APPENDIX C – TECHNICAL WORKSHEETS AND REFERENCE MATERIALS

NOAA Atlas 14, Volume 10, Version 3
Location name: Westport, Connecticut, USA*
Latitude: 41.1646°, Longitude: -73.323°
Elevation: 178.08 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.361 (0.284-0.454)	0.423 (0.333-0.533)	0.525 (0.411-0.661)	0.609 (0.475-0.773)	0.725 (0.545-0.955)	0.813 (0.598-1.09)	0.904 (0.643-1.25)	1.00 (0.677-1.42)	1.14 (0.738-1.67)	1.24 (0.788-1.86)
10-min	0.512 (0.403-0.643)	0.600 (0.472-0.755)	0.744 (0.584-0.940)	0.863 (0.672-1.10)	1.03 (0.772-1.35)	1.15 (0.847-1.55)	1.28 (0.911-1.77)	1.42 (0.960-2.02)	1.61 (1.05-2.36)	1.76 (1.12-2.63)
15-min	0.602 (0.474-0.757)	0.705 (0.555-0.888)	0.874 (0.685-1.10)	1.01 (0.791-1.29)	1.21 (0.909-1.59)	1.36 (0.996-1.82)	1.51 (1.07-2.09)	1.67 (1.13-2.37)	1.90 (1.23-2.78)	2.07 (1.31-3.10)
30-min	0.838 (0.660-1.05)	0.983 (0.773-1.24)	1.22 (0.955-1.54)	1.42 (1.10-1.80)	1.68 (1.26-2.22)	1.89 (1.39-2.53)	2.10 (1.49-2.90)	2.32 (1.57-3.29)	2.62 (1.70-3.83)	2.85 (1.80-4.25)
60-min	1.08 (0.846-1.35)	1.26 (0.991-1.59)	1.56 (1.23-1.97)	1.81 (1.41-2.30)	2.16 (1.62-2.84)	2.42 (1.78-3.24)	2.69 (1.91-3.71)	2.97 (2.01-4.21)	3.34 (2.17-4.89)	3.62 (2.29-5.41)
2-hr	1.38 (1.09-1.72)	1.64 (1.30-2.05)	2.06 (1.63-2.59)	2.41 (1.89-3.04)	2.90 (2.19-3.80)	3.27 (2.42-4.36)	3.64 (2.61-5.02)	4.06 (2.75-5.72)	4.64 (3.02-6.75)	5.10 (3.24-7.57)
3-hr	1.59 (1.26-1.98)	1.90 (1.51-2.36)	2.40 (1.90-3.00)	2.82 (2.22-3.54)	3.40 (2.58-4.44)	3.84 (2.85-5.11)	4.29 (3.09-5.91)	4.80 (3.26-6.74)	5.53 (3.61-8.02)	6.12 (3.89-9.04)
6-hr	2.00 (1.60-2.47)	2.40 (1.92-2.97)	3.06 (2.44-3.80)	3.61 (2.86-4.50)	4.36 (3.34-5.67)	4.93 (3.69-6.53)	5.52 (4.00-7.58)	6.21 (4.23-8.66)	7.20 (4.71-10.4)	8.03 (5.12-11.8)
12-hr	2.46 (1.99-3.02)	2.97 (2.39-3.65)	3.80 (3.05-4.68)	4.48 (3.57-5.55)	5.43 (4.18-7.01)	6.13 (4.62-8.09)	6.88 (5.02-9.41)	7.75 (5.31-10.8)	9.04 (5.93-12.9)	10.1 (6.47-14.7)
24-hr	2.87 (2.33-3.50)	3.50 (2.84-4.27)	4.53 (3.65-5.54)	5.38 (4.31-6.61)	6.55 (5.07-8.41)	7.42 (5.62-9.74)	8.35 (6.14-11.4)	9.46 (6.51-13.0)	11.1 (7.34-15.8)	12.6 (8.06-18.2)
2-day	3.19 (2.60-3.86)	3.95 (3.23-4.79)	5.21 (4.23-6.33)	6.25 (5.05-7.63)	7.68 (6.00-9.84)	8.74 (6.68-11.4)	9.89 (7.35-13.5)	11.3 (7.80-15.5)	13.5 (8.92-19.1)	15.4 (9.92-22.1)
3-day	3.43 (2.82-4.14)	4.28 (3.50-5.16)	5.65 (4.61-6.84)	6.80 (5.51-8.27)	8.37 (6.56-10.7)	9.53 (7.31-12.4)	10.8 (8.05-14.7)	12.4 (8.55-16.9)	14.8 (9.79-20.8)	16.9 (10.9-24.2)
4-day	3.68 (3.02-4.42)	4.56 (3.75-5.49)	6.02 (4.92-7.26)	7.22 (5.87-8.76)	8.88 (6.98-11.3)	10.1 (7.77-13.1)	11.4 (8.55-15.5)	13.1 (9.06-17.8)	15.6 (10.4-21.9)	17.8 (11.5-25.5)
7-day	4.38 (3.63-5.24)	5.35 (4.42-6.40)	6.92 (5.70-8.31)	8.23 (6.73-9.93)	10.0 (7.91-12.7)	11.4 (8.76-14.6)	12.8 (9.56-17.1)	14.5 (10.1-19.6)	17.1 (11.4-23.9)	19.4 (12.5-27.5)
10-day	5.08 (4.22-6.05)	6.09 (5.05-7.26)	7.74 (6.39-9.26)	9.12 (7.47-11.0)	11.0 (8.69-13.8)	12.4 (9.57-15.9)	13.9 (10.4-18.5)	15.7 (10.9-21.1)	18.2 (12.2-25.3)	20.4 (13.2-28.8)
20-day	7.18 (6.00-8.49)	8.30 (6.93-9.83)	10.1 (8.43-12.0)	11.7 (9.63-13.9)	13.8 (10.9-17.0)	15.4 (11.9-19.4)	17.0 (12.6-22.1)	18.8 (13.2-25.1)	21.3 (14.2-29.3)	23.2 (15.1-32.6)
30-day	8.91 (7.48-10.5)	10.1 (8.48-11.9)	12.1 (10.1-14.3)	13.7 (11.4-16.3)	16.0 (12.7-19.7)	17.7 (13.7-22.2)	19.5 (14.4-25.1)	21.3 (15.0-28.2)	23.7 (15.9-32.5)	25.5 (16.6-35.7)
45-day	11.1 (9.32-13.0)	12.4 (10.4-14.5)	14.5 (12.1-17.1)	16.3 (13.5-19.2)	18.7 (14.9-22.8)	20.6 (15.9-25.6)	22.4 (16.7-28.6)	24.3 (17.1-32.1)	26.6 (18.0-36.4)	28.4 (18.5-39.5)
60-day	12.9 (10.9-15.0)	14.2 (12.0-16.7)	16.5 (13.9-19.4)	18.4 (15.3-21.7)	20.9 (16.7-25.5)	22.9 (17.8-28.4)	24.9 (18.5-31.6)	26.7 (18.9-35.2)	29.1 (19.7-39.6)	30.8 (20.1-42.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.33 (3.41-5.45)	5.08 (4.00-6.40)	6.30 (4.93-7.93)	7.31 (5.70-9.28)	8.70 (6.54-11.5)	9.76 (7.18-13.1)	10.8 (7.72-15.0)	12.0 (8.12-17.1)	13.6 (8.86-20.0)	14.9 (9.46-22.3)
10-min	3.07 (2.42-3.86)	3.60 (2.83-4.53)	4.46 (3.50-5.64)	5.18 (4.03-6.57)	6.16 (4.63-8.11)	6.91 (5.08-9.27)	7.68 (5.47-10.6)	8.51 (5.76-12.1)	9.66 (6.27-14.2)	10.6 (6.70-15.8)
15-min	2.41 (1.90-3.03)	2.82 (2.22-3.55)	3.50 (2.74-4.41)	4.06 (3.16-5.15)	4.83 (3.64-6.36)	5.42 (3.98-7.27)	6.02 (4.28-8.34)	6.68 (4.51-9.48)	7.58 (4.92-11.1)	8.30 (5.25-12.4)
30-min	1.68 (1.32-2.11)	1.97 (1.55-2.47)	2.44 (1.91-3.08)	2.83 (2.21-3.59)	3.37 (2.53-4.43)	3.78 (2.77-5.06)	4.20 (2.98-5.79)	4.64 (3.14-6.58)	5.23 (3.40-7.67)	5.69 (3.60-8.51)
60-min	1.08 (0.846-1.35)	1.26 (0.991-1.59)	1.56 (1.23-1.97)	1.81 (1.41-2.30)	2.16 (1.62-2.84)	2.42 (1.78-3.24)	2.69 (1.91-3.71)	2.97 (2.01-4.21)	3.34 (2.17-4.89)	3.62 (2.29-5.41)
2-hr	0.690 (0.547-0.862)	0.820 (0.649-1.02)	1.03 (0.814-1.29)	1.21 (0.946-1.52)	1.45 (1.10-1.90)	1.63 (1.21-2.18)	1.82 (1.30-2.51)	2.03 (1.38-2.86)	2.32 (1.51-3.38)	2.55 (1.62-3.79)
3-hr	0.529 (0.421-0.658)	0.632 (0.502-0.787)	0.800 (0.634-0.999)	0.940 (0.740-1.18)	1.13 (0.860-1.48)	1.28 (0.949-1.70)	1.43 (1.03-1.97)	1.60 (1.09-2.25)	1.84 (1.20-2.67)	2.04 (1.30-3.01)
6-hr	0.333 (0.267-0.412)	0.401 (0.321-0.496)	0.511 (0.407-0.634)	0.602 (0.477-0.751)	0.728 (0.557-0.946)	0.822 (0.615-1.09)	0.922 (0.669-1.27)	1.04 (0.707-1.45)	1.20 (0.787-1.73)	1.34 (0.855-1.97)
12-hr	0.204 (0.165-0.251)	0.246 (0.198-0.303)	0.315 (0.253-0.388)	0.372 (0.297-0.461)	0.450 (0.347-0.582)	0.509 (0.383-0.671)	0.571 (0.417-0.781)	0.644 (0.441-0.893)	0.750 (0.493-1.07)	0.839 (0.537-1.22)
24-hr	0.120 (0.097-0.146)	0.146 (0.118-0.178)	0.189 (0.152-0.231)	0.224 (0.180-0.276)	0.273 (0.211-0.351)	0.309 (0.234-0.406)	0.348 (0.256-0.474)	0.394 (0.271-0.543)	0.464 (0.306-0.660)	0.523 (0.336-0.758)
2-day	0.066 (0.054-0.080)	0.082 (0.067-0.100)	0.108 (0.088-0.132)	0.130 (0.105-0.159)	0.160 (0.125-0.205)	0.182 (0.139-0.238)	0.206 (0.153-0.281)	0.236 (0.162-0.323)	0.281 (0.186-0.397)	0.321 (0.207-0.461)
3-day	0.048 (0.039-0.057)	0.059 (0.049-0.072)	0.079 (0.064-0.095)	0.094 (0.077-0.115)	0.116 (0.091-0.148)	0.132 (0.102-0.173)	0.150 (0.112-0.204)	0.172 (0.119-0.234)	0.206 (0.136-0.289)	0.235 (0.151-0.336)
4-day	0.038 (0.031-0.046)	0.048 (0.039-0.057)	0.063 (0.051-0.076)	0.075 (0.061-0.091)	0.093 (0.073-0.118)	0.105 (0.081-0.137)	0.119 (0.089-0.161)	0.136 (0.094-0.185)	0.163 (0.108-0.228)	0.186 (0.120-0.265)
7-day	0.026 (0.022-0.031)	0.032 (0.026-0.038)	0.041 (0.034-0.049)	0.049 (0.040-0.059)	0.060 (0.047-0.075)	0.068 (0.052-0.087)	0.076 (0.057-0.102)	0.086 (0.060-0.117)	0.102 (0.068-0.142)	0.115 (0.075-0.164)
10-day	0.021 (0.018-0.025)	0.025 (0.021-0.030)	0.032 (0.027-0.039)	0.038 (0.031-0.046)	0.046 (0.036-0.057)	0.052 (0.040-0.066)	0.058 (0.043-0.077)	0.065 (0.046-0.088)	0.076 (0.051-0.106)	0.085 (0.055-0.120)
20-day	0.015 (0.012-0.018)	0.017 (0.014-0.020)	0.021 (0.018-0.025)	0.024 (0.020-0.029)	0.029 (0.023-0.036)	0.032 (0.025-0.040)	0.035 (0.026-0.046)	0.039 (0.027-0.052)	0.044 (0.030-0.061)	0.048 (0.031-0.068)
30-day	0.012 (0.010-0.015)	0.014 (0.012-0.017)	0.017 (0.014-0.020)	0.019 (0.016-0.023)	0.022 (0.018-0.027)	0.025 (0.019-0.031)	0.027 (0.020-0.035)	0.030 (0.021-0.039)	0.033 (0.022-0.045)	0.035 (0.023-0.050)
45-day	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.013 (0.011-0.016)	0.015 (0.013-0.018)	0.017 (0.014-0.021)	0.019 (0.015-0.024)	0.021 (0.015-0.027)	0.022 (0.016-0.030)	0.025 (0.017-0.034)	0.026 (0.017-0.037)
60-day	0.009 (0.008-0.010)	0.010 (0.008-0.012)	0.011 (0.010-0.013)	0.013 (0.011-0.015)	0.015 (0.012-0.018)	0.016 (0.012-0.020)	0.017 (0.013-0.022)	0.019 (0.013-0.024)	0.020 (0.014-0.027)	0.021 (0.014-0.030)

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Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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PROJECT: BELTA SUBDIVISION	PAGE: 1
CLIENT: BELTA	JOB #: 934
SUBJECT: DRAINAGE COMPS.	DATE: 5/17/20
DONE BY: S.A.L	CHECKED BY:

PRE-DEVELOPMENT (EXISTING BELTA FARM w/ 2 HOUSES + GREEN HOUSES (W DISTURBAR)

RUNOFF COMPS ARE EST. BY TR-55 METHOD w/ NRCS SOILS MAPPING FOR SITE.

TOTAL D.A. = 857593 SF. ≈ 19.7 AC±
(P.O.G.'A')

SOIL ID	HSG.
73E	B
73C	B
103	D
84B	C
45A	D
3	D
17	D

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PROJECT: Bella Subdivision PAGE: 2
CLIENT: Bella JOB #: 934
SUBJECT: Drainage Comps DATE: 3/19/20
DONE BY: SAC CHECKED BY:

EXISTING CONDITIONS TIME OF CONC
(BASED ON TR-55)

Sheet Flow.

$$T_T = \frac{0.007 (n L)^{0.8}}{(P_2)^{0.5} (S)^{0.4}}$$

$= 0.154$ hrs

$\simeq 19.2$ min

$n = 0.12$ (mix of cultivated soils + fallow >20%)

$L = 150$

$P_2 = 3.5$

$S = (189 - 184.5)/150 = 3\%$

SHALLOW CONC. FLOW

$$T_T = \frac{L}{V \times 3600}$$

$L = 1825$

$S = \frac{184.5 - 154}{1825} = 1.6\%$

$T_T = 0.247$ hrs

$\simeq 14.8$ min

$\Rightarrow V = 2.05$ fps (unpaved)

CHANNEL FLOW (MUDDY BROOK)

$$T_T = \frac{L}{V\ 3600}$$

$L = 799$

$S = \frac{154 - 149.5}{799} \simeq 0.0059$ ft/ft

$= 0.271$ hrs

$\simeq 16.2$ min

$V = \frac{1.49}{n} R^{2/3} \sqrt{S}$

$S = 0.0059$ ft/ft

$n = 0.08$ (irr w/pools)

$V = 0.82$ fps.

$R = 6.5 \times 0.5 / (6.5 + 1)$

$R = 0.43$ ft

$\Sigma T_T = 9.2 + 14.8 + 16.2$

$\Sigma T_T = 40.2$ min

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PROJECT: Beta Subdivision	PAGE: 3
CLIENT: Beta	JOB #: 934
SUBJECT: Drainage Comps	DATE:
DONE BY: SAL	CHECKED BY:

Post Development Time of Conc.

D.A. A (Non Developed)

Sheet Flow

$$T_T = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,(S)^{0.4}}$$

$n = 0.24$
$L = 150$
$P_2 = 3.50$
$S = (189 - 184.5)/150 = 0.03$ ft/ft

$= 0.267$ hrs. $\simeq 16$ min

Shallow Conc. Flow (Unpaved)

$$T_T = \frac{L}{V\,3600} = \frac{1825}{2 \times 3600}$$

$S = \frac{184.5 - 154}{1825} = 4.65\%$

$= 0.253$ hrs $\simeq 15.2$ min

$\Rightarrow V = 2$ fps

Channel Flow (Muddy Brook)

Channel.

$$T_T = \frac{799}{0.82 \times 3600} = 0.277 \text{ hrs} \simeq 16.6 \text{ min}$$

$\Sigma T_T = 47.8$ min.

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PROJECT: Beta Subdivision PAGE: 4
CLIENT: Beta JOB #: 939
SUBJECT: Drainage Comps DATE: 3/20/20
DONE BY: SHL CHECKED BY:

Post-Development Cont.

D.A. B (Detention) Time of Conc.

Sheet Flow

$$T_T = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,(S)^{0.4}}$$

$n = 0.24$
$L = 150'$
$P_2 = 3.5$
$S = \frac{182-180.5}{150} = 0.01$ ft/ft.

$T_T = 0.415$ hrs
≈ 24.9 min.

Shallow Conc. Flow

$$T_T = \frac{L}{V \times 3600}$$

$L = 520$ ft
$S = \frac{180.5-166}{520} = 0.028$ ft/ft

$T_T = 0.056$ hrs
≈ 3.3 min

$V = 2.6$ fps (unpaved)

No Channel Flow

$\Sigma T_T = 24.9 + 3.3 = 28.2$ min

D.A. C (Entrance to Paver Rd)

Sheet Flow $T_T = 1.4$ min @ $L = 126$
$n = 0.011$, $S = \frac{182.4-180}{126} = 0.019$ ft/ft
$P_2 = 3.50$

Shallow Conc. $T_T = \frac{332}{4 \times 3600}$

$S = \frac{180-159.3}{332} = 6.2\%$

$= 0.023$ hrs.
≈ 1.38 min

$V = 4$ fps

No Channel flow

$\Sigma T_T = 2.78$ min use 5 min

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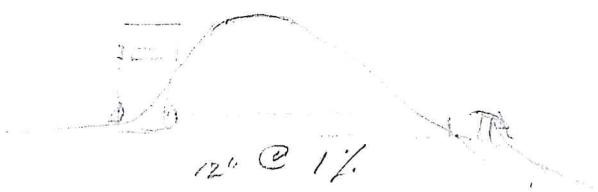
PROJECT: Brown Subdivision		PAGE: 5	
CLIENT: Beta		JOB #: 934	
SUBJECT: Drainage Comps		DATE: 3/19/20	
DONE BY: SAL		CHECKED BY:	

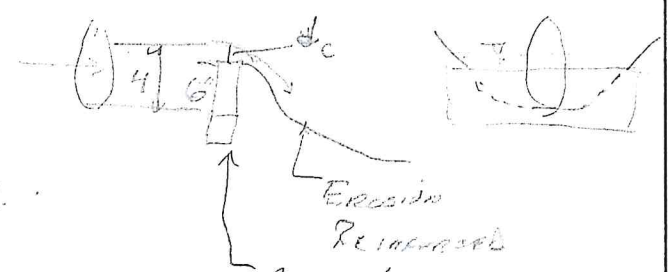
STAGE / STORAGE of Prop Pond.

STAGE	AREA	VOLUME	VOLUME TOTAL
0	6652	0	0
1	9211	15863	15863
2	12773	21984	37847

RATING CURVE FOR LEVEL SPREADER.

ALLOWED 0.2 CFS PER LF.





FOR 1 UNIT LF

STAGE	H	AREA	FLOW	VOL.
0	0	0	0	0
0.05	0.05	0.05	0.037	0.74
0.10	0.10	0.10	0.105	1.05
0.15	0.15	0.15	0.193	1.29
0.20	0.20	0.20	0.298	1.49
0.25	0.25	0.25	0.416	1.67
0.30	0.30	0.30	0.547	1.82

$Q = VA$ $A = W \times H$

$Q = 3.367 L H^{3/2}$

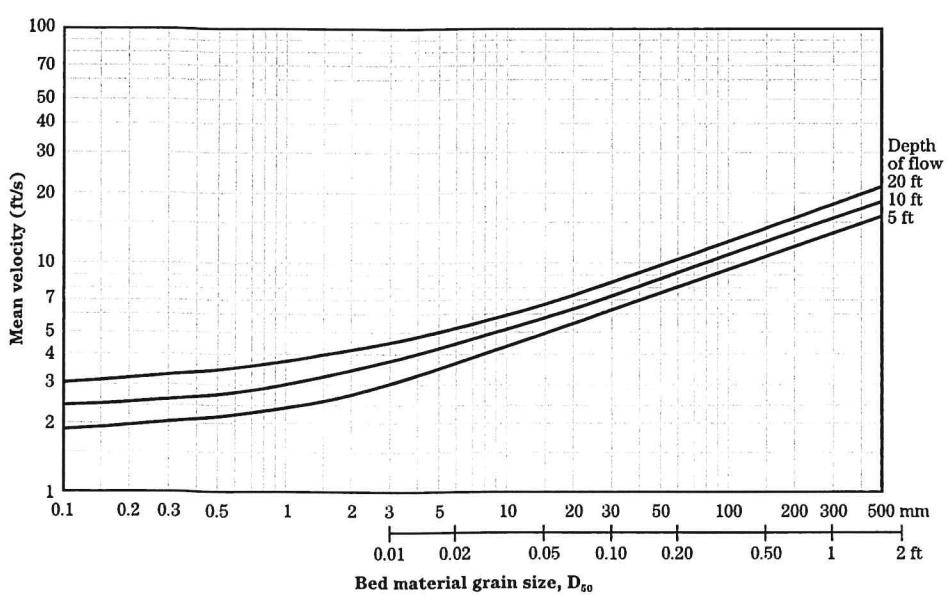
L = Length

H = Height of flow

Table 8–4 Allowable velocities

Channel material	Mean channel velocity (ft/s)	(m/s)
Fine sand	2.0	0.61
Coarse sand	4.0	1.22
Fine gravel	6.0	1.83
Earth		
Sandy silt	2.0	0.61
Silt clay	3.5	1.07
Clay	6.0	1.83
Grass-lined earth (slopes <5%)		
Bermudagrass		
Sandy silt	6.0	1.83
Silt clay	8.0	2.44
Kentucky bluegrass		
Sandy silt	5.0	1.52
Silt clay	7.0	2.13
Poor rock (usually sedimentary)	10.0	3.05
Soft sandstone	8.0	2.44
Soft shale	3.5	1.07
Good rock (usually igneous or hard metamorphic)	20.0	6.08

Figure 8–3 Allowable velocity-depth grain chart



Runoff Curve Number and Runoff Sat May 30 13:39:50 2020

Project: Belta Subdivision By: S.A.L. Date: 05/30/20
Location: D.A. C Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Acre)
Meadow (continuous grass)	71	C	0.063
Woods (Good)	70	C	0.109
Paved Lots Roofs & Driveways	98	B	0.003
Open Space-Good (>75% grass)	61	B	0.041
Woods (Good)	55	B	0.018
Paved Lots Roofs & Driveways	98	D	0.314
Open Space-Good (>75% grass)	80	D	0.928
Woods (Good)	77	D	1.115
Meadow (continuous grass)	78	D	0.818
Open Space-Poor (<50% grass)	79	B	0.105
Open Space-Poor (<50% grass)	86	C	0.077
Open Space-Poor (<50% grass)	89	D	0.448

CN (weighted): 80.6
Total Area: 4.039 Acre

2. Runoff

Return Period:	2 YEAR	
Rainfall, P:	3.53	in
Runoff, Q:	1.7001	in
Runoff Volume:	0.5722	Acre-Ft

Runoff Curve Number and Runoff Fri Jun 26 16:34:01 2020

Project: Belta Subdivision By: S.A.L. Date: 06/26/20
Location: DA A Checked: Date:
Developed

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Acre)
Brush (Good)	48	B	0.010
Meadow (continuous grass)	71	C	0.265
Woods (Good)	55	B	0.683
Brush (Fair)	70	C	0.093
Brush (Fair)	77	D	0.060
Meadow (continuous grass)	78	D	0.096
Brush (Good)	65	C	0.548
Brush (Good)	73	D	0.887
Open Space-Good (>75% grass)	80	D	0.435
Open Space-Good (>75% grass)	74	C	3.365
Woods (Good)	70	C	2.009
Woods (Good)	77	D	3.050
Paved Lots Roofs & Driveways	98	C	0.475
Paved Lots Roofs & Driveways	98	D	0.061
Paved Streets w/Curbs & Sewers	98	D	0.134
Paved Streets w/Curbs & Sewers	98	C	1.857
Open Space-Poor (<50% grass)	79	B	0.432
Open Space-Poor (<50% grass)	86	C	0.113
Open Space-Poor (<50% grass)	89	D	0.131

CN (weighted): 77.4
Total Area: 14.704 Acre

2. Runoff

Return Period:	2 YEAR	
Rainfall, P:	0.00	in
Runoff, Q:	0.0000	in
Runoff Volume:	0.0000	Acre-Ft

Runoff Curve Number and Runoff Fri Jun 26 16:35:32 2020

Project: Belta Subdivision By: S.A.L. Date: 06/26/20
Location: DA B Checked: Date:
Developed

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Acre)
Meadow (continuous grass)	71	C	0.644
Brush (Fair)	70	C	0.162
Woods (Good)	70	C	0.072
Brush (Fair)	77	D	0.074
Meadow (continuous grass)	78	D	0.337
Open Space-Good (>75% grass)	74	C	0.668
Open Space-Good (>75% grass)	80	D	2.070
Woods (Good)	77	D	0.556
Paved Lots Roofs & Driveways	98	D	0.206
Paved Streets w/Curbs & Sewers	98	C	0.412
Paved Streets w/Curbs & Sewers	98	D	1.137
Open Space-Poor (<50% grass)	86	C	0.040
Open Space-Poor (<50% grass)	89	D	0.240

CN (weighted): 82.9
Total Area: 6.618 Acre

2. Runoff

Return Period:	2 YEAR	
Rainfall, P:	0.00	in
Runoff, Q:	0.0000	in
Runoff Volume:	0.0000	Acre-Ft

Runoff Curve Number and Runoff Fri Jun 26 16:36:49 2020

Project: Belta Subdivision By: S.A.L. Date: 06/26/20
Location: DA C Checked: Date:
Developed

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Acre)
Paved Streets w/Curbs & Sewers	98	B	0.015
Paved Lots Roofs & Driveways	98	B	0.003
Open Space-Good (>75% grass)	61	B	0.037
Woods (Good)	55	B	0.015
Paved Lots Roofs & Driveways	98	D	0.231
Woods (Good)	77	D	0.574
Open Space-Good (>75% grass)	80	D	0.949
Paved Streets w/Curbs & Sewers	98	D	0.263
Open Space-Poor (<50% grass)	79	B	0.096
Open Space-Poor (<50% grass)	89	D	0.254

CN (weighted): 83.5
Total Area: 2.437 Acre

2. Runoff

Return Period:	2 YEAR	
Rainfall, P:	0.00	in
Runoff, Q:	0.0000	in
Runoff Volume:	0.0000	Acre-Ft

Design Storm Report

Custom Storm filename: MB-10yr-pct.cds

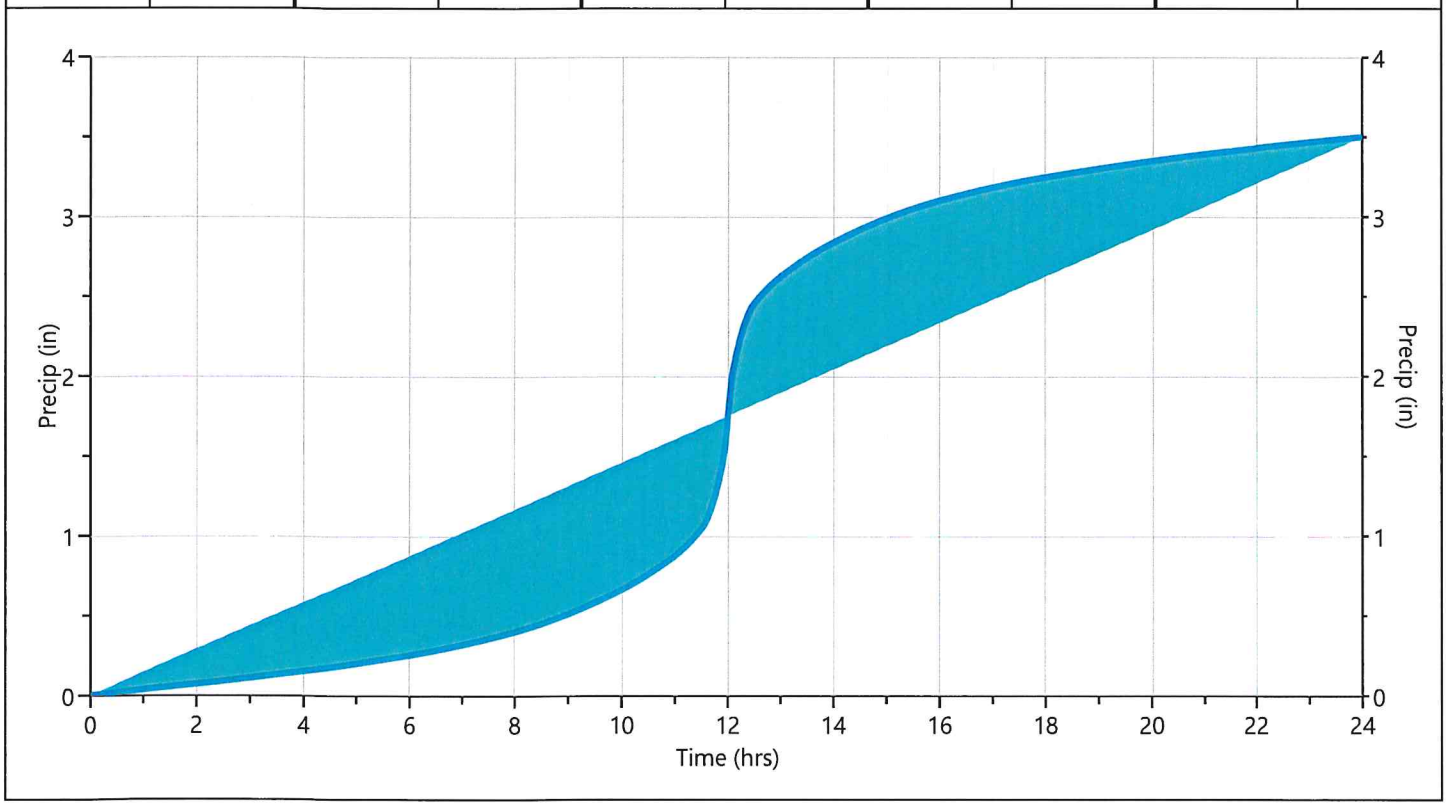
Hydrology Studio v 3.0.0.16

08-18-2020

Storm Distribution: NRCS/SCS - Type III

Storm Duration	Total Rainfall Volume (in)								
	1-yr	✔ 2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
24 hrs	2.87	3.50	0.00	4.53	5.38	6.55	7.42	8.35	

Incremental Rainfall Distribution, 2-yr									
Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)
11.50	0.006897	11.68	0.015925	11.87	0.025336	12.05	0.052587	12.23	0.021058
11.52	0.007350	11.70	0.016781	11.88	0.026192	12.07	0.045412	12.25	0.020203
11.53	0.008225	11.72	0.017636	11.90	0.027047	12.08	0.038237	12.27	0.019347
11.55	0.009081	11.73	0.018492	11.92	0.031162	12.10	0.031062	12.28	0.018492
11.57	0.009936	11.75	0.019347	11.93	0.038238	12.12	0.027150	12.30	0.017636
11.58	0.010792	11.77	0.020203	11.95	0.045413	12.13	0.026192	12.32	0.016781
11.60	0.011647	11.78	0.021058	11.97	0.052588	12.15	0.025336	12.33	0.015925
11.62	0.012503	11.80	0.021914	11.98	0.059763	12.17	0.024481	12.35	0.015069
11.63	0.013358	11.82	0.022769	**12.00**	**0.066938**	12.18	0.023625	12.37	0.014214
11.65	0.014214	11.83	0.023625	12.02	0.066777	12.20	0.022769	12.38	0.013358
11.67	0.015069	11.85	0.024481	12.03	0.059762	12.22	0.021914	12.40	0.012503



Design Storm Report

Custom Storm filename: MB-10yr-pct.cds

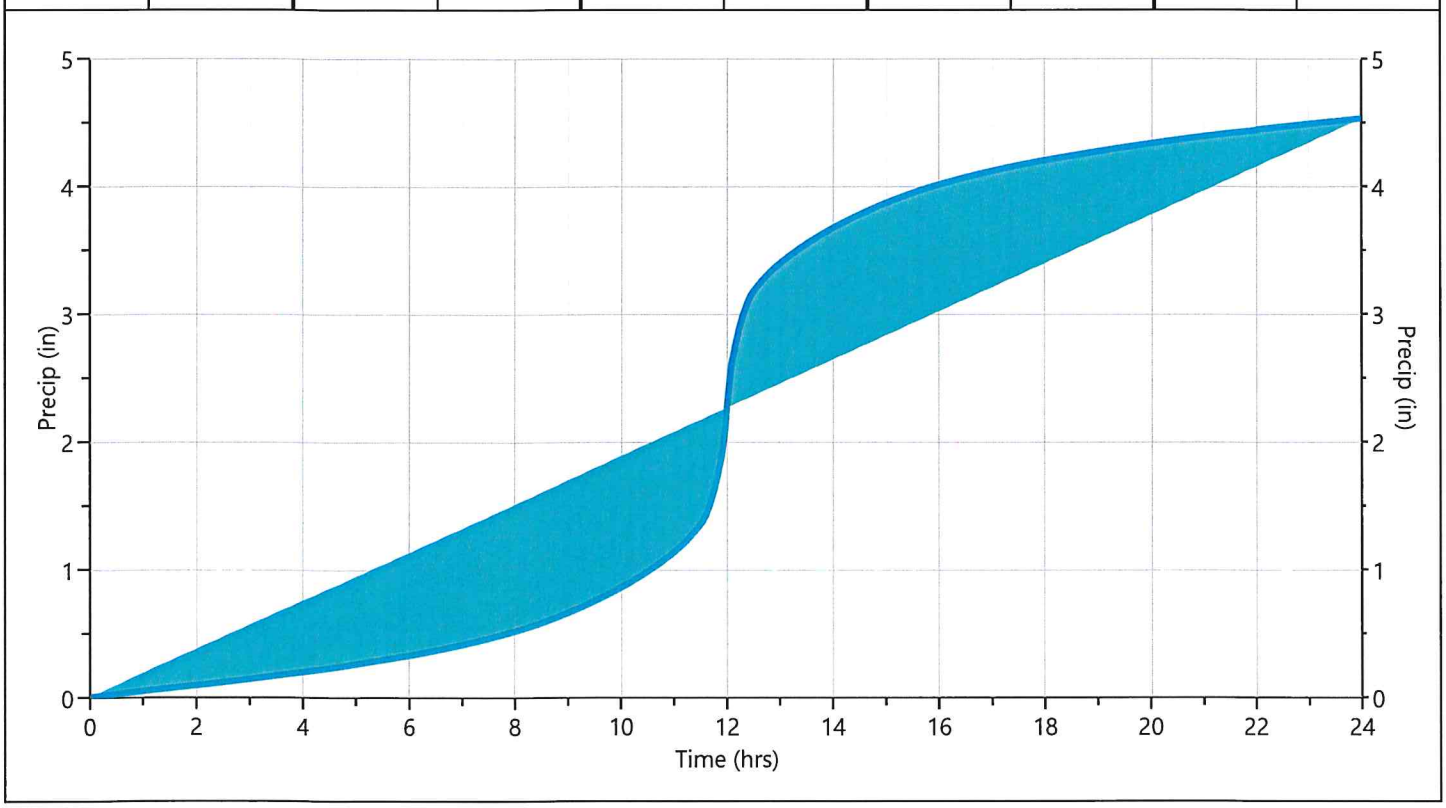
Hydrology Studio v 3.0.0.16

08-18-2020

Storm Distribution: NRCS/SCS - Type III

Storm Duration	Total Rainfall Volume (in)								
	1-yr	2-yr	3-yr	✔ 5-yr	10-yr	25-yr	50-yr	100-yr	
24 hrs	2.87	3.50	0.00	4.53	5.38	6.55	7.42	8.35	

Incremental Rainfall Distribution, 5-yr									
Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)
11.50	0.008927	11.68	0.020612	11.87	0.032792	12.05	0.068063	12.23	0.027256
11.52	0.009513	11.70	0.021719	11.88	0.033900	12.07	0.058777	12.25	0.026148
11.53	0.010645	11.72	0.022826	11.90	0.035007	12.08	0.049490	12.27	0.025041
11.55	0.011753	11.73	0.023933	11.92	0.040333	12.10	0.040204	12.28	0.023933
11.57	0.012860	11.75	0.025041	11.93	0.049491	12.12	0.035140	12.30	0.022826
11.58	0.013967	11.77	0.026148	11.95	0.058777	12.13	0.033900	12.32	0.021719
11.60	0.015075	11.78	0.027255	11.97	0.068064	12.15	0.032792	12.33	0.020612
11.62	0.016182	11.80	0.028363	11.98	0.077350	12.17	0.031685	12.35	0.019504
11.63	0.017290	11.82	0.029470	**12.00**	**0.086637**	12.18	0.030578	12.37	0.018397
11.65	0.018397	11.83	0.030578	12.02	0.086429	12.20	0.029470	12.38	0.017289
11.67	0.019504	11.85	0.031685	12.03	0.077349	12.22	0.028363	12.40	0.016182



Design Storm Report

Custom Storm filename: MB-10yr-pct.cds

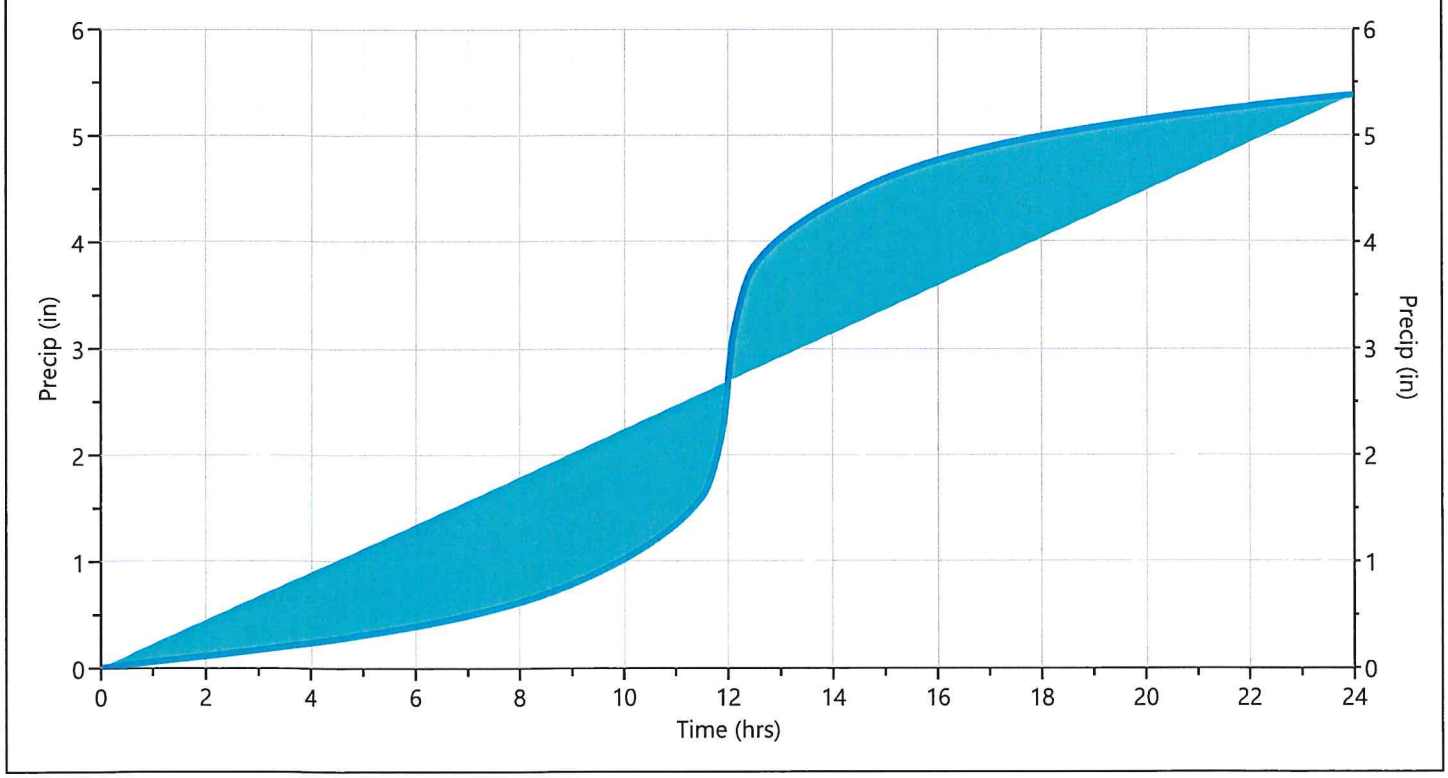
Hydrology Studio v 3.0.0.16

08-18-2020

Storm Distribution: NRCS/SCS - Type III

Storm Duration	Total Rainfall Volume (in)								
	1-yr	2-yr	3-yr	5-yr	✔ 10-yr	25-yr	50-yr	100-yr	
24 hrs	2.87	3.50	0.00	4.53	5.38	6.55	7.42	8.35	

Incremental Rainfall Distribution, 10-yr									
Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)
11.50	0.010602	11.68	0.024479	11.87	0.038945	12.05	0.080834	12.23	0.032370
11.52	0.011297	11.70	0.025794	11.88	0.040260	12.07	0.069805	12.25	0.031055
11.53	0.012643	11.72	0.027109	11.90	0.041575	12.08	0.058776	12.27	0.029740
11.55	0.013958	11.73	0.028424	11.92	0.047901	12.10	0.047747	12.28	0.028424
11.57	0.015273	11.75	0.029739	11.93	0.058777	12.12	0.041733	12.30	0.027109
11.58	0.016588	11.77	0.031055	11.95	0.069806	12.13	0.040261	12.32	0.025794
11.60	0.017903	11.78	0.032370	11.97	0.080835	12.15	0.038945	12.33	0.024479
11.62	0.019218	11.80	0.033685	11.98	0.091864	12.17	0.037630	12.35	0.023164
11.63	0.020534	11.82	0.035000	**12.00**	**0.102893**	12.18	0.036315	12.37	0.021849
11.65	0.021849	11.83	0.036315	12.02	0.102646	12.20	0.035000	12.38	0.020534
11.67	0.023164	11.85	0.037630	12.03	0.091863	12.22	0.033685	12.40	0.019218



Design Storm Report

Custom Storm filename: MB-10yr-pct.cds

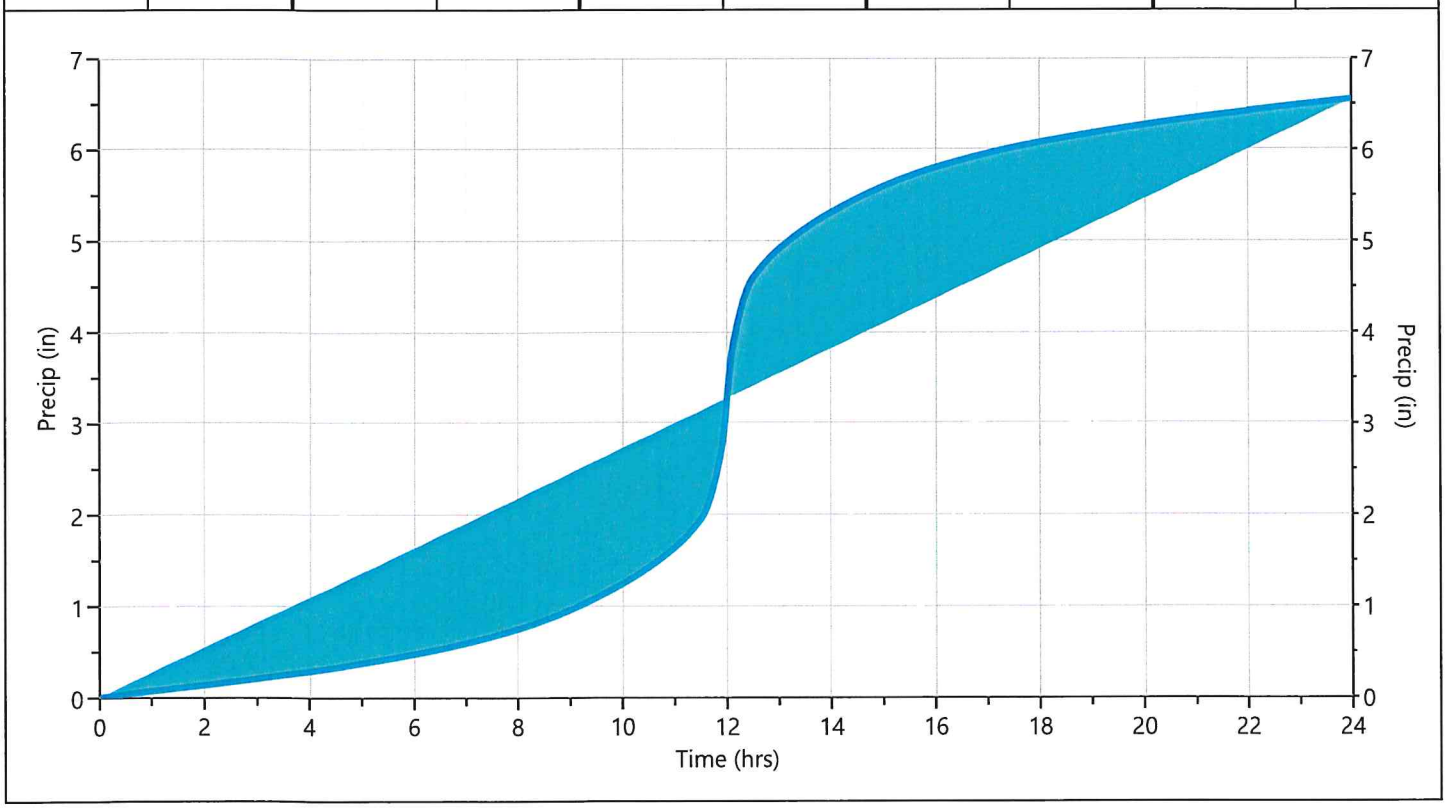
Hydrology Studio v 3.0.0.16

08-18-2020

Storm Distribution: NRCS/SCS - Type III

Storm Duration	Total Rainfall Volume (in)								
	1-yr	2-yr	3-yr	5-yr	10-yr	✔ 25-yr	50-yr	100-yr	
24 hrs	2.87	3.50	0.00	4.53	5.38	6.55	7.42	8.35	

Incremental Rainfall Distribution, 25-yr									
Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)
11.50	0.012907	11.68	0.029803	11.87	0.047415	12.05	0.098413	12.23	0.039409
11.52	0.013754	11.70	0.031404	11.88	0.049016	12.07	0.084986	12.25	0.037808
11.53	0.015392	11.72	0.033005	11.90	0.050617	12.08	0.071558	12.27	0.036207
11.55	0.016994	11.73	0.034606	11.92	0.058318	12.10	0.058131	12.28	0.034606
11.57	0.018595	11.75	0.036207	11.93	0.071559	12.12	0.050809	12.30	0.033005
11.58	0.020196	11.77	0.037808	11.95	0.084986	12.13	0.049016	12.32	0.031404
11.60	0.021797	11.78	0.039409	11.97	0.098414	12.15	0.047415	12.33	0.029802
11.62	0.023398	11.80	0.041010	11.98	0.111842	12.17	0.045814	12.35	0.028202
11.63	0.024999	11.82	0.042611	**12.00**	**0.125269**	12.18	0.044212	12.37	0.026600
11.65	0.026600	11.83	0.044212	12.02	0.124969	12.20	0.042612	12.38	0.024999
11.67	0.028201	11.85	0.045814	12.03	0.111841	12.22	0.041010	12.40	0.023398



Design Storm Report

Custom Storm filename: MB-10yr-pct.cds

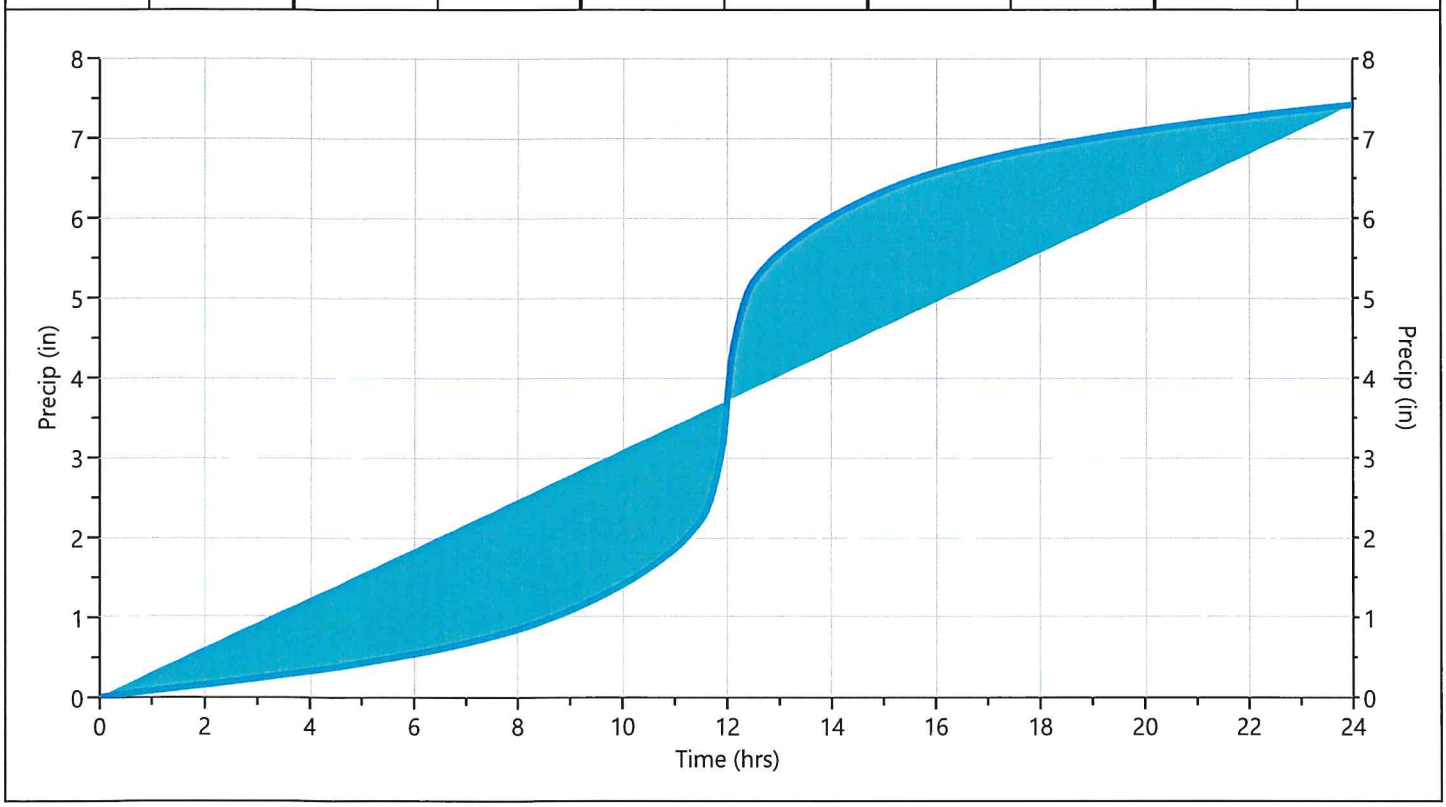
Hydrology Studio v 3.0.0.16

08-18-2020

Storm Distribution: NRCS/SCS - Type III

Storm Duration	Total Rainfall Volume (in)								
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	✔ 50-yr	100-yr	
24 hrs	2.87	3.50	0.00	4.53	5.38	6.55	7.42	8.35	

Incremental Rainfall Distribution, 50-yr									
Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)
11.50	0.014622	11.68	0.033761	11.87	0.053713	12.05	0.111485	12.23	0.044644
11.52	0.015581	11.70	0.035575	11.88	0.055526	12.07	0.096274	12.25	0.042830
11.53	0.017437	11.72	0.037389	11.90	0.057340	12.08	0.081063	12.27	0.041016
11.55	0.019251	11.73	0.039202	11.92	0.066064	12.10	0.065852	12.28	0.039202
11.57	0.021065	11.75	0.041016	11.93	0.081064	12.12	0.057558	12.30	0.037389
11.58	0.022878	11.77	0.042830	11.95	0.096275	12.13	0.055526	12.32	0.035575
11.60	0.024692	11.78	0.044644	11.97	0.111486	12.15	0.053713	12.33	0.033761
11.62	0.026506	11.80	0.046458	11.98	0.126697	12.17	0.051898	12.35	0.031947
11.63	0.028320	11.82	0.048271	**12.00**	**0.141908**	12.18	0.050085	12.37	0.030134
11.65	0.030133	11.83	0.050085	12.02	0.141568	12.20	0.048272	12.38	0.028319
11.67	0.031947	11.85	0.051899	12.03	0.126696	12.22	0.046457	12.40	0.026506



Design Storm Report

Custom Storm filename: MB-10yr-pct.cds

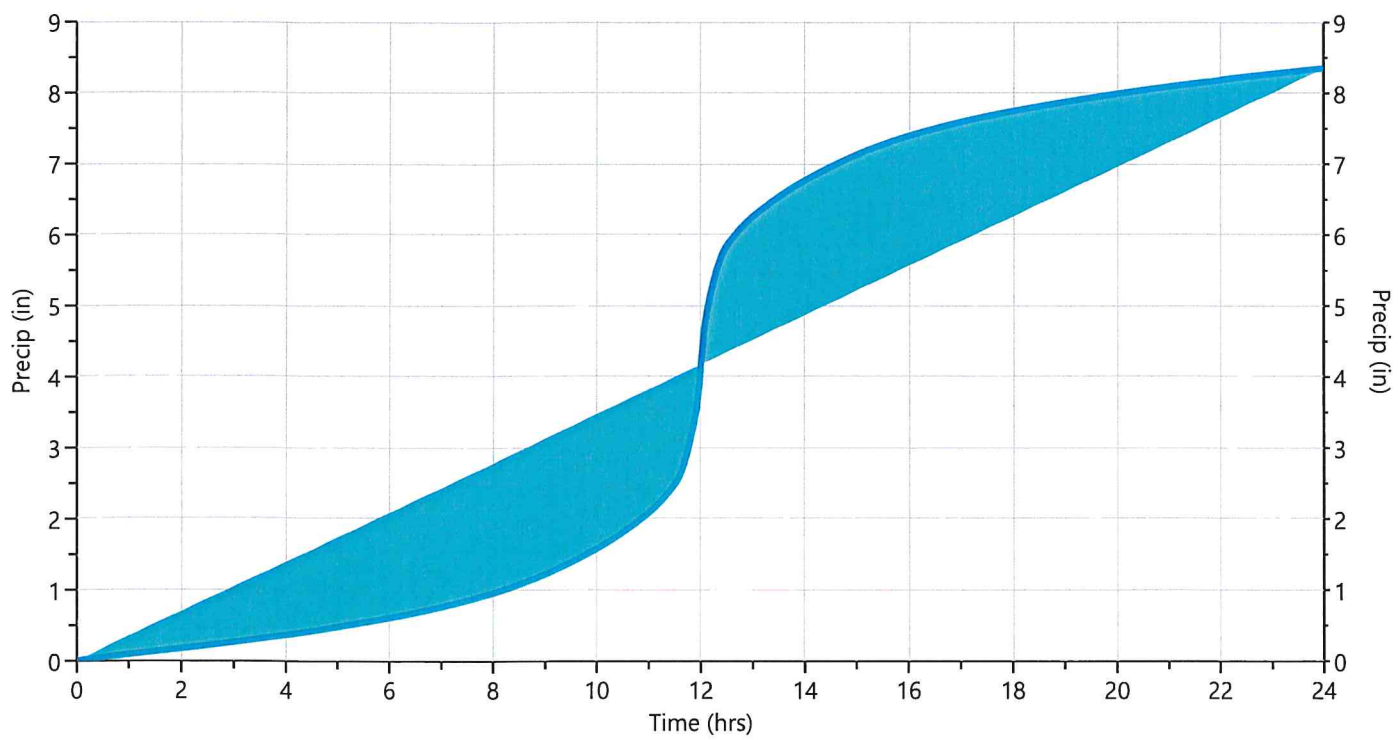
Hydrology Studio v 3.0.0.16

08-18-2020

Storm Distribution: NRCS/SCS - Type III

Storm Duration	Total Rainfall Volume (in)								
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	✔ 100-yr	
24 hrs	2.87	3.50	0.00	4.53	5.38	6.55	7.42	8.35	

Incremental Rainfall Distribution, 100-yr									
Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)	Time (hrs)	Precip (in)
11.50	0.016454	11.68	0.037992	11.87	0.060445	12.05	0.125458	12.23	0.050239
11.52	0.017534	11.70	0.040034	11.88	0.062486	12.07	0.108341	12.25	0.048198
11.53	0.019622	11.72	0.042075	11.90	0.064527	12.08	0.091223	12.27	0.046157
11.55	0.021664	11.73	0.044116	11.92	0.074345	12.10	0.074106	12.28	0.044116
11.57	0.023705	11.75	0.046157	11.93	0.091224	12.12	0.064772	12.30	0.042075
11.58	0.025746	11.77	0.048198	11.95	0.108342	12.13	0.062486	12.32	0.040034
11.60	0.027787	11.78	0.050239	11.97	0.125459	12.15	0.060445	12.33	0.037992
11.62	0.029828	11.80	0.052280	11.98	0.142577	12.17	0.058403	12.35	0.035952
11.63	0.031869	11.82	0.054321	**12.00**	**0.159694**	12.18	0.056363	12.37	0.033910
11.65	0.033910	11.83	0.056363	12.02	0.159311	12.20	0.054321	12.38	0.031869
11.67	0.035951	11.85	0.058403	12.03	0.142576	12.22	0.052280	12.40	0.029828



IDF Report

IDF filename: WestportCT.idf

Hydrology Studio v 3.0.0.16

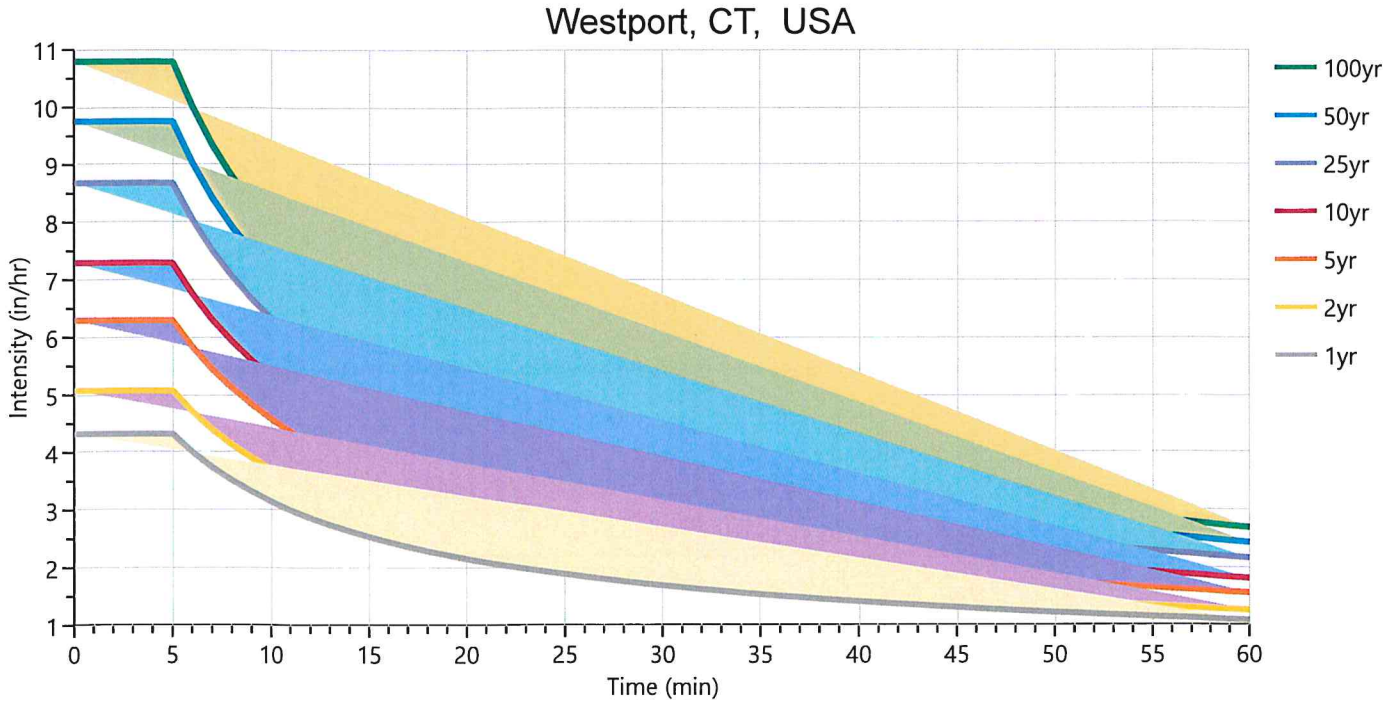
08-18-2020

Equation Coefficients	Intensity = B / (Tc + D)^E (in/hr)								
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
B	19.1512	23.4447	0.0000	29.1010	33.6846	39.3431	42.7720	49.6031	
D	3.6000	3.8000	0.0000	3.8000	3.8000	3.7000	3.5000	3.8000	
E	0.6924	0.7035	0.0000	0.7041	0.7035	0.6986	0.6909	0.7013	

Minimum Tc = 5 minutes

Tc (min)	Intensity Values (in/hr)								
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
Cf	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
5	4.32	5.08	0	6.29	7.29	8.68	9.75	10.79	
10	3.14	3.70	0	4.58	5.31	6.32	7.08	7.87	
15	2.53	2.98	0	3.69	4.28	5.09	5.70	6.34	
20	2.15	2.52	0	3.12	3.62	4.31	4.83	5.37	
25	1.88	2.20	0	2.73	3.17	3.77	4.23	4.70	
30	1.68	1.97	0	2.44	2.83	3.37	3.78	4.20	
35	1.53	1.79	0	2.21	2.57	3.06	3.43	3.81	
40	1.40	1.64	0	2.03	2.36	2.81	3.16	3.50	
45	1.30	1.52	0	1.88	2.19	2.61	2.93	3.25	
50	1.22	1.42	0	1.76	2.04	2.43	2.74	3.03	
55	1.14	1.33	0	1.65	1.92	2.29	2.57	2.85	
60	1.08	1.26	0	1.56	1.81	2.16	2.43	2.69	

Cf = Correction Factor applied to Rational Method runoff coefficient.



Precipitation Report

Precipitation filename: WestportCT.pcp

Hydrology Studio v 3.0.0.16 (Rainfall totals in Inches)

08-18-2020

	Active	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Active			✔		✔	✔	✔	✔	✔
SCS Storms	**> SCS Dimensionless Storms**								
SCS 6hr		2.00	2.40	0	3.06	3.61	4.36	4.93	5.52
Type I, 24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Type IA, 24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Type II, 24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Type II FL, 24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Type III, 24-hr	✔	2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Synthetic Storms	**> IDF-Based Synthetic Storms**								
1-hr		1.08	1.26	0	1.56	1.81	2.16	2.43	2.69
2-hr		1.36	1.58	0	1.96	2.27	2.72	3.07	3.38
3-hr		1.56	1.80	0	2.22	2.58	3.09	3.50	3.84
6-hr		1.94	2.22	0	2.75	3.19	3.84	4.37	4.76
12-hr		2.41	2.74	0	3.39	3.93	4.75	5.43	5.88
24-hr		2.98	3.37	0	4.16	4.84	5.86	6.74	7.24
Huff Distribution	**> 1st Quartile (0 to 6 hrs)**								
1-hr		1.08	1.26	0	1.56	1.81	2.16	2.43	2.69
2-hr		1.38	1.64	0	2.06	2.41	2.90	3.27	3.64
3-hr		1.59	1.90	0	2.40	2.82	3.40	3.84	4.29
6-hr		2.00	2.40	0	3.06	3.61	4.36	4.93	5.52
Huff Distribution	**> 2nd Quartile (>6 to 12 hrs)**								
8-hr		0	0	0	0	0	0	0	0
12-hr		2.46	2.97	0	3.80	4.48	5.43	6.13	6.88
Huff Distribution	**> 3rd Quartile (>12 to 24 hrs)**								
18-hr		0	0	0	0	0	0	0	0
24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Custom Storms	**> Custom Storm Distributions**								
My Custom Storm 1		0	3.50	0	4.53	5.38	6.55	7.42	8.35
My Custom Storm 2		0	0	0	0	0	0	0	0
My Custom Storm 3		0	0	0	0	0	0	0	0
My Custom Storm 4		0	0	0	0	0	0	0	0
My Custom Storm 5		0	0	0	0	0	0	0	0
My Custom Storm 6		0	0	0	0	0	0	0	0
My Custom Storm 7		0	0	0	0	0	0	0	0
My Custom Storm 8		0	0	0	0	0	0	0	0
My Custom Storm 9		0	0	0	0	0	0	0	0
My Custom Storm 10		0	0	0	0	0	0	0	0

Precipitation Report Cont'd

Precipitation filename: WestportCT.pcp

Rainfall totals in Inches

08-18-2020

	Active	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Active			✔		✔	✔	✔	✔	✔
Huff Indiana	**> Indianapolis**								
30-min		0.84	0.98	0	1.22	1.42	1.68	1.89	2.10
1-hr		1.08	1.26	0	1.56	1.81	2.16	2.43	2.69
2-hr		1.38	1.64	0	2.06	2.41	2.90	3.27	3.64
3-hr		1.59	1.90	0	2.40	2.82	3.40	3.84	4.29
6-hr		2.00	2.40	0	3.06	3.61	4.36	4.93	5.52
12-hr		2.46	2.97	0	3.80	4.48	5.43	6.13	6.88
24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Huff Indiana	**> Evansville**								
30-min		0.84	0.98	0	1.22	1.42	1.68	1.89	2.10
1-hr		1.08	1.26	0	1.56	1.81	2.16	2.43	2.69
2-hr		1.38	1.64	0	2.06	2.41	2.90	3.27	3.64
3-hr		1.59	1.90	0	2.40	2.82	3.40	3.84	4.29
6-hr		2.00	2.40	0	3.06	3.61	4.36	4.93	5.52
12-hr		2.46	2.97	0	3.80	4.48	5.43	6.13	6.88
24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Huff Indiana	**> Fort Wayne**								
30-min		0.84	0.98	0	1.22	1.42	1.68	1.89	2.10
1-hr		1.08	1.26	0	1.56	1.81	2.16	2.43	2.69
2-hr		1.38	1.64	0	2.06	2.41	2.90	3.27	3.64
3-hr		1.59	1.90	0	2.40	2.82	3.40	3.84	4.29
6-hr		2.00	2.40	0	3.06	3.61	4.36	4.93	5.52
12-hr		2.46	2.97	0	3.80	4.48	5.43	6.13	6.88
24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
Huff Indiana	**> South Bend**								
30-min		0.84	0.98	0	1.22	1.42	1.68	1.89	2.10
1-hr		1.08	1.26	0	1.56	1.81	2.16	2.43	2.69
2-hr		1.38	1.64	0	2.06	2.41	2.90	3.27	3.64
3-hr		1.59	1.90	0	2.40	2.82	3.40	3.84	4.29
6-hr		2.00	2.40	0	3.06	3.61	4.36	4.93	5.52
12-hr		2.46	2.97	0	3.80	4.48	5.43	6.13	6.88
24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35

Precipitation Report Cont'd

Precipitation filename: WestportCT.pcp

Rainfall totals in Inches

08-18-2020

	Active	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Active			✔		✔	✔	✔	✔	✔
NRCS Storms	**> NRCS Dimensionless Storms**								
NRCS MSE3, 24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
NRCS MSE4, 24-hr		2.87	3.50	0	4.53	5.38	6.55	7.42	8.35
NRCS MSE3, 24-hr		0	0	0	0	0	0	0	0
NRCS MSE4, 24-hr		0	0	0	0	0	0	0	0
NRCS MSE5, 24-hr		0	0	0	0	0	0	0	0
NRCS MSE6, 24-hr		0	0	0	0	0	0	0	0
NOAA-A, 24-hr		0	0	0	0	0	0	0	0
NOAA-B, 24-hr		0	0	0	0	0	0	0	0
NOAA-C, 24-hr		0	0	0	0	0	0	0	0
NOAA-D, 24-hr		0	0	0	0	0	0	0	0
NRCC-A, 24-hr		0	0	0	0	0	0	0	0
NRCC-B, 24-hr		0	0	0	0	0	0	0	0
NRCC-C, 24-hr		0	0	0	0	0	0	0	0
NRCC-D, 24-hr		0	0	0	0	0	0	0	0
CA-1, 24-hr		0	0	0	0	0	0	0	0
CA-2, 24-hr		0	0	0	0	0	0	0	0
CA-3, 24-hr		0	0	0	0	0	0	0	0
CA-4, 24-hr		0	0	0	0	0	0	0	0
CA-5, 24-hr		0	0	0	0	0	0	0	0
CA-6, 24-hr		0	0	0	0	0	0	0	0