36/48	16/36	6/13
4 (50pimp/ 100pimp)	11/30	5/9	14/32	5/13	3/7	15/36	6/16	4/6
6 (50pimp/ 100pimp)	5/19	3/7	7/21	4/7	2/4	10/27	3/10	2/4

FEH factor: 1.0	Critical durations for each hydrological zone (hours)							
Qbar (l/s/ha)	Hydrological Zones							
	M560:14 R:0.2	M560:14 R:0.3	M560:17 R:0.2	M560:17 R:0.3	M560:17 R:0.4	M560:20 R:0.2	M560:20 R:0.3	M560:20 R:0.4
2 (50pimp/ 100pimp)	30/44	10/32	32/48	13/32	6/11	48/48	15/32	6/13
4 (50pimp/ 100pimp)	11/30	5/10	15/32	5/13	4/6	13/40	7/14	4/6
6 (50pimp/ 100pimp)	6/20	4/8	8/26	4/8	2/4	10/27	5/10	2/4

FEH factor: 0.8	Critical durations for each hydrological zone (hours)							
Qbar (l/s/ha)	Hydrological Zones							
	M560:14 R:0.2	M560:14 R:0.3	M560:17 R:0.2	M560:17 R:0.3	M560:17 R:0.4	M560:20 R:0.2	M560:20 R:0.3	M560:20 R:0.4
2 (50pimp/ 100pimp)	36/48	14/36	40/48	18/40	7/16	48/48	23/44	9/19
4 (50pimp/ 100pimp)	19/36	7/14	20/40	7/18	4/7	19/44	10/23	4/9
6 (50pimp/ 100pimp)	8/27	4/9	9/30	5/11	2/5	14/32	5/13	3/6

FEH factor: 0.65	Critical durations for each hydrological zone (hours)							
Qbar (l/s/ha)	Hydrological Zones							
	M560:14 R:0.2	M560:14 R:0.3	M560:17 R:0.2	M560:17 R:0.3	M560:17 R:0.4	M560:20 R:0.2	M560:20 R:0.3	M560:20 R:0.4
2 (50pimp/ 100pimp)	44/48	19/44	48/48	24/48	9/20	48/48	30/48	11/20
4 (50pimp/ 100pimp)	25/44	8/9	27/48	10/24	4/9	34/48	13/32	5/10
6 (50pimp/ 100pimp)	13/30	5/11	19/36	5/15	4/6	20/44	7/21	4/7

Note: This set of tables provides assistance in choosing the correct duration map in figures 6.1.1-6.3.4

See note 3 in section 3.1 for discussion on the use of Figure 11.

Figure 11 Table of critical durations as a function of Q_{BAR}/A and PIMP for Attenuation Storage analysis

HOST/SOIL CLASS	SPR Value % (HOST)	SPR Value SOIL *
1	0.020	0.15 (0.10)
2	0.020	0.30 (0.30)
3	0.145	0.40 (0.37)
4	0.020	0.45 (0.47)
5	0.145	0.50 (0.53)
6	0.338	
7	0.443	
8	0.443	
9	0.253	
10	0.253	
11	0.020	
12	0.600	
13	0.020	
14	0.253	
15	0.484	
16	0.292	
17	0.292	
18	0.472	
19	0.600	
20	0.600	
21	0.472	
22	0.600	
23	0.600	
24	0.397	
25	0.496	
26	0.687	
27	0.600	
28	0.600	
29	0.600	

* Values of SPR for SOIL have been used for deriving Figure 10. These SPR values are based on the SOIL coefficients used in the Wallingford Procedure runoff model. The value in brackets is the SPR value for SOIL from the Flood Studies Report. The Wallingford Procedure analysis was carried out by the Institute of Hydrology and resulted in modified SPR values to obtain the best correlation for the percentage runoff equation for urban drainage.

Note: There is no relationship between the HOST index class and the same index for SOIL

Figure 12 SPR Values for SOIL and HOST