Farnsworth GROUP

STORM WATER DETENTION REPORT

Casey's General Store
Town of Geneva, Indiana

SAMPLE

Owner: Casey's Retail Company
One Convenience Boulevard
Ankeny, IA 60181
(515) 965-6100

Engineer: Farnsworth Group, Inc.
2211 West Bradley Avenue
Champaign, Illinois 61821
(217) 352-7408

September 2016
Revised October 2016
Revised December 2016

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12/7/16

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Casey's – Geneva, IN

Storm Detention

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DETENTION ANALYSIS

ABSTRACT

Casey's General Stores is proposing to construct a new convenience store with fuel sales in the Town of Geneva, Indiana. The new store will be located on the northeast corner of the intersection of North Main Street (US 27) and Rainbow Road, which is commonly known as 835 North Main Street. The proposed development will include the construction of an approximate 3,350 SF convenience store with fuel islands, one access drive onto Main Street (U.S. Route 27) and two drives onto Rainbow Road, associated parking areas and drive lanes, and utility services.

The report will analyze the pre-development and the post-development conditions, determine the estimated required storage volume to control the 10-year, 50-year and 100-year storm events, and design the required outlet structure to control the peak runoff rates for the 10-year, 50-year and 100-year storm events for the proposed site.

The report will follow the SCS TR-55 methodology and will use the Bentley Pondpack software program.

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PRE-DEVELOPMENT CONDITIONS

The existing site is approximately 1.74 acres in size. The existing ground cover conditions consist of lawn areas with >75% coverage.

Due to the grading of the surrounding area, the total existing area to be considered in calculations was expanded to include additional offsite area draining onto the site.

Additionally, due to the proposed development of an extended access drive onto Rainbow Road, the right-of-way area will also be analyzed separately (Existing Area 2) for pre- and post-development runoff rates. Refer to the drainage area maps located in Appendix Section 1.

The following land use classification and corresponding curve numbers are based upon the existing site conditions and the existing soil classification as determined by the National Resource Conservation Service soils map for the area.

Existing Area 1			
Soil Group D	Open Space/Lawn	1.983 ac	CN = 80
			Weighted CN = 80
Existing Area 2			
Soil Group D	Open Space/Lawn	0.588 ac	CN = 80
			Weighted CN = 80

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POST-DEVELOPMENT CONDITIONS

The post-developed conditions will result in the development of a commercial/retail business (Casey's General Store) and fuel sales. The proposed ground cover conditions will consist of an approximate 3,350 SF retail building, parking and drive aisles and perimeter green space areas.

The following land use classification and corresponding curve numbers are based upon the proposed site conditions and the existing soil classification as determined by the National Resource Conservation Service soils map for the area.

Developed Area 1			
Soil Group D	Open Space/Lawn	0.860 ac	CN = 80
	Pavement/Building	1.111 ac	CN = 98
		Weighted CN = 90	
Uncontrolled Area 1			
Soil Group D	Open Space/Lawn	0.122 ac	CN = 80
		Weighted CN = 80	
Developed Area 2			
Soil Group D	Open Space/Lawn	0.474 ac	CN = 80
		Weighted CN = 80	

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ALLOWABLE PEAK DISCHARGE

Per the Town of Geneva, IN Design Criteria, the runoff rates shall not be increased for the 10 year up to the 100 year event. However, due to existing storm drainage issues just downstream of the project limits, the allowable release rate will be reduced from the allowable release rate for the project.

Per the Indiana DOT Design Manual, the post-development 1000-year storm shall be released at a rate not to exceed the pre-development 10-year 24-hour storm event. INDOT's Design Manual requires that the 50% Huff Distribution be used for the analysis – See Appendix Section 1 for the Huff Distribution Chart.

The Town of Geneva's design criteria and the INDOT Design Criteria shall be incorporated into the final designs.

For the proposed Casey's General Store site the existing condition discharge rates are as follows for the Town of Geneva criteria:

Area 1

- 10-year event = 7.84 cfs
- 50-year event = 10.87 cfs
- 100-year event = 12.29 cfs

Uncontrolled Area 1

- 10-year event = 0.73 cfs
- 50-year event = 1.14 cfs
- 100-year event = 1.33 cfs

Area 2

- 10-year event = 1.39 cfs
- 50-year event = 2.14 cfs
- 100-year event = 2.51 cfs

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For the proposed Casey's General Store site the existing condition discharge rates are as follows for the INDOT drainage criteria:

Area 1

Storm Duration	10-year Event (cfs)	100-year Event (cfs)
15 minute	1.52	2.98
30 minute	1.79	3.19
60 minute	1.51	3.52
2 hour	1.21	2.92
3 hour	0.96	2.37
6 hour	0.84	1.72
12 hour	0.54	1.06
24 hour	0.35	0.63

Area 2

Storm Duration	10-year Event	100-year Event
15 minute	0.41	0.82
30 minute	0.50	0.90
60 minute	0.40	0.98
2 hour	0.33	0.80
3 hour	0.26	0.66
6 hour	0.23	0.49
12 hour	0.15	0.30
24 hour	0.10	0.18

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The rainfall intensities for the 10-year and 100-year 24-hour storms have been taken from the NOAA Atlas 14 Volume 2 PF Tabular for Geneva, Indiana. The rainfall intensities are 3.78 inches for the 10-year event, 4.99 inches for the 50-year event, and 5.56 inches for the 100-year event.

STORM ROUTING

For this project a detention basin will be required to control the stormwater runoff from the site for Area 1. No detention basin will be required for the Uncontrolled Area or Area 2, as the peak flows are less during post-development. The detention basin will provide approximately 0.513 ac-ft (22,345 cu-ft) of storage.

The control for the detention basin will consist of one orifice; a 4.85" (0.405') hole at 844.50. The control outlet structure will be located within catch basin 1.1 located on the northwest corner of the site.

The developed condition hydrographs for the 10-year, and 100-year storms were calculated and routed through the proposed outlet structure using the 2005 version of Bentley Pondpack software. The results of the storm routings are located in Section 3 Appendix of this report.

The results of the storm routings are as follows:

Town of Geneva Criteria:

	Storm Event (24-hr)	Pre-Developed Discharge (cfs)	Post-Developed Discharge (cfs)	Peak Elevation (ft)
CP 1	10-year	6.05	1.12	846.69
	50-year	9.24	1.40	847.31
	100-year	10.78	1.53	847.59
CP 2	10-year	1.72	1.39	N/A
	50-year	2.65	2.14	N/A
	100-year	3.11	2.51	N/A

INDOT Criteria

	Storm Event	Pre-Developed Discharge (cfs)	Post-Developed Discharge (cfs)	Peak Elevation (ft)
CP 1	15 min - 10-year	1.52	0.60	845.49
	15 min - 100-year	2.98	0.81	845.90
	30 min - 10-year	1.79	0.76	845.89
	30 min - 100-year	3.19	0.99	846.49
	60 min - 10-year	1.51	0.82	846.15
	60 min - 100-year	3.52	1.08	846.98
	2 hour - 10-year	1.21	0.80	846.15
	2 hour - 100-year	2.92	1.06	847.12

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	3 hour - 10-year	0.96	0.74	845.96
	3 hour - 100-year	2.37	1.01	846.99
	6 hour - 10-year	0.84	0.71	845.90
	6 hour - 100-year	1.72	0.97	846.91
	12 hour - 10-year	0.54	0.60	845.56
	12 hour - 100-year	1.06	0.86	846.61
	24 hour - 10-year	0.35	0.45	845.18
	24 hour - 100-year	0.63	0.66	845.72
CP 2	15 min - 10-year	0.41	0.33	N/A
	15 min - 100-year	0.82	0.66	N/A
	30 min - 10-year	0.50	0.40	N/A
	30 min - 100-year	0.90	0.73	N/A
	60 min - 10-year	0.40	0.32	N/A
	60 min - 100-year	0.98	0.79	N/A
	2 hour - 10-year	0.33	0.27	N/A
	2 hour - 100-year	0.80	0.65	N/A
	3 hour - 10-year	0.26	0.21	N/A
	3 hour - 100-year	0.66	0.53	N/A
	6 hour - 10-year	0.23	0.19	N/A
	6 hour - 100-year	0.49	0.40	N/A
	12 hour - 10-year	0.15	0.12	N/A
	12 hour - 100-year	0.30	0.24	N/A
	24 hour - 10-year	0.10	0.08	N/A
	24 hour - 100-year	0.18	0.15	N/A

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CONCLUSION

The results of the analysis demonstrate that adequate detention storage volume is provided for the proposed Casey's General Store site. The results of the storm routings indicates that the allowable peak discharges will not be exceeded once the store and associated infrastructure has been constructed as proposed.

All pertinent worksheets, storm routing information are located within the Appendix of this report.

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APPENDIX

Section 1

Project Location Map

NCRS Soils Map

Rainfall Table 1

Huff Distribution Table

Pre-Development Drainage and Flow Map

Post-Development Drainage and Flow Map

Section 2

Pre-Development Runoff Models

- Town of Geneva Analysis
- INDOT Analysis

Section 3

Post-Development Runoff Models

- Town of Geneva Analysis
- INDOT Analysis

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Section 1

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Project Location Plan
Not to Scale

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Hydrologic Soil Group—Adams County, Indiana
(Caseys Geneva IN)

Map Scale: 1:977 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Adams County, Indiana
Survey Area Data: Version 18, Sep 8, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 30, 2010—Oct 7, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

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Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Adams County, Indiana (IN001)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BgmB	Blount silt loam, ground moraine, 2 to 4 percent slopes	D	2.2	100.0%
Totals for Area of Interest			**2.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

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Tie-break Rule: Higher

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NOAA Atlas 14, Volume 2, Version 3
Location name: Geneva, Indiana, US*
Latitude: 40.5996°, Longitude: -84.9553°
Elevation: 849 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

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	0.354 (0.324–0.388)	0.421 (0.386–0.462)	0.503 (0.460–0.551)	0.567 (0.517–0.620)	0.648 (0.588–0.707)	0.709 (0.642–0.775)	0.771 (0.693–0.839)	0.833 (0.745–0.907)	0.916 (0.813–0.998)	0.975 (0.859–1.07)
10-min	0.549 (0.503–0.602)	0.657 (0.602–0.721)	0.781 (0.715–0.856)	0.875 (0.798–0.957)	0.991 (0.900–1.08)	1.08 (0.973–1.17)	1.16 (1.04–1.26)	1.24 (1.11–1.35)	1.35 (1.20–1.47)	1.42 (1.25–1.55)
15-min	0.673 (0.617–0.738)	0.804 (0.736–0.882)	0.959 (0.878–1.05)	1.08 (0.982–1.18)	1.22 (1.11–1.34)	1.33 (1.21–1.45)	1.44 (1.30–1.57)	1.55 (1.38–1.68)	1.68 (1.49–1.83)	1.78 (1.56–1.94)
30-min	0.891 (0.817–0.977)	1.08 (0.985–1.18)	1.31 (1.20–1.44)	1.50 (1.36–1.64)	1.73 (1.57–1.89)	1.90 (1.72–2.08)	2.08 (1.87–2.27)	2.26 (2.02–2.46)	2.49 (2.21–2.71)	2.66 (2.34–2.90)
60-min	1.09 (0.997–1.19)	1.32 (1.21–1.45)	1.65 (1.51–1.81)	1.90 (1.74–2.08)	2.24 (2.04–2.45)	2.51 (2.27–2.74)	2.78 (2.50–3.03)	3.06 (2.74–3.33)	3.44 (3.06–3.75)	3.74 (3.29–4.08)
2-hr	1.28 (1.17–1.40)	1.55 (1.41–1.70)	1.94 (1.77–2.12)	2.25 (2.04–2.46)	2.67 (2.41–2.91)	3.00 (2.70–3.27)	3.35 (2.99–3.64)	3.71 (3.29–4.03)	4.20 (3.70–4.57)	4.59 (4.00–5.00)
3-hr	1.37 (1.25–1.51)	1.66 (1.51–1.83)	2.07 (1.89–2.28)	2.40 (2.18–2.64)	2.86 (2.59–3.14)	3.23 (2.90–3.53)	3.62 (3.23–3.95)	4.02 (3.56–4.38)	4.58 (4.02–4.99)	5.03 (4.37–5.48)
6-hr	1.63 (1.48–1.79)	1.96 (1.79–2.16)	2.43 (2.22–2.68)	2.83 (2.57–3.10)	3.38 (3.06–3.69)	3.83 (3.44–4.18)	4.31 (3.85–4.69)	4.81 (4.26–5.23)	5.53 (4.84–6.02)	6.11 (5.29–6.65)
12-hr	1.88 (1.71–2.07)	2.26 (2.06–2.49)	2.80 (2.55–3.08)	3.24 (2.95–3.56)	3.87 (3.50–4.23)	4.37 (3.93–4.78)	4.92 (4.39–5.36)	5.49 (4.86–5.98)	6.31 (5.51–6.86)	6.97 (6.03–7.58)
24-hr	2.22 (2.07–2.39)	2.67 (2.49–2.87)	3.29 (3.07–3.53)	3.78 (3.52–4.05)	4.45 (4.13–4.77)	4.99 (4.62–5.34)	5.56 (5.12–5.94)	6.13 (5.63–6.55)	6.93 (6.33–7.41)	7.56 (6.86–8.09)
2-day	2.59 (2.42–2.78)	3.10 (2.89–3.33)	3.78 (3.53–4.07)	4.32 (4.02–4.65)	5.06 (4.69–5.43)	5.64 (5.22–6.06)	6.25 (5.76–6.71)	6.87 (6.31–7.38)	7.71 (7.05–8.30)	8.38 (7.61–9.03)
3-day	2.78 (2.61–2.98)	3.32 (3.11–3.56)	4.03 (3.77–4.32)	4.59 (4.29–4.92)	5.36 (4.99–5.73)	5.96 (5.54–6.37)	6.58 (6.10–7.03)	7.21 (6.66–7.72)	8.07 (7.41–8.64)	8.74 (7.98–9.38)
4-day	2.97 (2.80–3.17)	3.54 (3.33–3.78)	4.28 (4.02–4.57)	4.87 (4.56–5.19)	5.66 (5.29–6.02)	6.28 (5.86–6.69)	6.91 (6.43–7.36)	7.56 (7.00–8.05)	8.43 (7.77–8.99)	9.11 (8.35–9.73)
7-day	3.51 (3.30–3.74)	4.17 (3.92–4.45)	5.01 (4.71–5.34)	5.68 (5.33–6.05)	6.59 (6.17–7.01)	7.31 (6.83–7.77)	8.04 (7.49–8.56)	8.79 (8.16–9.36)	9.81 (9.06–10.5)	10.6 (9.74–11.3)
10-day	3.97 (3.75–4.22)	4.71 (4.45–5.01)	5.63 (5.31–5.98)	6.36 (5.99–6.75)	7.34 (6.90–7.78)	8.12 (7.61–8.61)	8.91 (8.32–9.45)	9.70 (9.03–10.3)	10.8 (9.97–11.5)	11.6 (10.7–12.4)
20-day	5.44 (5.15–5.76)	6.42 (6.07–6.80)	7.55 (7.14–8.00)	8.44 (7.97–8.93)	9.62 (9.07–10.2)	10.5 (9.90–11.2)	11.4 (10.7–12.1)	12.3 (11.5–13.1)	13.5 (12.6–14.4)	14.4 (13.4–15.4)
30-day	6.72 (6.39–7.08)	7.91 (7.52–8.33)	9.19 (8.73–9.67)	10.2 (9.65–10.7)	11.5 (10.9–12.0)	12.4 (11.8–13.1)	13.4 (12.6–14.1)	14.3 (13.4–15.0)	15.5 (14.5–16.3)	16.4 (15.3–17.3)
45-day	8.60 (8.19–9.02)	10.1 (9.61–10.6)	11.6 (11.0–12.2)	12.8 (12.1–13.4)	14.2 (13.5–14.9)	15.3 (14.5–16.1)	16.4 (15.5–17.2)	17.4 (16.4–18.3)	18.7 (17.6–19.6)	19.6 (18.4–20.6)
60-day	10.4 (9.91–10.9)	12.2 (11.6–12.8)	13.9 (13.2–14.6)	15.2 (14.5–15.9)	16.9 (16.1–17.7)	18.2 (17.2–19.0)	19.3 (18.3–20.3)	20.5 (19.4–21.5)	21.9 (20.6–23.0)	22.9 (21.5–24.1)

[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.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

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Table 2.1.5
50% Huff Curve Ordinates (Purdue et al., 1992)

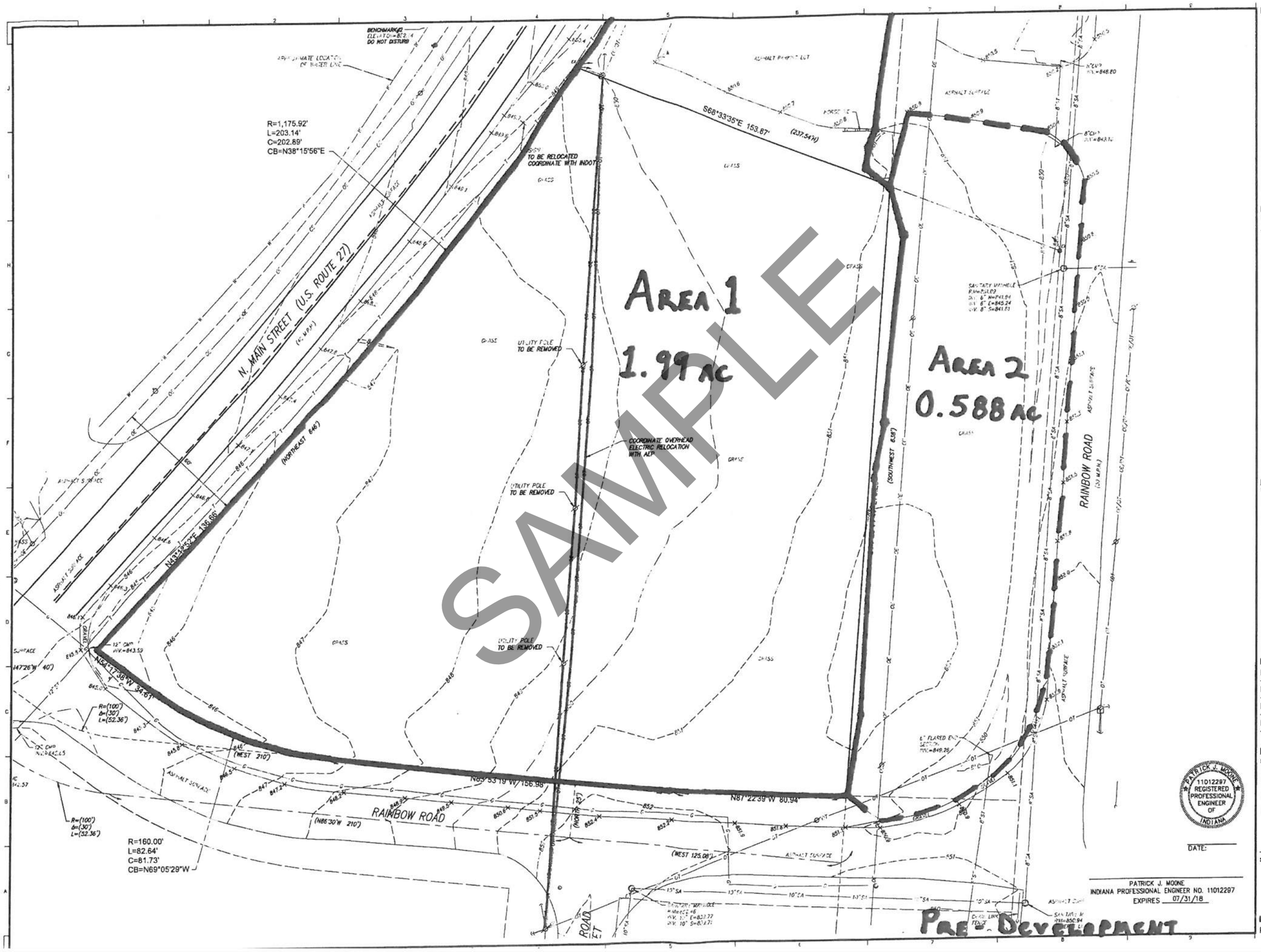
% Storm Time	Indianapolis				Evansville				Fort Wayne				South Bend			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	20.00	6.50	5.26	6.67	22.82	6.28	5.13	6.92	20.00	6.67	6.00	7.14	20.00	7.50	7.00	8.26
20	40.80	18.13	11.55	14.25	44.69	17.33	11.11	14.04	41.11	17.14	12.23	14.23	40.00	18.57	13.33	16.35
30	54.95	35.85	17.06	20.00	57.11	33.33	16.67	20.51	54.83	34.17	18.86	20.00	51.67	34.00	20.00	22.73
40	62.50	52.94	24.24	26.09	65.33	53.09	25.44	27.06	62.00	52.18	26.15	25.71	60.89	51.43	27.50	28.50
50	68.75	67.86	37.78	33.33	71.43	69.57	37.93	34.21	68.42	66.67	38.46	33.33	67.35	66.67	39.13	34.04
60	76.67	76.52	58.33	40.00	78.15	78.57	57.39	40.91	75.00	76.36	57.23	38.00	75.00	75.17	58.46	40.20
70	83.05	83.81	78.03	50.00	84.66	85.60	77.44	50.79	81.62	84.29	76.11	48.50	80.83	82.32	75.98	50.00
80	89.70	90.67	88.68	68.57	90.00	91.72	88.54	69.70	87.50	90.00	87.69	68.24	86.67	88.89	86.79	67.50
90	95.00	95.89	95.29	88.37	95.36	96.50	95.88	89.36	93.75	95.56	95.08	87.88	92.89	94.78	94.17	87.50
100	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 2.1.6
60% Huff Curve Ordinates (Purdue et al., 1992)

% Storm Time	Indianapolis				Evansville				Fort Wayne				South Bend			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	17.50	5.22	4.18	5.45	19.15	5.07	4.00	5.22	17.78	5.71	4.67	5.45	17.37	6.09	5.65	6.67
20	37.86	15.56	9.23	11.03	40.51	15.12	9.00	11.11	38.00	14.69	10.42	11.00	36.00	15.94	11.25	13.33
30	50.00	31.25	14.29	17.39	53.13	30.00	13.69	16.94	50.00	30.00	15.89	16.04	48.57	30.53	17.14	20.00
40	58.33	48.39	21.58	22.28	60.86	48.81	22.22	23.00	57.50	48.42	22.44	22.98	56.67	48.00	24.00	25.00
50	65.12	64.13	32.45	28.57	66.95	65.79	33.96	30.77	65.00	63.64	35.00	27.42	65.00	62.50	35.66	29.41
60	71.97	73.33	54.17	36.67	74.36	75.56	53.33	37.23	71.43	73.33	53.08	34.17	71.43	72.44	54.07	37.02
70	80.00	81.13	73.89	47.14	80.91	82.46	74.43	47.27	77.78	81.43	72.86	44.17	77.78	79.29	72.67	47.02
80	86.67	88.82	86.32	65.00	87.50	89.53	86.67	66.00	85.00	88.00	85.71	64.41	84.00	86.67	84.44	64.44
90	93.33	94.74	94.12	86.67	94.00	95.50	94.67	86.00	92.12	94.44	93.85	85.42	90.77	93.55	92.89	85.71
100	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

SAMPLE

SAMPLE



Farnsworth
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Engineers | Architects | Surveyors | Scientists

ISSUE:

#	Date	Description

0 10 20 40
SCALE: 1"=20'

PROJECT:
CASEY'S
MARKETING COMPANY

TOWN OF GENEVA
ADAMS COUNTY, INDIANA

Date:	08-05-16
Design/Drawn:	
Reviewed:	PJM
Book No.: -	Field: -

SHEET TITLE:

EXISTING TOPOGRAPHY & DEMOLITION PLAN

SHEET NUMBER:

3
of __

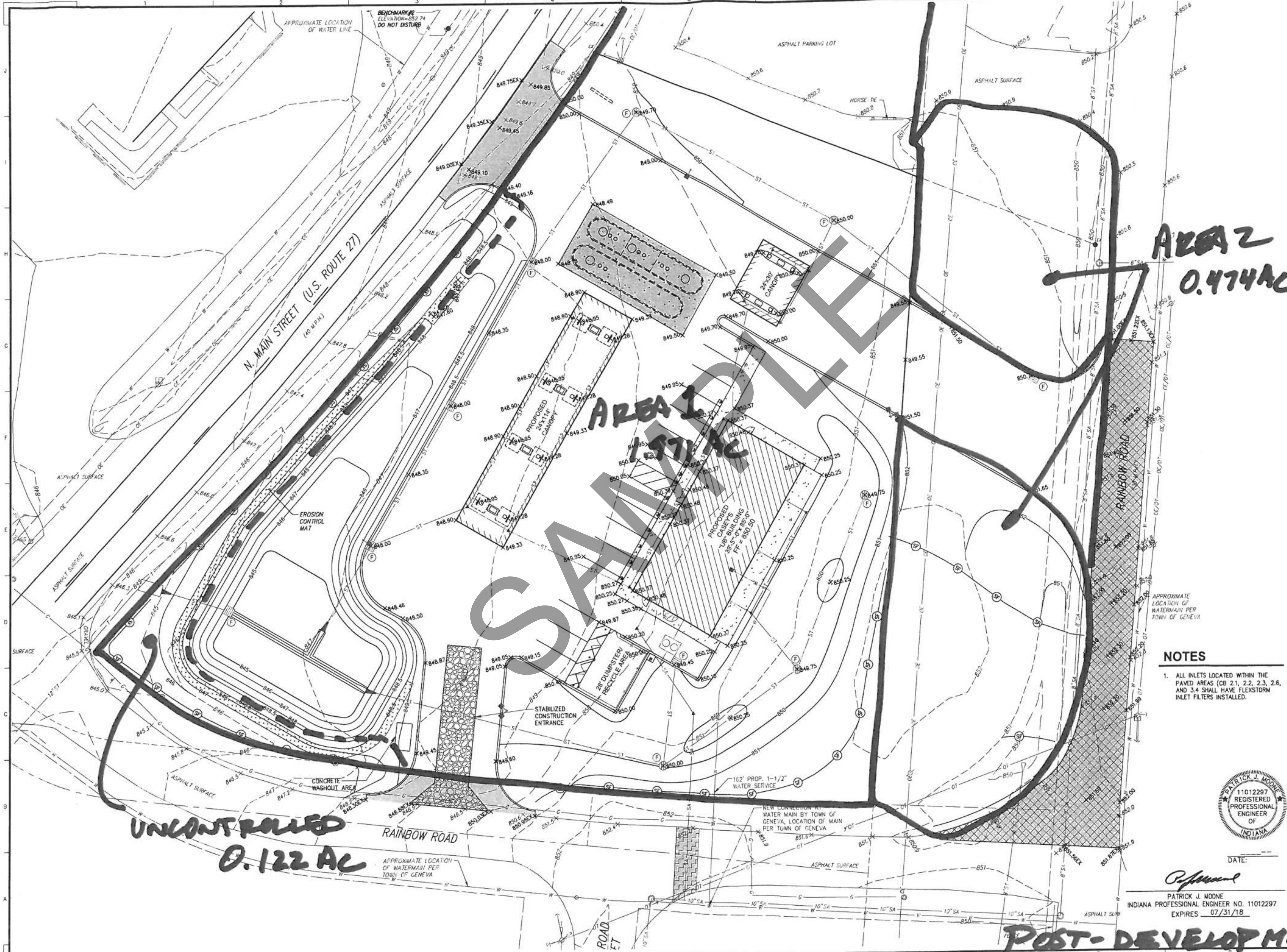
Project No.: 0160615.02

PATRICK J. MOONE
11012297
REGISTERED PROFESSIONAL ENGINEER
OF
INDIANA

DATE:

PATRICK J. MOONE
INDIANA PROFESSIONAL ENGINEER NO. 11012297
EXPIRES 07/31/18

SAMPLE



NOTES

1. ALL INLETS LOCATED WITHIN THE PAVED AREAS (CB 2.1, 2.2, 2.3, 2.6, AND 3.4 SHALL HAVE FLEXSTORM INLET FILTERS INSTALLED.

PATRICK J. MOONE
11012297
REGISTERED PROFESSIONAL ENGINEER
OF
INDIANA

DATE:

PATRICK J. MOONE
INDIANA PROFESSIONAL ENGINEER NO. 11012297
EXPIRES 07/31/18

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ISSUE:
Date: Description:

SCALE: 1"=20'

PROJECT:
CASEY'S MARKETING COMPANY

TOWN OF GENEVA
ADAMS COUNTY, INDIANA

Date: 09-02-16
Design/Drawn:
Reviewed: PJM
Book No.: - Field: -

SHEET TITLE:
GRADING & EROSION CONTROL PLAN

SHEET NUMBER:
5
of __

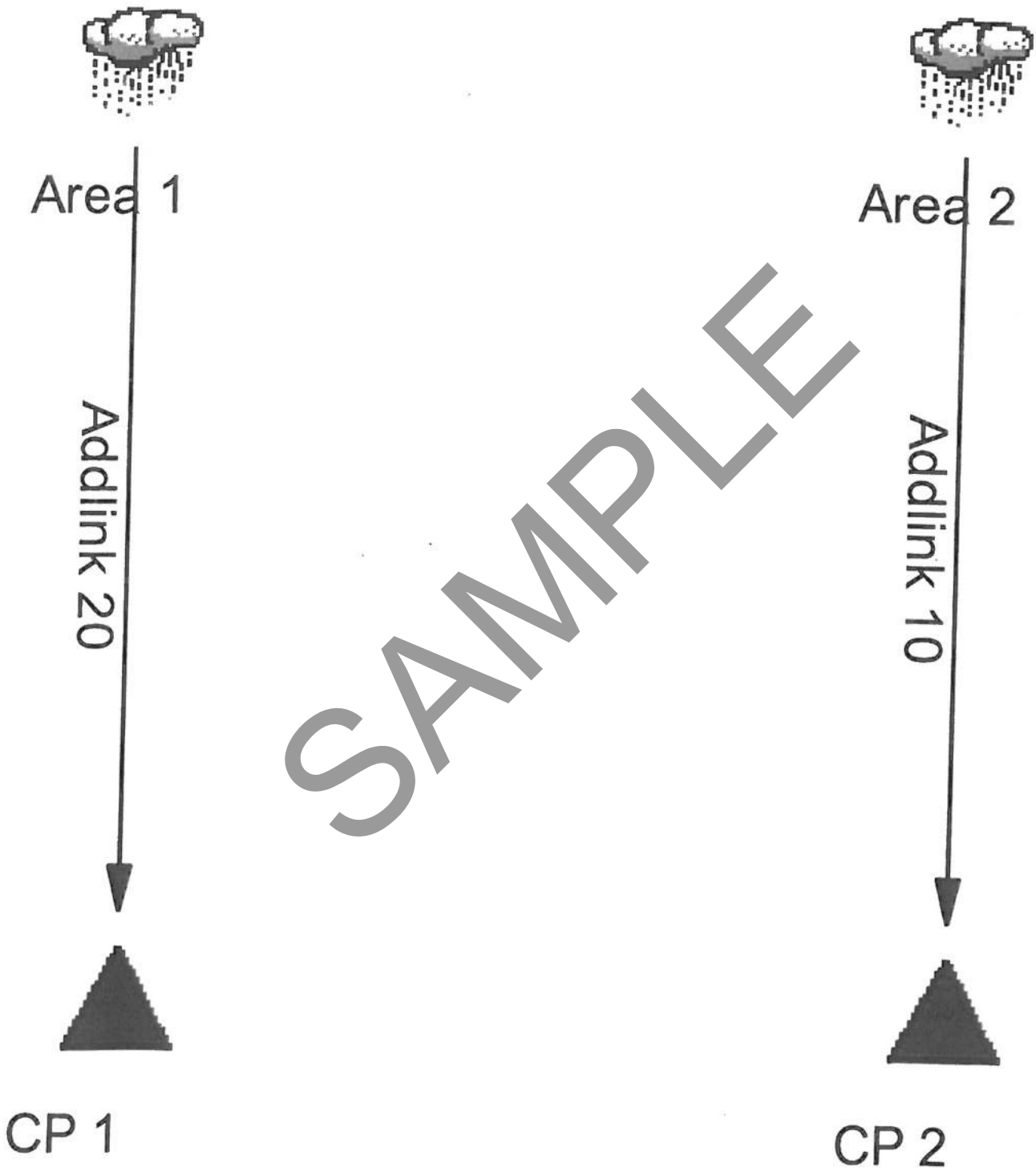
Project No.: 0160615.02

SAMPLE

Section 2

SAMPLE

SAMPLE



SAMPLE

SAMPLE

Town of Geneva Model

SAMPLE

Casey's – Geneva, IN

Storm Detention

September 2016
Revised October 2016
Revised December 2016

SAMPLE

==========
JOB TITLE
==========

Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at Geneva, IN

SAMPLE

Table of Contents

SAMPLE

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Geneva, IN

Return Event	Total Depth in	Rainfall Type	RNF ID
10	3.7800	Synthetic Curve	TypeII 24hr
50	4.9900	Synthetic Curve	TypeII 24hr
100	5.5600	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AREA 1	AREA	10	.321		11.9250	6.05		
AREA 1	AREA	50	.493		11.9250	9.24		
AREA 1	AREA	100	.577		11.9250	10.78		
AREA 2	AREA	10	.091		11.9250	1.72		
AREA 2	AREA	50	.141		11.9250	2.65		
AREA 2	AREA	100	.166		11.9250	3.11		
*CP 1	JCT	10	.321		11.9250	6.05		
*CP 1	JCT	50	.493		11.9250	9.24		
*CP 1	JCT	100	.577		11.9250	10.78		
*CP 2	JCT	10	.091		11.9250	1.72		
*CP 2	JCT	50	.141		11.9250	2.65		
*CP 2	JCT	100	.166		11.9250	3.11		

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Geneva, IN

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 3.7800 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 4.9900 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 5.5600 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

SAMPLE

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110
Hydraulic Length	68.00 ft
2yr, 24hr P	2.6700 in
Slope	.010000 ft/ft
Avg.Velocity	.88 ft/sec

Segment #1 Time: .0214 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	375.00 ft
Slope	.018000 ft/ft
Unpaved	
Avg.Velocity	2.16 ft/sec

Segment #2 Time: .0481 hrs

Total Tc: .0695 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, ft/ft

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0250
Hydraulic Length	90.00 ft
2yr, 24hr P	2.6700 in
Slope	.025000 ft/ft
Avg.Velocity	.70 ft/sec

Segment #1 Time: .0358 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	151.00 ft
Slope	.007500 ft/ft
Unpaved	
Avg.Velocity	1.40 ft/sec

Segment #2 Time: .0300 hrs

==========
Total Tc: .0659 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, ft

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	1.829			80.00
Impervious Areas - Paved parking lo	98	.157			98.00
COMPOSITE AREA & WEIGHTED CN --->		1.986			81.42 (81)

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.588			80.00
COMPOSITE AREA & WEIGHTED CN --->		.588			80.00 (80)

SAMPLE

Section 3

SAMPLE

SAMPLE

Indiana DOT Model

SAMPLE

Casey's – Geneva, IN

Storm Detention

September 2016
Revised October 2016
Revised December 2016

SAMPLE

==========
JOB TITLE
==========

Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at Geneva, IN

SAMPLE

Table of Contents

SAMPLE

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Huff storms Gene

Return Event	Total Depth in	Rainfall Type	RNF ID
Pre 1	1.0800	Synthetic Curve	HUFF 15 MIN
Pre 2	1.5000	Synthetic Curve	HUFF 30 MIN
Pre 21	2.0800	Synthetic Curve	HUFF 30 MIN
Pre 3	1.9000	Synthetic Curve	Huff 60 MIN
Pre 31	2.7800	Synthetic Curve	Huff 60 MIN
Pre 4	2.2500	Synthetic Curve	HUFF 120 MIN
Pre 41	3.3500	Synthetic Curve	HUFF 120 MIN
Pre 5	2.4000	Synthetic Curve	HUFF 180 MIN
Pre 51	3.6200	Synthetic Curve	HUFF 180 MIN
Pre 11	1.4400	Synthetic Curve	HUFF 15 MIN
Pre 6	2.8300	Synthetic Curve	HUFF 6 HR
Pre 61	4.3100	Synthetic Curve	HUFF 6 HR
Pre 7	3.2400	Synthetic Curve	HUFF 12 HR
Pre 71	4.9200	Synthetic Curve	HUFF 12 HR
Pre 8	3.7800	Synthetic Curve	HUFF 24 HR
Pre 81	5.5600	Synthetic Curve	HUFF 24 HR

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AREA 1	AREA	1	.021		.2500	1.52		
AREA 1	AREA	2	.052		.5000	1.79		
AREA 1	AREA	21	.108		.5000	3.19		
AREA 1	AREA	3	.090		.3250	1.51		
AREA 1	AREA	31	.190		.3000	3.52		
AREA 1	AREA	4	.127		.6000	1.21		
AREA 1	AREA	41	.263		.4250	2.92		
AREA 1	AREA	5	.144		.6250	.96		
AREA 1	AREA	51	.299		.6250	2.37		
AREA 1	AREA	11	.047		.2500	2.98		
AREA 1	AREA	6	.196		2.4000	.84		
AREA 1	AREA	61	.394		2.4000	1.72		
AREA 1	AREA	7	.248		4.8000	.54		
AREA 1	AREA	71	.482		4.8000	1.06		
AREA 1	AREA	8	.320		9.6000	.35		
AREA 1	AREA	81	.576		9.6000	.63		
AREA 2	AREA	1	.005		.2750	.41		
AREA 2	AREA	2	.014		.5000	.50		
AREA 2	AREA	21	.030		.5000	.90		
AREA 2	AREA	3	.025		.3250	.40		
AREA 2	AREA	31	.053		.3250	.98		
AREA 2	AREA	4	.035		.6000	.33		
AREA 2	AREA	41	.074		.4250	.80		
AREA 2	AREA	5	.040		.9000	.26		
AREA 2	AREA	51	.085		.6250	.66		
AREA 2	AREA	11	.013		.2500	.82		
AREA 2	AREA	6	.055		2.4000	.23		
AREA 2	AREA	61	.113		2.4000	.49		
AREA 2	AREA	7	.070		4.7250	.15		
AREA 2	AREA	71	.138		4.8000	.30		
AREA 2	AREA	8	.091		9.5250	.10		
AREA 2	AREA	81	.166		9.4250	.18		

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*CP 1	JCT	1	.021		.2500	1.52		
*CP 1	JCT	2	.052		.5000	1.79		
*CP 1	JCT	21	.108		.5000	3.19		
*CP 1	JCT	3	.090		.3250	1.51		
*CP 1	JCT	31	.190		.3000	3.52		
*CP 1	JCT	4	.127		.6000	1.21		
*CP 1	JCT	41	.263		.4250	2.92		
*CP 1	JCT	5	.144		.6250	.96		
*CP 1	JCT	51	.299		.6250	2.37		
*CP 1	JCT	11	.047		.2500	2.98		
*CP 1	JCT	6	.196		2.4000	.84		
*CP 1	JCT	61	.394		2.4000	1.72		
*CP 1	JCT	7	.248		4.8000	.54		
*CP 1	JCT	71	.482		4.8000	1.06		
*CP 1	JCT	8	.320		9.6000	.35		
*CP 1	JCT	81	.576		9.6000	.63		
*CP 2	JCT	1	.005		.2750	.41		
*CP 2	JCT	2	.014		.5000	.50		
*CP 2	JCT	21	.030		.5000	.90		
*CP 2	JCT	3	.025		.3250	.40		
*CP 2	JCT	31	.053		.3250	.98		
*CP 2	JCT	4	.035		.6000	.33		
*CP 2	JCT	41	.074		.4250	.80		
*CP 2	JCT	5	.040		.9000	.26		
*CP 2	JCT	51	.085		.6250	.66		
*CP 2	JCT	11	.013		.2500	.82		
*CP 2	JCT	6	.055		2.4000	.23		
*CP 2	JCT	61	.113		2.4000	.49		
*CP 2	JCT	7	.070		4.7250	.15		
*CP 2	JCT	71	.138		4.8000	.30		
*CP 2	JCT	8	.091		9.5250	.10		
*CP 2	JCT	81	.166		9.4250	.18		

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Pre 1

Data Type, File, ID = Synthetic Storm HUFF 15 MIN
Storm Frequency = 1 yr
Total Rainfall Depth= 1.0800 in
Duration Multiplier = 1
Resulting Duration = .2500 hrs
Resulting Start Time= .0000 hrs Step= .0250 hrs End= .2500 hrs

Storm Tag Name = Pre 2

Data Type, File, ID = Synthetic Storm HUFF 30 MIN
Storm Frequency = 2 yr
Total Rainfall Depth= 1.5000 in
Duration Multiplier = 1
Resulting Duration = .5000 hrs
Resulting Start Time= .0000 hrs Step= .0500 hrs End= .5000 hrs

Storm Tag Name = Pre 21

Data Type, File, ID = Synthetic Storm HUFF 30 MIN
Storm Frequency = 21 yr
Total Rainfall Depth= 2.0800 in
Duration Multiplier = 1
Resulting Duration = .5000 hrs
Resulting Start Time= .0000 hrs Step= .0500 hrs End= .5000 hrs

Storm Tag Name = Pre 3

Data Type, File, ID = Synthetic Storm Huff 60 MIN
Storm Frequency = 3 yr
Total Rainfall Depth= 1.9000 in
Duration Multiplier = 1
Resulting Duration = 1.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 1.0000 hrs

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Pre 31

Data Type, File, ID = Synthetic Storm Huff 60 MIN
Storm Frequency = 31 yr
Total Rainfall Depth= 2.7800 in
Duration Multiplier = 1
Resulting Duration = 1.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 1.0000 hrs

Storm Tag Name = Pre 4

Data Type, File, ID = Synthetic Storm HUFF 120 MIN
Storm Frequency = 4 yr
Total Rainfall Depth= 2.2500 in
Duration Multiplier = 1
Resulting Duration = 2.0000 hrs
Resulting Start Time= .0000 hrs Step= .2000 hrs End= 2.0000 hrs

Storm Tag Name = Pre 41

Data Type, File, ID = Synthetic Storm HUFF 120 MIN
Storm Frequency = 41 yr
Total Rainfall Depth= 3.3500 in
Duration Multiplier = 1
Resulting Duration = 2.0000 hrs
Resulting Start Time= .0000 hrs Step= .2000 hrs End= 2.0000 hrs

Storm Tag Name = Pre 5

Data Type, File, ID = Synthetic Storm HUFF 180 MIN
Storm Frequency = 5 yr
Total Rainfall Depth= 2.4000 in
Duration Multiplier = 1
Resulting Duration = 3.0000 hrs
Resulting Start Time= .0000 hrs Step= .3000 hrs End= 3.0000 hrs

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Pre 51

Data Type, File, ID = Synthetic Storm HUFF 180 MIN
Storm Frequency = 51 yr
Total Rainfall Depth= 3.6200 in
Duration Multiplier = 1
Resulting Duration = 3.0000 hrs
Resulting Start Time= .0000 hrs Step= .3000 hrs End= 3.0000 hrs

Storm Tag Name = Pre 11

Data Type, File, ID = Synthetic Storm HUFF 15 MIN
Storm Frequency = 11 yr
Total Rainfall Depth= 1.4400 in
Duration Multiplier = 1
Resulting Duration = .2500 hrs
Resulting Start Time= .0000 hrs Step= .0250 hrs End= .2500 hrs

Storm Tag Name = Pre 6

Data Type, File, ID = Synthetic Storm HUFF 6 HR
Storm Frequency = 6 yr
Total Rainfall Depth= 2.8300 in
Duration Multiplier = 1
Resulting Duration = 6.0000 hrs
Resulting Start Time= .0000 hrs Step= .6000 hrs End= 6.0000 hrs

Storm Tag Name = Pre 61

Data Type, File, ID = Synthetic Storm HUFF 6 HR
Storm Frequency = 61 yr
Total Rainfall Depth= 4.3100 in
Duration Multiplier = 1
Resulting Duration = 6.0000 hrs
Resulting Start Time= .0000 hrs Step= .6000 hrs End= 6.0000 hrs

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Existing - Geneva, IN
Project Comments:
Pre-Development Conditions for the proposed site at
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Pre 7

Data Type, File, ID = Synthetic Storm HUFF 12 HR
Storm Frequency = 7 yr
Total Rainfall Depth= 3.2400 in
Duration Multiplier = 1
Resulting Duration = 12.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.2000 hrs End= 12.0000 hrs

Storm Tag Name = Pre 71

Data Type, File, ID = Synthetic Storm HUFF 12 HR
Storm Frequency = 71 yr
Total Rainfall Depth= 4.9200 in
Duration Multiplier = 1
Resulting Duration = 12.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.2000 hrs End= 12.0000 hrs

Storm Tag Name = Pre 8

Data Type, File, ID = Synthetic Storm HUFF 24 HR
Storm Frequency = 8 yr
Total Rainfall Depth= 3.7800 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 2.4000 hrs End= 24.0000 hrs

Storm Tag Name = Pre 81

Data Type, File, ID = Synthetic Storm HUFF 24 HR
Storm Frequency = 81 yr
Total Rainfall Depth= 5.5600 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 2.4000 hrs End= 24.0000 hrs

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	68.00	ft
2yr, 24hr P	2.6700	in
Slope	.010000	ft/ft
Avg.Velocity	.88	ft/sec

Segment #1 Time: .0214 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	375.00	ft
Slope	.018000	ft/ft
Unpaved		
Avg.Velocity	2.16	ft/sec

Segment #2 Time: .0481 hrs

==========
Total Tc: .0695 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, ft

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0250
Hydraulic Length	90.00 ft
2yr, 24hr P	2.6700 in
Slope	.025000 ft/ft
Avg.Velocity	.70 ft/sec

Segment #1 Time: .0358 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	151.00 ft
Slope	.007500 ft/ft
Unpaved	
Avg.Velocity	1.40 ft/sec

Segment #2 Time: .0300 hrs

==========
Total Tc: .0659 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	1.829			80.00
Impervious Areas - Paved parking lo	98	.157			98.00
COMPOSITE AREA & WEIGHTED CN --->		1.986			81.42 (81)

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.588			80.00
COMPOSITE AREA & WEIGHTED CN --->		.588			80.00 (80)

SAMPLE

Index of Starting Page Numbers for ID Names

SAMPLE

Section 3

SAMPLE

SAMPLE

Town of Geneva Model

SAMPLE

Casey's – Geneva, IN

Storm Detention

September 2016
Revised October 2016
Revised December 2016

SAMPLE

==========
JOB TITLE
==========

Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in Geneva, IN

SAMPLE

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SAMPLE

Table of Contents (continued)

SAMPLE

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Geneva, IN

Return Event	Total Depth in	Rainfall Type	RNF ID
10	3.7800	Synthetic Curve	TypeII 24hr
50	4.9900	Synthetic Curve	TypeII 24hr
100	5.5600	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AREA 1	AREA	10	.445		11.9250	8.16		
AREA 1	AREA	50	.635		11.9250	11.42		
AREA 1	AREA	100	.726		11.9250	12.95		
AREA 2	AREA	10	.074		11.9250	1.39		
AREA 2	AREA	50	.114		11.9250	2.14		
AREA 2	AREA	100	.134		11.9250	2.51		
*CP 1	JCT	10	.464		12.0000	1.12		
*CP 1	JCT	50	.664		11.9500	1.40		
*CP 1	JCT	100	.760		11.9250	1.53		
*CP 2	JCT	10	.074		11.9250	1.39		
*CP 2	JCT	50	.114		11.9250	2.14		
*CP 2	JCT	100	.134		11.9250	2.51		
POND 10 IN	POND	10	.445		11.9250	8.16		
POND 10 IN	POND	50	.635		11.9250	11.42		
POND 10 IN	POND	100	.726		11.9250	12.95		

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
POND 10	OUT POND	10	.445		12.2750	.87	846.69	.187
POND 10	OUT POND	50	.635		12.4500	1.00	847.31	.283
POND 10	OUT POND	100	.726		12.4000	1.05	847.59	.330
UC 1	AREA	10	.019		11.9250	.36		
UC 1	AREA	50	.029		11.9250	.55		
UC 1	AREA	100	.034		11.9250	.64		

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Geneva, IN

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 3.7800 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 4.9900 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 5.5600 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110
Hydraulic Length	68.00 ft
2yr, 24hr P	2.6700 in
Slope	.010000 ft/ft
Avg.Velocity	.88 ft/sec

Segment #1 Time: .0214 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	141.00 ft
Slope	.012500 ft/ft
Paved	
Avg.Velocity	2.27 ft/sec

Segment #2 Time: .0172 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	.7854 sq.ft
Wetted Perimeter	3.14 ft
Hydraulic Radius	.25 ft
Slope	.008000 ft/ft
Mannings n	.0110
Hydraulic Length	196.00 ft
Avg.Velocity	4.81 ft/sec

Segment #3 Time: .0113 hrs

==========
Total Tc: .0500 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

==== SCS Channel Flow ==

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	81.00	ft
2yr, 24hr P	2.6700	in
Slope	.015000	ft/ft
Avg.Velocity	1.07	ft/sec

Segment #1 Time: .0210 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	64.00	ft
Slope	.012000	ft/ft
Unpaved		
Avg.Velocity	1.77	ft/sec

Segment #2 Time: .0101 hrs

==========
Total Tc: .0310 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0250	
Hydraulic Length	75.00	ft
2yr, 24hr P	2.6700	in
Slope	.018500	ft/ft
Avg.Velocity	.60	ft/sec

Segment #1 Time: .0849 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	175.00	ft
Slope	.020000	ft/ft
Unpaved		
Avg.Velocity	2.28	ft/sec

Segment #2 Time: .0213 hrs

==========
Total Tc: .0562 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.860			80.00
Impervious Areas - Paved parking lo	98	1.111			98.00
COMPOSITE AREA & WEIGHTED CN --->		1.971			90.15 (90)

SAMPLE

File.... J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainage\Models\Pr

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.474			80.00
COMPOSITE AREA & WEIGHTED CN --->		.474			80.00 (80)

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.122			80.00
COMPOSITE AREA & WEIGHTED CN --->		.122			80.00 (80)

SAMPLE

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
844.50	-----	.0001	.0000	.000	.000
845.00	-----	.0693	.0720	.012	.012
846.00	-----	.1107	.2675	.089	.101
847.00	-----	.1530	.3938	.131	.232
848.00	-----	.1990	.5265	.175	.408
848.50	-----	.2210	.6297	.105	.513

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

SAMPLE

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 844.50 ft
Increment = .10 ft
Max. Elev.= 848.50 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	O0	--->	TW	844.500	848.500
TW SETUP, DS Channel					

SAMPLE

OUTLET STRUCTURE INPUT DATA

Structure ID = O0
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 844.50 ft
Diameter = .4050 ft
Orifice Coeff. = .600

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN 10
Outflow HYG file = work_pad.hyg - POND 10 OUT 10

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	8.16 cfs	at	11.9250 hrs
Peak Outflow	=	.87 cfs	at	12.2750 hrs
Peak Elevation	=	846.69 ft		
Peak Storage	=	.187 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.445
- Infiltration	=	.000
- HYG Vol OUT	=	.445
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.004% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN 50
Outflow HYG file = work_pad.hyg - POND 10 OUT 50

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	11.42 cfs	at	11.9250 hrs
Peak Outflow	=	1.00 cfs	at	12.4500 hrs
Peak Elevation	=	847.31 ft		
Peak Storage	=	.283 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.635
- Infiltration	=	.000
- HYG Vol OUT	=	.635
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN 100
Outflow HYG file = work_pad.hyg - POND 10 OUT 100

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	12.95 cfs	at	11.9250 hrs
Peak Outflow	=	1.05 cfs	at	12.4000 hrs
Peak Elevation	=	847.59 ft		
Peak Storage	=	.330 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.726
- Infiltration	=	.000
- HYG Vol OUT	=	.726
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

SAMPLE

Indiana DOT Model

SAMPLE

Casey's – Geneva, IN

Storm Detention

September 2016
Revised October 2016
Revised December 2016

SAMPLE

==========
JOB TITLE
==========

Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in Geneva, IN

SAMPLE

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SAMPLE

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SAMPLE

Table of Contents (continued)

SAMPLE

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Huff storms Gene

Return Event	Total Depth in	Rainfall Type	RNF ID
Dev 1	1.0800	Synthetic Curve	HUFF 15 MIN
Dev 2	1.5000	Synthetic Curve	HUFF 30 MIN
Dev 21	2.0800	Synthetic Curve	HUFF 30 MIN
Dev 3	1.9000	Synthetic Curve	Huff 60 MIN
Dev 31	2.7800	Synthetic Curve	Huff 60 MIN
Dev 4	2.2500	Synthetic Curve	HUFF 120 MIN
Dev 41	3.3500	Synthetic Curve	HUFF 120 MIN
Dev 5	2.4000	Synthetic Curve	HUFF 180 MIN
Dev 51	3.6200	Synthetic Curve	HUFF 180 MIN
Dev 11	1.4400	Synthetic Curve	HUFF 15 MIN
Dev 6	2.8300	Synthetic Curve	HUFF 6 HR
Dev 61	4.3100	Synthetic Curve	HUFF 6 HR
Dev 7	3.2400	Synthetic Curve	HUFF 12 HR
Dev 71	4.9200	Synthetic Curve	HUFF 12 HR
Dev 8	3.7800	Synthetic Curve	HUFF 24 HR
Dev 81	5.5600	Synthetic Curve	HUFF 24 HR

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AREA 1	AREA	1	.061		.2500	3.28		
AREA 1	AREA	2	.112		.1750	3.83		
AREA 1	AREA	21	.191		.1750	6.95		
AREA 1	AREA	3	.166		.2500	3.40		
AREA 1	AREA	31	.293		.2250	6.68		
AREA 1	AREA	4	.215		.4250	2.63		
AREA 1	AREA	41	.379		.4250	4.91		
AREA 1	AREA	5	.237		.6000	2.02		
AREA 1	AREA	51	.421		.6000	3.77		
AREA 1	AREA	11	.105		.1250	5.50		
AREA 1	AREA	6	.300		2.4000	1.30		
AREA 1	AREA	61	.528		2.4000	2.23		
AREA 1	AREA	7	.362		4.8000	.78		
AREA 1	AREA	71	.624		4.7500	1.31		
AREA 1	AREA	8	.445		9.5000	.48		
AREA 1	AREA	81	.726		9.4250	.75		
AREA 2	AREA	1	.004		.2500	.33		
AREA 2	AREA	2	.011		.5000	.40		
AREA 2	AREA	21	.024		.5000	.73		
AREA 2	AREA	3	.020		.3250	.32		
AREA 2	AREA	31	.043		.3250	.79		
AREA 2	AREA	4	.028		.6000	.27		
AREA 2	AREA	41	.060		.4250	.65		
AREA 2	AREA	5	.032		.9000	.21		
AREA 2	AREA	51	.068		.6250	.53		
AREA 2	AREA	11	.010		.2500	.66		
AREA 2	AREA	6	.044		2.4000	.19		
AREA 2	AREA	61	.091		2.4000	.40		
AREA 2	AREA	7	.057		4.7000	.12		
AREA 2	AREA	71	.112		4.7250	.24		
AREA 2	AREA	8	.074		9.2250	.08		
AREA 2	AREA	81	.134		9.4500	.15		

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*CP 1	JCT	1	.063		.2750	.60		
*CP 1	JCT	2	.115		.5250	.76		
*CP 1	JCT	21	.197		.5000	.99		
*CP 1	JCT	3	.171		1.0000	.82		
*CP 1	JCT	31	.304		1.0000	1.08		
*CP 1	JCT	4	.222		2.0000	.80		
*CP 1	JCT	41	.394		1.9750	1.06		
*CP 1	JCT	5	.245		3.0000	.74		
*CP 1	JCT	51	.438		2.9500	1.01		
*CP 1	JCT	11	.107		.2750	.81		
*CP 1	JCT	6	.312		3.6000	.71		
*CP 1	JCT	61	.551		4.1500	.97		
*CP 1	JCT	7	.377		6.0000	.60		
*CP 1	JCT	71	.653		5.9500	.86		
*CP 1	JCT	8	.464		9.5500	.45		
*CP 1	JCT	81	.760		9.5750	.66		
*CP 2	JCT	1	.004		.2500	.33		
*CP 2	JCT	2	.011		.5000	.40		
*CP 2	JCT	21	.024		.5000	.73		
*CP 2	JCT	3	.020		.3250	.32		
*CP 2	JCT	31	.043		.3250	.79		
*CP 2	JCT	4	.028		.6000	.27		
*CP 2	JCT	41	.060		.4250	.65		
*CP 2	JCT	5	.032		.9000	.21		
*CP 2	JCT	51	.068		.6250	.53		
*CP 2	JCT	11	.010		.2500	.66		
*CP 2	JCT	6	.044		2.4000	.19		
*CP 2	JCT	61	.091		2.4000	.40		
*CP 2	JCT	7	.057		4.7000	.12		
*CP 2	JCT	71	.112		4.7250	.24		
*CP 2	JCT	8	.074		9.2250	.08		
*CP 2	JCT	81	.134		9.4500	.15		

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
POND 10	IN POND	1	.061		.2500	3.28		
POND 10	IN POND	2	.112		.1750	3.83		
POND 10	IN POND	21	.191		.1750	6.95		
POND 10	IN POND	3	.166		.2500	3.40		
POND 10	IN POND	31	.293		.2250	6.68		
POND 10	IN POND	4	.215		.4250	2.63		
POND 10	IN POND	41	.379		.4250	4.91		
POND 10	IN POND	5	.237		.6000	2.02		
POND 10	IN POND	51	.421		.6000	3.77		
POND 10	IN POND	11	.105		.1250	5.50		
POND 10	IN POND	6	.300		2.4000	1.30		
POND 10	IN POND	61	.528		2.4000	2.23		
POND 10	IN POND	7	.362		4.8000	.78		
POND 10	IN POND	71	.624		4.7500	1.31		
POND 10	IN POND	8	.445		9.5000	.48		
POND 10	IN POND	81	.726		9.4250	.75		
POND 10	OUT POND	1	.061		.3250	.55	845.49	.050
POND 10	OUT POND	2	.112		.5750	.67	845.89	.089
POND 10	OUT POND	21	.191		.5750	.83	846.49	.161
POND 10	OUT POND	3	.166		1.0500	.74	846.15	.118
POND 10	OUT POND	31	.293		1.0500	.93	846.98	.230
POND 10	OUT POND	4	.215		2.0000	.74	846.15	.118
POND 10	OUT POND	41	.379		2.0500	.96	847.12	.251
POND 10	OUT POND	5	.237		2.9500	.69	845.96	.097
POND 10	OUT POND	51	.421		3.0000	.94	846.99	.231
POND 10	OUT POND	11	.105		.3500	.68	845.90	.090
POND 10	OUT POND	6	.300		3.5750	.68	845.90	.090
POND 10	OUT POND	61	.528		4.2000	.92	846.91	.218
POND 10	OUT POND	7	.362		5.9500	.57	845.56	.057
POND 10	OUT POND	71	.624		6.0750	.81	846.41	.150
POND 10	OUT POND	8	.445		9.5500	.43	845.18	.025
POND 10	OUT POND	81	.726		9.5750	.62	845.72	.072

SAMPLE

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
UC 1	AREA	1	.001		.2500	.08		
UC 1	AREA	2	.003		.5000	.10		
UC 1	AREA	21	.006		.5000	.19		
UC 1	AREA	3	.005		.3250	.08		
UC 1	AREA	31	.011		.3000	.20		
UC 1	AREA	4	.007		.5750	.07		
UC 1	AREA	41	.015		.4250	.17		
UC 1	AREA	5	.008		.9000	.05		
UC 1	AREA	51	.018		.6000	.13		
UC 1	AREA	11	.003		.2500	.17		
UC 1	AREA	6	.011		2.4000	.05		
UC 1	AREA	61	.023		2.3750	.10		
UC 1	AREA	7	.015		4.5000	.03		
UC 1	AREA	71	.029		4.6500	.06		
UC 1	AREA	8	.019		8.9500	.02		
UC 1	AREA	81	.034		8.8250	.04		

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Dev 1

Data Type, File, ID = Synthetic Storm HUFF 15 MIN
Storm Frequency = 1 yr
Total Rainfall Depth= 1.0800 in
Duration Multiplier = 1
Resulting Duration = .2500 hrs
Resulting Start Time= .0000 hrs Step= .0250 hrs End= .2500 hrs

Storm Tag Name = Dev 2

Data Type, File, ID = Synthetic Storm HUFF 30 MIN
Storm Frequency = 2 yr
Total Rainfall Depth= 1.5000 in
Duration Multiplier = 1
Resulting Duration = .5000 hrs
Resulting Start Time= .0000 hrs Step= .0500 hrs End= .5000 hrs

Storm Tag Name = Dev 21

Data Type, File, ID = Synthetic Storm HUFF 30 MIN
Storm Frequency = 21 yr
Total Rainfall Depth= 2.0800 in
Duration Multiplier = 1
Resulting Duration = .5000 hrs
Resulting Start Time= .0000 hrs Step= .0500 hrs End= .5000 hrs

Storm Tag Name = Dev 3

Data Type, File, ID = Synthetic Storm Huff 60 MIN
Storm Frequency = 3 yr
Total Rainfall Depth= 1.9000 in
Duration Multiplier = 1
Resulting Duration = 1.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 1.0000 hrs

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Dev 31

Data Type, File, ID = Synthetic Storm Huff 60 MIN
Storm Frequency = 31 yr
Total Rainfall Depth= 2.7800 in
Duration Multiplier = 1
Resulting Duration = 1.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 1.0000 hrs

Storm Tag Name = Dev 4

Data Type, File, ID = Synthetic Storm HUFF 120 MIN
Storm Frequency = 4 yr
Total Rainfall Depth= 2.2500 in
Duration Multiplier = 1
Resulting Duration = 2.0000 hrs
Resulting Start Time= .0000 hrs Step= .2000 hrs End= 2.0000 hrs

Storm Tag Name = Dev 41

Data Type, File, ID = Synthetic Storm HUFF 120 MIN
Storm Frequency = 41 yr
Total Rainfall Depth= 3.3500 in
Duration Multiplier = 1
Resulting Duration = 2.0000 hrs
Resulting Start Time= .0000 hrs Step= .2000 hrs End= 2.0000 hrs

Storm Tag Name = Dev 5

Data Type, File, ID = Synthetic Storm HUFF 180 MIN
Storm Frequency = 5 yr
Total Rainfall Depth= 2.4000 in
Duration Multiplier = 1
Resulting Duration = 3.0000 hrs
Resulting Start Time= .0000 hrs Step= .3000 hrs End= 3.0000 hrs

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Dev 51

Data Type, File, ID = Synthetic Storm HUFF 180 MIN
Storm Frequency = 51 yr
Total Rainfall Depth= 3.6200 in
Duration Multiplier = 1
Resulting Duration = 3.0000 hrs
Resulting Start Time= .0000 hrs Step= .3000 hrs End= 3.0000 hrs

Storm Tag Name = Dev 11

Data Type, File, ID = Synthetic Storm HUFF 15 MIN
Storm Frequency = 11 yr
Total Rainfall Depth= 1.4400 in
Duration Multiplier = 1
Resulting Duration = .2500 hrs
Resulting Start Time= .0000 hrs Step= .0250 hrs End= .2500 hrs

Storm Tag Name = Dev 6

Data Type, File, ID = Synthetic Storm HUFF 6 HR
Storm Frequency = 6 yr
Total Rainfall Depth= 2.8300 in
Duration Multiplier = 1
Resulting Duration = 6.0000 hrs
Resulting Start Time= .0000 hrs Step= .6000 hrs End= 6.0000 hrs

Storm Tag Name = Dev 61

Data Type, File, ID = Synthetic Storm HUFF 6 HR
Storm Frequency = 61 yr
Total Rainfall Depth= 4.3100 in
Duration Multiplier = 1
Resulting Duration = 6.0000 hrs
Resulting Start Time= .0000 hrs Step= .6000 hrs End= 6.0000 hrs

SAMPLE

Title... Project Date: 8/23/2016
Project Engineer: iramsay
Project Title: Proposed - Geneva, IN
Project Comments:
Post-Development Conditions for the proposed site in
Geneva, IN

DESIGN STORMS SUMMARY

Design Storm File,ID = Huff storms Gene

Storm Tag Name = Dev 7

Data Type, File, ID = Synthetic Storm HUFF 12 HR
Storm Frequency = 7 yr
Total Rainfall Depth= 3.2400 in
Duration Multiplier = 1
Resulting Duration = 12.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.2000 hrs End= 12.0000 hrs

Storm Tag Name = Dev 71

Data Type, File, ID = Synthetic Storm HUFF 12 HR
Storm Frequency = 71 yr
Total Rainfall Depth= 4.9200 in
Duration Multiplier = 1
Resulting Duration = 12.0000 hrs
Resulting Start Time= .0000 hrs Step= 1.2000 hrs End= 12.0000 hrs

Storm Tag Name = Dev 8

Data Type, File, ID = Synthetic Storm HUFF 24 HR
Storm Frequency = 8 yr
Total Rainfall Depth= 3.7800 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 2.4000 hrs End= 24.0000 hrs

Storm Tag Name = Dev 81

Data Type, File, ID = Synthetic Storm HUFF 24 HR
Storm Frequency = 81 yr
Total Rainfall Depth= 5.5600 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= 2.4000 hrs End= 24.0000 hrs

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110
Hydraulic Length	68.00 ft
2yr, 24hr P	2.6700 in
Slope	.010000 ft/ft
Avg.Velocity	.88 ft/sec

Segment #1 Time: .0214 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	141.00 ft
Slope	.012500 ft/ft
Paved	
Avg.Velocity	2.27 ft/sec

Segment #2 Time: .0172 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	.7854 sq.ft
Wetted Perimeter	3.14 ft
Hydraulic Radius	.25 ft
Slope	.008000 ft/ft
Mannings n	.0110
Hydraulic Length	196.00 ft
Avg.Velocity	4.81 ft/sec

Segment #3 Time: .0113 hrs

==========
Total Tc: .0500 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

==== SCS Channel Flow ==

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	81.00	ft
2yr, 24hr P	2.6700	in
Slope	.015000	ft/ft
Avg.Velocity	1.07	ft/sec

Segment #1 Time: .0210 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	64.00	ft
Slope	.012000	ft/ft
Unpaved		
Avg.Velocity	1.77	ft/sec

Segment #2 Time: .0101 hrs

==========
Total Tc: .0310 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0250	
Hydraulic Length	75.00	ft
2yr, 24hr P	2.6700	in
Slope	.018500	ft/ft
Avg.Velocity	.60	ft/sec

Segment #1 Time: .0349 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	175.00	ft
Slope	.020000	ft/ft
Unpaved		
Avg.Velocity	2.28	ft/sec

Segment #2 Time: .0213 hrs

==========
Total Tc: .0562 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

SAMPLE

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.860			80.00
Impervious Areas - Paved parking lo	98	1.111			98.00
COMPOSITE AREA & WEIGHTED CN --->		1.971			90.15 (90)

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.474			80.00
COMPOSITE AREA & WEIGHTED CN --->		.474			80.00 (80)

SAMPLE

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open space (Lawns,parks etc.) - Goo	80	.122			80.00
COMPOSITE AREA & WEIGHTED CN --->		.122			80.00 (80)

SAMPLE

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
844.50	-----	.0001	.0000	.000	.000
845.00	-----	.0693	.0720	.012	.012
846.00	-----	.1107	.2675	.089	.101
847.00	-----	.1530	.3938	.131	.232
848.00	-----	.1990	.5265	.175	.408
848.50	-----	.2210	.6297	.105	.513

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

SAMPLE

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 844.50 ft
Increment = .10 ft
Max. Elev.= 848.50 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	O0	--->	TW	844.500	848.500

TW SETUP, DS Channel

SAMPLE

OUTLET STRUCTURE INPUT DATA

Structure ID = O0
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 844.50 ft
Diameter = .4050 ft
Orifice Coeff. = .600

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 1
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 1

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	3.28 cfs	at	.2500 hrs
Peak Outflow	=	.55 cfs	at	.3250 hrs
Peak Elevation	=	845.49 ft		
Peak Storage	=	.050 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.061
- Infiltration	=	.000
- HYG Vol OUT	=	.061
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.023% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 2
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 2

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	3.83 cfs	at	.1750 hrs
Peak Outflow	=	.67 cfs	at	.5750 hrs
Peak Elevation	=	845.89 ft		
Peak Storage	=	.089 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.112
- Infiltration	=	.000
- HYG Vol OUT	=	.112
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.013% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 3
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 3

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	3.40 cfs	at	.2500 hrs
Peak Outflow	=	.74 cfs	at	1.0500 hrs
Peak Elevation	=	846.15 ft		
Peak Storage	=	.118 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.166
- Infiltration	=	.000
- HYG Vol OUT	=	.166
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.009% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 4
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 4

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	2.63 cfs	at	.4250 hrs
Peak Outflow	=	.75 cfs	at	2.0000 hrs
Peak Elevation	=	846.15 ft		
Peak Storage	=	.118 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.215
- Infiltration	=	.000
- HYG Vol OUT	=	.215
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.008% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 5
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 5

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	2.02 cfs	at	.6000 hrs
Peak Outflow	=	.70 cfs	at	2.9500 hrs
Peak Elevation	=	845.96 ft		
Peak Storage	=	.097 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.237
- Infiltration	=	.000
- HYG Vol OUT	=	.237
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.006% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 6
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 6

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	1.30 cfs	at	2.4000 hrs
Peak Outflow	=	.68 cfs	at	3.5750 hrs
Peak Elevation	=	845.90 ft		
Peak Storage	=	.090 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.300
- Infiltration	=	.000
- HYG Vol OUT	=	.300
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.005% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 7
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 7

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	.78 cfs	at	4.8000 hrs
Peak Outflow	=	.58 cfs	at	5.9500 hrs
Peak Elevation	=	845.56 ft		
Peak Storage	=	.057 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.362
- Infiltration	=	.000
- HYG Vol OUT	=	.362
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.004% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 8
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 8

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	.48 cfs	at	9.5000 hrs
Peak Outflow	=	.43 cfs	at	9.5500 hrs
Peak Elevation	=	845.18 ft		
Peak Storage	=	.025 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.445
- Infiltration	=	.000
- HYG Vol OUT	=	.445
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.004% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 11
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 11

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	5.50 cfs	at	.1250 hrs
Peak Outflow	=	.68 cfs	at	.3500 hrs
Peak Elevation	=	845.90 ft		
Peak Storage	=	.090 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.105
- Infiltration	=	.000
- HYG Vol OUT	=	.105
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.016% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 21
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 21

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	6.95 cfs	at	.1750 hrs
Peak Outflow	=	.83 cfs	at	.5750 hrs
Peak Elevation	=	846.49 ft		
Peak Storage	=	.161 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.191
- Infiltration	=	.000
- HYG Vol OUT	=	.191
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.008% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 31
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 31

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	6.68 cfs	at	.2250 hrs
Peak Outflow	=	.94 cfs	at	1.0500 hrs
Peak Elevation	=	846.98 ft		
Peak Storage	=	.230 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.293
- Infiltration	=	.000
- HYG Vol OUT	=	.293
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.006% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 41
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 41

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	4.91 cfs	at	.4250 hrs
Peak Outflow	=	.96 cfs	at	2.0500 hrs
Peak Elevation	=	847.12 ft		
Peak Storage	=	.251 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.379
- Infiltration	=	.000
- HYG Vol OUT	=	.379
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.004% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 51
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 51

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	3.77 cfs	at	.6000 hrs
Peak Outflow	=	.94 cfs	at	3.0000 hrs
Peak Elevation	=	846.99 ft		
Peak Storage	=	.231 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.421
- Infiltration	=	.000
- HYG Vol OUT	=	.421
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.004% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 61
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 61

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	2.23 cfs	at	2.4000 hrs
Peak Outflow	=	.92 cfs	at	4.2000 hrs
Peak Elevation	=	846.91 ft		
Peak Storage	=	.218 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.528
- Infiltration	=	.000
- HYG Vol OUT	=	.528
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.003% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 71
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 71

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	1.31 cfs	at	4.7500 hrs
Peak Outflow	=	.81 cfs	at	6.0750 hrs
Peak Elevation	=	846.41 ft		
Peak Storage	=	.150 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.624
- Infiltration	=	.000
- HYG Vol OUT	=	.624
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

SAMPLE

LEVEL POOL ROUTING SUMMARY

HYG Dir = J:\2016\0160615.01 - Caseys Geneva Indiana-Surveying\06_Design\Drainag
Inflow HYG file = work_pad.hyg - POND 10 IN Dev 81
Outflow HYG file = work_pad.hyg - POND 10 OUT Dev 81

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	844.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	.75 cfs	at	9.4250 hrs
Peak Outflow	=	.63 cfs	at	9.5750 hrs
Peak Elevation	=	845.72 ft		
Peak Storage	=	.072 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	.726
- Infiltration	=	.000
- HYG Vol OUT	=	.726
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

SAMPLE