MasterDrain SW

BDS Architecture
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Job No.			
Sheet no.	1		
Date	16/09/20		
Project	Drove Road	By	Checked / Reviewed
Title	Storage		

Data:-

FSR Hydrology:-

Location = SPALDING
M5-60 (mm) = 18.8
Soil index = 0.30
Return period = 100
UCWI = 54.4

Grid reference = TF2422
r = 0.41
SAAR (mm/yr) = 560
WRAP = 2
Climate change = 30

i) Very permeable soils with shallow ground water;
ii) Permeable soils over rock or fragipan, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils; The layer is low in organic matter, mottled and (fragipan - a natural subsurface horizon having a higher bulk density than the solum above. Seemingly cemented when dry but showing moderate to weak brittleness when moist. Slowly or very slowly permeable to water. It is found in profiles of either cultivated or virgin soils but not in calcareous material).
iii) Moderately permeable soils, some with slowly permeable subsoils.

Runoff factor (RF) = 32.0, calculated from:-

Runoff factor = (0.829*PIMP)+(25*SOIL)+(0.078*UCWI)-20.7
where
PIMP = Impervious Area*100/(Impervious Area+Pervious Area)
UCWI = Calculated value for Wetness Index

Design data:-

Imperv. area = 1118 m²
Total area (TA) = 2278 m²
Allowed discharge rate = 5.000 l/s
Additional flow = 0.00 l/s

Pervious area = 1160 m²
Equiv area = 729 m² (TA x RF).
Areal reduction factor = 1.000
Climate change factor = 30

Calculated data:-

Time to max = 43.0 mins
Rainfall at max = 62.25 mm/hr
Pipeline storage = 2.0 m³
Offline storage = 0.0 m³

Calculated storage volume = 27.7 m³
Allowed discharge rate = 5.000 l/s
Available MH storage = 0.0 m³

Fixed 6 hour data:-

Rainfall event = 6 hours
Rainfall rate = 12.00 mm/hr

Calculated storage volume = 0.0 m³
Allowed discharge rate = 5.000 l/s

Rainfall intensities calculated using the Wallingford Procedure

Storage lengths for initial calculation (x 1.1, 1.2, 1.3 or 1.5 as above if required) :-

Diam	Len	Diam	Len
100	3533.9	1125	27.9
150	1570.6	1200	24.5
225	698.1	1275	21.7
300	392.7	1350	19.4
375	251.3	1425	17.4
450	174.5	1500	15.7
525	128.2	1575	14.2
600	98.2	1650	13.0
675	77.6	1725	11.9
750	62.8	1800	10.9
825	51.9	1875	10.1
900	43.6	1950	9.3
975	37.2	2025	8.6
1050	32.1	2100	8.0

Ovoid	Len
400 x 600	154.2
600 x 900	67.1
800 x 1200	37.8

Box culvert	Len
500 x 500	111.0
500 x 750	74.0
500 x 1000	55.5
750 x 1000	37.0
750 x 1200	30.8
750 x 1500	24.7
1000 x 1000	27.7
1000 x 1200	23.1
1000 x 1500	18.5
1000 x 1800	15.4
1000 x 2000	13.9
1500 x 1500	12.3
1500 x 1800	10.3
1500 x 2000	9.2

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Project: Drove Road

Title: Storage

Data:-

Time (mins)	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)
10	150.0	22.823	3.000	19.823
20	102.0	31.019	6.000	25.019
30	79.0	36.055	9.000	27.055
40	65.0	39.718	12.000	27.718
50	56.0	42.608	15.000	27.608
60	49.0	45.003	18.000	27.003
70	44.0	47.050	21.000	26.050
80	40.0	48.840	24.000	24.840
90	37.0	50.431	27.000	23.431
100	34.0	51.863	30.000	21.863
110	32.0	53.166	33.000	20.166
120	30.0	54.361	36.000	18.361
130	28.0	55.464	39.000	16.464
140	27.0	56.488	42.000	14.488
150	25.0	57.444	45.000	12.444
160	24.0	58.340	48.000	10.340
170	23.0	59.182	51.000	8.182
180	22.0	59.977	54.000	5.977
190	21.0	60.729	57.000	3.729
200	20.0	61.442	60.000	1.442
210	19.0	62.121	63.000	0.000
220	19.0	62.767	66.000	0.000
230	18.0	63.384	69.000	0.000
240	18.0	63.975	72.000	0.000
250	17.0	64.540	75.000	0.000
260	16.0	65.082	78.000	0.000
270	16.0	65.603	81.000	0.000
280	16.0	66.104	84.000	0.000
290	15.0	66.586	87.000	0.000
300	15.0	67.050	90.000	0.000
310	14.0	67.498	93.000	0.000
320	14.0	67.931	96.000	0.000
330	14.0	68.349	99.000	0.000
340	13.0	68.754	102.000	0.000
350	13.0	69.145	105.000	0.000
360	13.0	69.525	108.000	0.000
370	12.0	69.892	111.000	0.000
380	12.0	70.301	114.000	0.000
390	12.0	70.683	117.000	0.000
400	12.0	71.056	120.000	0.000
410	11.0	71.422	123.000	0.000
420	11.0	71.780	126.000	0.000
430	11.0	72.130	129.000	0.000
440	11.0	72.474	132.000	0.000
450	11.0	72.811	135.000	0.000
460	10.0	73.142	138.000	0.000
470	10.0	73.467	141.000	0.000
480	10.0	73.786	144.000	0.000
490	10.0	74.099	147.000	0.000
500	10.0	74.407	150.000	0.000
510	10.0	74.710	153.000	0.000
520	9.0	75.007	156.000	0.000
530	9.0	75.300	159.000	0.000
540	9.0	75.588	162.000	0.000
550	9.0	75.872	165.000	0.000
560	9.0	76.151	168.000	0.000
570	9.0	76.426	171.000	0.000
580	9.0	76.697	174.000	0.000
590	9.0	76.963	177.000	0.000
600	8.0	77.227	180.000	0.000

Storage volume (m^3) = 27.7 m^3

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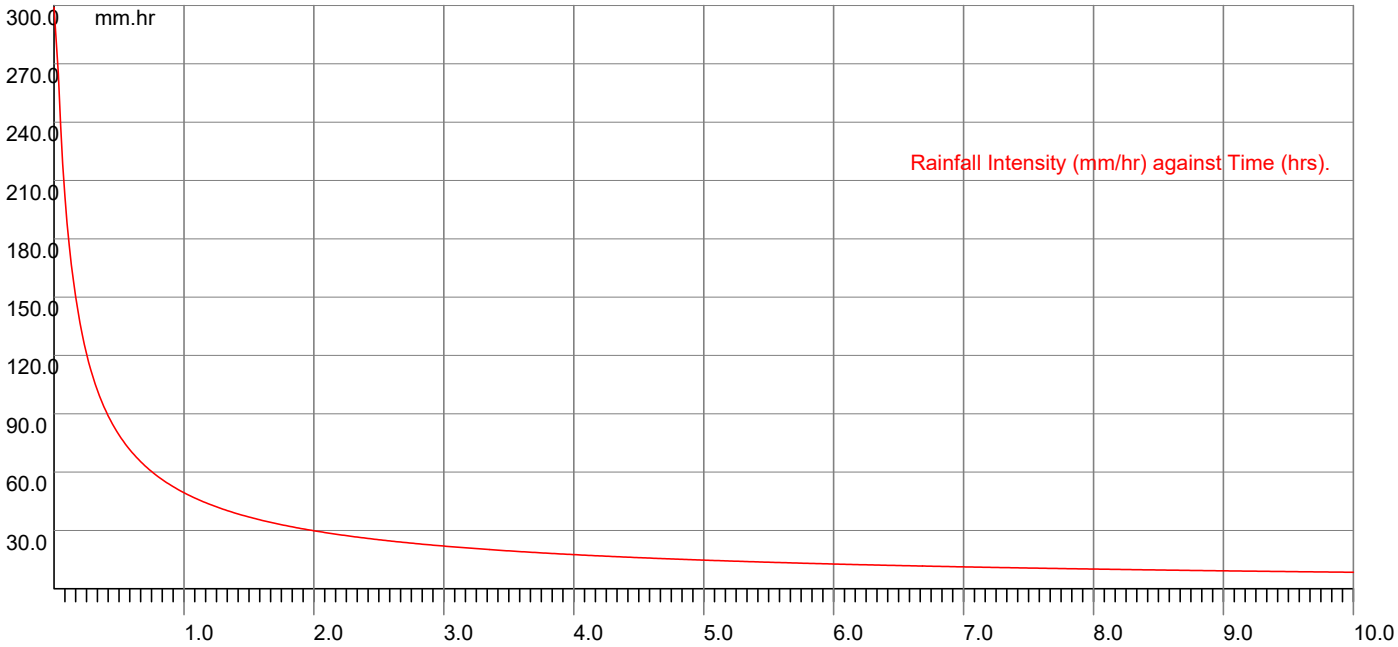
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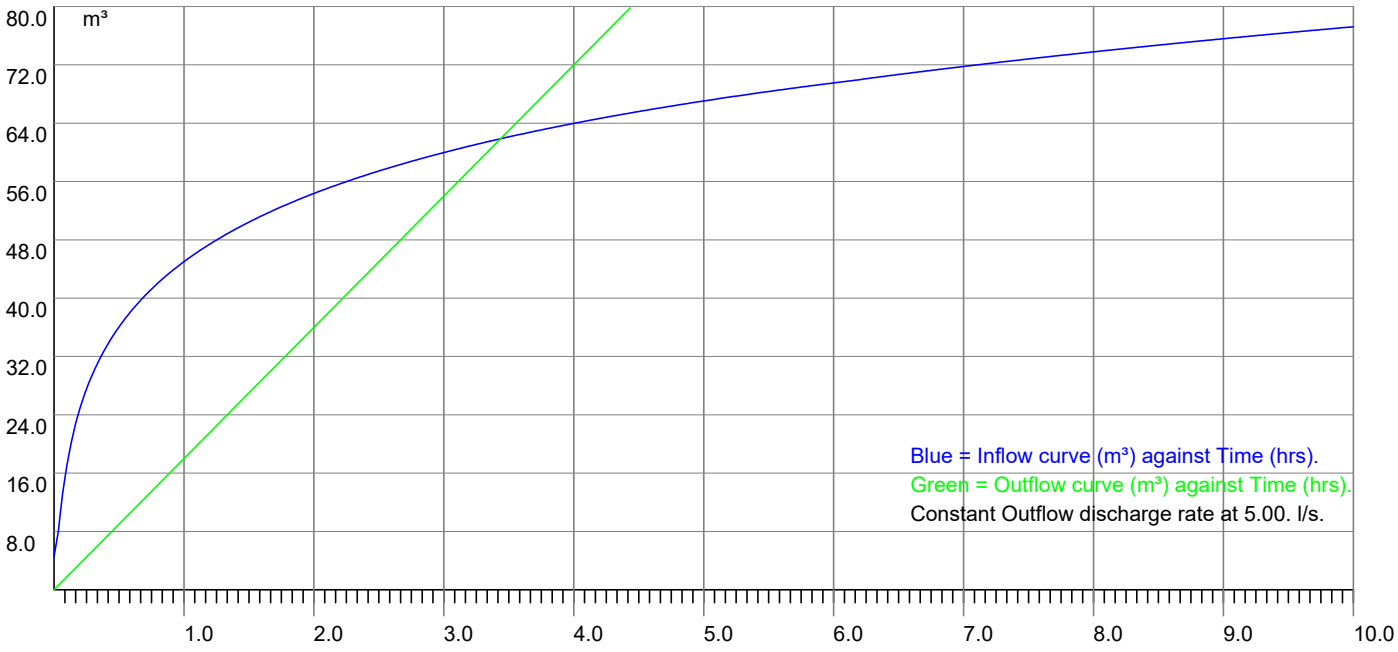
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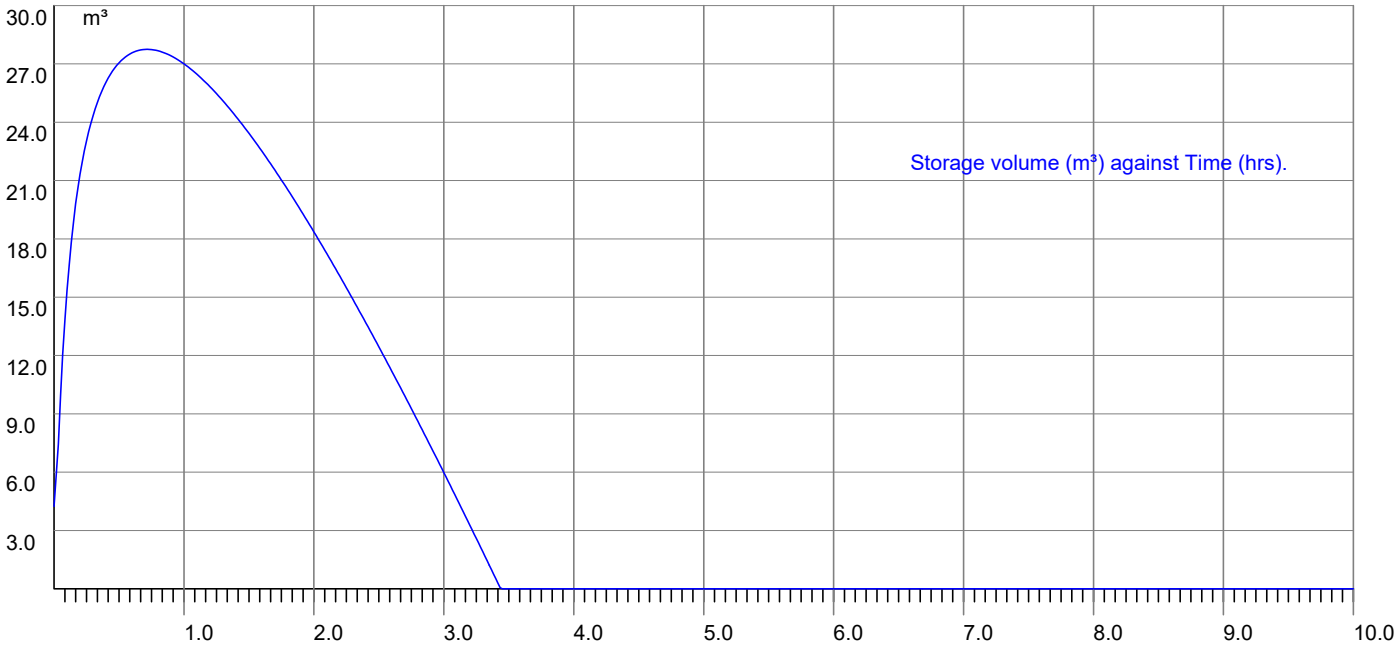
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Project **Drove Road**

Title **Storage**







Explanatory notes for Peak Flow Storage

1) This system uses the rainfall intensity/ duration curve calculated using either the Wallingford or FEH method as selected.
2) The balance is calculated from the inflow minus the outflow.
3) The storage volume is the maximum value of the balance curve.
4) This method was described by Davis (1963) - see Butler & Davies, 2nd edition, p294
5) References to 'storm duration' relate only to the hydrograph method (qv).
6) There are always 600 steps in the calculation process, thus a 'run' time of 10 hours will be sampled every minute,

Explanatory notes for Hydrograph Storage

1) The user has the choice of Summer or Winter curves
2) The mean intensity varies with the duration of the storm curve
3) There are always 120 steps in the calculation process, irrespective of storm duration.
4) The balance is calculated from the inflow minus the outflow.
5) The storage volume is the sum of the balance values for each step.
6) Varying durations should be tried to find the maximum storage value - this can be narrowed down very closely.

*Modelling using the flow characteristics of the restrictor is available using Vortex Control modelling function. Please be aware that this function needs the full design data file to function.

Why do the two methods give different results?

The rainfall characteristics for each method are very different.

The Peak flow (using the Intensity/Duration/Frequency curve) does not model the actual rainfall. This curve is joined points which represent the mean intensity of a storm at a given duration i.e. a value of 19.5 mm/hr for a 60 minute storm indicates that over the sixty minute period, the mean intensity was 19.5 mm/hr. The calculation method samples the IDF curve for a given location and frequency (Return Period) and calculates the storage for that rate and duration less the outflow volume. The maximum value is displayed as the 'worst case' storage.

The hydrograph method uses a standard curve for either Winter or Summer storms. Traditionally these are symmetrical about the central peak. UK rainfall does not fit into this convenient curve, so the calculations are dealing with a stylised set of data. The mean intensity for the storm is calculated from the IDF curve and applied to the curve data, calculating the storage for that step less the outflow volume. The final storage volume is the sum of the storage for all the steps.

It can be seen that these two methods are very different, and the user may have the choice of which result to use. This is not an exact science, though is often treated as such by those that do not understand the principles of the calculations.