Drainage Design Report

for

Franklin Animal Clinic

Franklin, Indiana

Prepared for:
Alderson Commercial Group
425 West South Street, Suite 100
Indianapolis, IN 46225

October 7, 2021

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DRAINAGE DESIGN REPORT FOR FRANKLIN ANIMAL CLINIC

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APPENDICIES

1.0 Introduction

This report addresses Stormwater Management systems associated The Franklin Animal Clinic development located at 2990 North Morton Street in Franklin, Indiana. This report is a supplement to the May 2006 *Animal House Drainage Report* by *Steven B Williams.* The on-site stormwater system design is regulated by the City of Franklin and is subject to design requirements of the 2005 *City of Franklin Subdivision Control Ordinance*.

2.0 Detailed Site Narrative

2.1 General Description

The 2.94-acre project parcel is on the west side of North Morton Street at the International Drive and North Morton Street intersection. The site is currently operating as an animal care clinic and contains an existing building, asphalt drives, and asphalt parking lot.

This project will include an expansion to the building and parking facilities, as well as utility service lines including storm water systems.

Existing zoning designations on the site and adjacent properties are as follows:

Existing Site: MXC: Mixed Use – Community Center
North: MXC: Mixed Use – Community Center
South: MXC: Mixed Use – Community Center
East: IG: Industrial - General
West: MXC: Mixed Use – Community Center

The proposed stormwater system, design, construction, and management will address current Franklin requirements per the 2005 *City of Franklin Subdivision Control Ordinance.*

This report describes both the pre and post construction stormwater systems including design calculations for a new storm sewer pipe network, detained stormwater runoff, and post development stormwater quality BMPs.

2.2 Existing Conditions

The 2.94-acre project parcel has an existing building and asphalt parking lot. Storm runoff is divided into 3 distinct areas within the site:

- The **Existing Undeveloped** area includes approximately the south half of the site. It is essentially a grass field that sheet drains east to the right-of-way ditch along US Highway 31.

- The **Existing Detained Area North** includes the building, a small portion of the parking lot, and the grass area north and west of the building. This area drains to a swale on the north side of the building that serves as detention. The outlet of the swale is controlled by a 12” RCP culvert with 4" orifice running under the sidewalk along US Highway 31.
- The **Existing Detained Area South** includes the majority of the parking lot and the grass area immediately south of the parking lot. This area drains to a swale on the south side of the parking lot that serves as detention. The outlet of the swale is controlled by a 12” RCP culvert with 4" orifice running under the sidewalk along US Highway 31.

For more information on the existing conditions refer to Appendix A. For more detailed information on the existing on-site detention see Appendix E.

SOILS

According to the USDA web soil survey website, hydrologic soil **groups B and C** are present in the project limits. Refer to Figure 2.2.1 for the soil map and classification. Refer to Appendix A for the existing conditions watershed limits and the drainage calculations.

Figure 2.2.1 Soils Map

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UbaA	Urban land-Brookston complex, 0 to 2 percent slopes	0.0	0.4%
UcfA	Urban land-Crosby silt loam complex, fine-loamy subsoil, 0 to 2 percent slopes	0.1	2.6%
YbvA	Brookston silty clay loam-Urban land complex, 0 to 2 percent slopes	0.8	24.4%
YclA	Crosby silt loam, fine-loamy subsoil-Urban land complex, 0 to 2 percent slopes	2.3	72.6%
Totals for Area of Interest		**3.2**	**100.0%**

Based on the Flood Insurance Rate Map Number 18081C0139E, the project area of the site is located within Zone X, which is the area determined to be outside of the 0.2% annual chance of floodplain. Refer to figure 2.2.2.

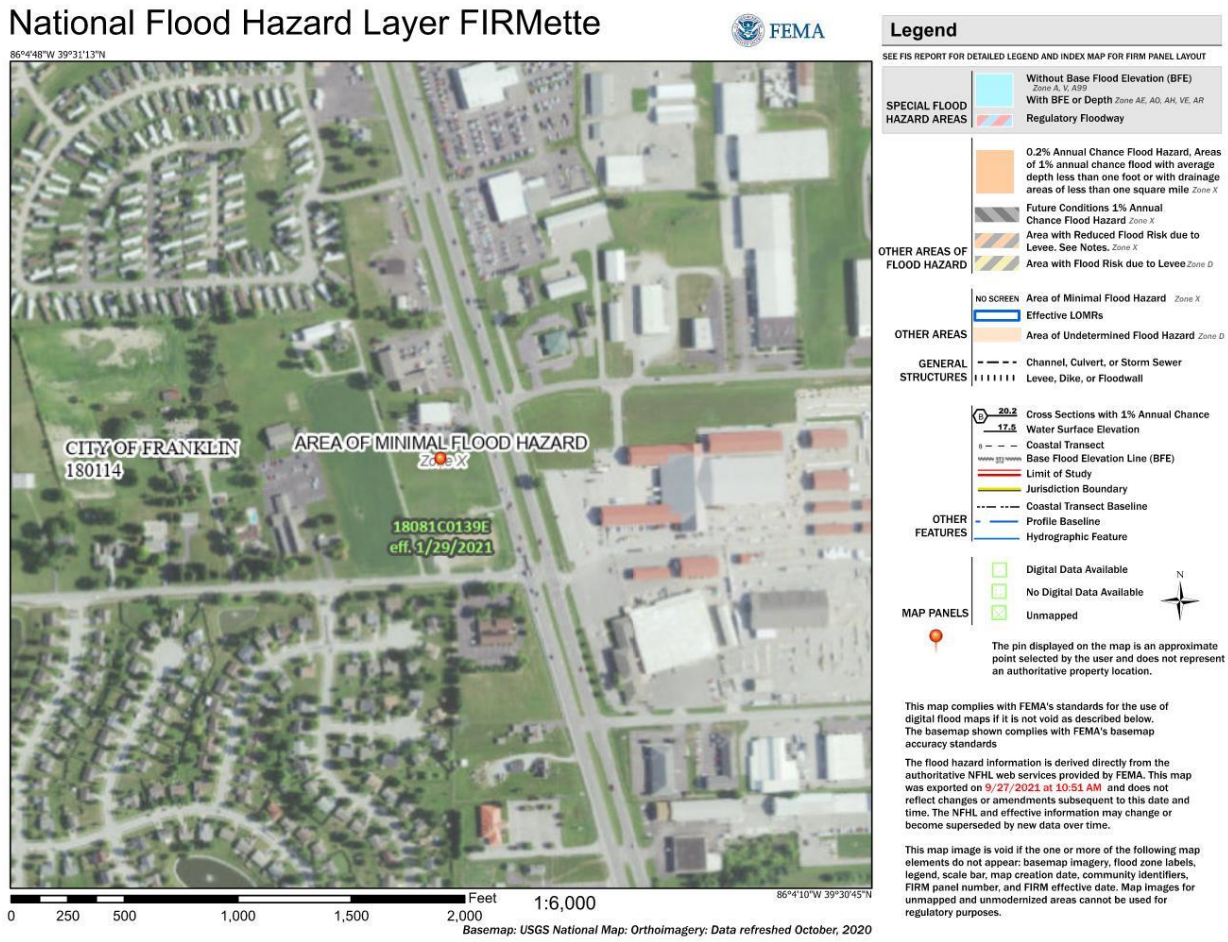


Figure 2.2.2 Flood Insurance Rate Map (FIRM)

2.3 Proposed Conditions

The proposed project will include an expansion to the building and parking facilities, as well as utility service lines including storm water systems. Storm runoff is divided into 3 distinct areas within the site:

- The **Proposed Detained Area** includes the majority of the site. It contains the building addition, the area of pavement south of the building addition, and the parking expansion. Drainage in this area is collected via a network of storm inlets and pervious pavers and outlets to a dry detention pond. The pond outlet is regulated by an outlet control structure using a 6-inch orifice and weir wall, and discharges to the right-of-way ditch along US Highway 31.
- The **Detained Area North** includes the existing building, a small portion of the parking lot, and the grass area north and west of the building. This area has been reduced from the existing condition by *0.09 acres*, including an impervious area reduction of 0.05 acres. This area drains to a swale on the north side of the building that serves as detention. The outlet of the swale is controlled by a 12" RCP culvert with 4" orifice running under the sidewalk along US Highway 31.
- The **Detained Area South** includes the majority of the parking lot and the grass area immediately south of the parking lot. This area has been reduced from the existing condition by *0.16 acres*, including an impervious area reduction of 0.12 acres. This area drains to a swale on the south side of the parking lot that serves as detention. The outlet of the swale is controlled by a 12" RCP culvert with 4" orifice running under the sidewalk along US Highway 31.

See Appendix B for more information regarding the proposed conditions.

3.0 Hydrologic Methods

The method used to generate watershed runoff and establish the peak flows that meet Franklin requirements is the SCS unit hydrograph method. Factors used with this method are watershed basin areas, the weighted curve number (CN), and the times of concentration (Tc). Weighted curve number and TC calculations are as follows:

- Existing and Proposed TC and CN calculations for basins with weighted curve numbers and/or TC numbers greater than 5 minutes are provided in the HydroCAD 10.10-4b model reports.

The Rational Method is used to size storm sewer pipes and structures that convey storm water to the outlet nodes at the detention basin or project outlet. Storm Sewer Calculations can be found in **Appendix C**. The factors used in these calculations include the storm sewer basins area, (A), the runoff coefficient, (C), and the rainfall

intensity for 10 and 100-year Storm, (i). The IDF table from the NOAA Atlas 14 was used in determining the maximum runoff generated. The runoff coefficient, C, is determined by the location of the site and surface conditions: pervious and impervious areas.

3.1 Rainfall Distribution

The SCS Type-II Rainfall Distribution was used to calculate the storm water runoff for both the existing and proposed conditions for the site.

3.2 Software

HydroCAD 10.10-4b, a hydraulic modeling program, is used to determine the peak flows and volumes using the SCS Unit Hydrograph Method. HydroCAD generates an individual hydrograph for each basin. The hydrographs are then added to generate runoff flows for ponds or to specific points of interest.

Hydraflow Storm Sewers Extension for AutoCAD Civil 3D has been used to size all onsite storm pipes for the 10-year event peak flows. Hydraflow utilizes a graphical pipe network containing pipe data, inlet characteristics, watershed areas, and rainfall information. The calculations are based on the rational method. Factors involved include runoff coefficient (C), time of concentration (Tc) and Area (A).

See **Appendix C** for storm Sewer Calculations.

4.0 Existing Drainage Analysis

The existing drainage analysis is based on existing conditions at the project site. Due to the presence of hydrologic soil groups B and C, curve numbers (CN) 61 and 74 were used, respectively, in pervious cover areas, and CN 98 in impervious paved areas. Based on these CN values a weighted curve Number is calculated by HydroCAD and shown in model reports located in **Appendix A**. Time of Concentration (Tc) and Curve Number (CN) calculations are included with the HydroCAD reports.

Refer to **Appendix A** for a breakdown of existing conditions watersheds and calculations. The purpose of the existing conditions drainage model is to accommodate a comparison between existing and proposed conditions. Table 4.1 below is a summary of the HydroCAD pre-construction calculation results illustrating existing discharge rates.

Table 4.1. Existing Drainage Analysis Summary

	2yr	10yr	100yr
Detained Area North and South	-	0.95 cfs*	1.45 cfs*
Existing Undeveloped	1.43 cfs	3.02 cfs	5.92 cfs

**Values obtained from previously approved May 2006 Report. See Appendix E for more information*

Per the design requirements of the *2005 City of Franklin Subdivision Control Ordinance* the allowed release rates for the proposed condition are as follows in Table 4.2:

Table 4.2. Allowed Release Rates

	10yr	100yr
Proposed Detained Area	1.43 cfs	3.02 cfs

5.0 Proposed Drainage Analysis and Detention System

The proposed drainage analysis is based on post development site conditions described earlier in this report. The new dry detention pond is included in the model.

Like the existing conditions drainage calculations, Time of Concentration (Tc) and Curve Number (CN) calculations are included with the HydroCAD reports. See **Appendix B** for a breakdown of the proposed watersheds and calculations. Table 5.1 is a summary the HydroCAD model calculations.

Table 5.1. Proposed Release Rates

	10yr	100yr
Detained Area North and South	0.95 cfs*	1.45 cfs*
Proposed Detained Area	1.37 cfs	2.97cfs

**Values obtained from May 2006 report. Values will be reduced since contributing watersheds have been reduced. See Appendix E for more information*

A dry detention pond achieves the required release rates from the overall site. A control structure (Structure 700A) at the pond outlet restricts stormwater release rates that reach the existing roadside swale. A 6-inch diameter orifice will be set at elevation 768.15 and an overflow weir will be set at elevation 771.05 within the outlet structure.

Table 5.2. Spillway Analysis

Peak Det. Elevation 100yr	Peak 100-year Inflow
771.27	11.62 cfs

Based on the 100-year storm water surface elevation of **771.27** in the dry detention pond, the emergency spillway elevation has been set at **772.17**. Thus, the detention volume is adequate. Refer to **Appendix B** for more information on the detention system.

Peak 100-year inflow into the detention system is 11.62 cfs. Thus, the spillway must be able to handle the following flow rate:

11.62 cfs * 1.25 = **14.53 cfs**

Refer to **Appendix E** for detention and spillway calculations for situations in which detained storm water elevations exceeds the 100-year storm water surface elevation.

6.0 Comparison of Pre- and Post-Development Peak Discharge

All post development storm sewer flow from this site will drain to the existing right-of-way ditch along US Highway 31.

Table 6.1. Existing and Proposed Storm Runoff Discharge Rate Comparison

Release Rates to 72-Inch CMP			
Rainfall Event	Existing Conditions (cfs)	**Allowed (csf)**	**Proposed Conditions (cfs)**
10-yr	3.02	**1.43**	**1.37**
100-yr	5.92	**3.02**	**2.99**

7.0 Conclusions

The proposed release rates are below the allowed release rates. Therefore, the downstream system can be deemed adequate for proposed flows. In conclusion, the proposed project will not have adverse effects to downstream storm systems or water quality.

Appendix A

Existing Drainage Exhibit and Calculations

HERMAN A. BRIGGEMAN CREDIT TRUST PROPERTY (INSTR. # 2004-003657)

5/8-INCH DIAMETER REBAR W/ CAP STAMPED "FECO"

WEST 290.4' (D) S 87°31'30" W 292.47' (M)

ZBS FRANKLIN REAL ESTATE, LLC PROPERTY (INSTR. # 2017-020940) PARCEL 1:

TWO-STORY MASONRY BUILDING (7,245.5 SQ. FT.) FF. ELEV. = 773.23

UTILITY EASEMENT & RIGHT-OF-WAY (INSTR. 2007011167)

SOUTHEAST 150.0' (D) S 16°05'49" E 150.00' (M)

NORTH 150.0' (D) N 16°05'49" W 150.00' (M)

0.23 ACRES ± (9,959.9 SQ. FT.)

EAST 290.4' (D) N 87°31'30" E 292.47' (M)

EAST 290.40' (D)

ZBS FRANKLIN REAL ESTATE, LLC PROPERTY (INSTR. # 2017-020940)

N 13°38'23" W 35.04' (D) N 16°05'49" W 35.04' (M)

0.23 ACRES ± (9,959.9 SQ. FT.)

WEST 290.40' (D) S 87°31'30" W 292.47' (M)

5/8-INCH DIAMETER REBAR W/ CAP STAMPED "SEA GROUP" POINT OF BEGINNING: INSTR. # 2017-020940, PARCEL 2 DEED EXCEPT INSTR. # 2018-000657

SANITARY MANHOLE TC = 772.79 INV 8" PVC N = 763.74 INV 8" PVC S = 763.69

15' SANITARY SEWER EASEMENT (DR. 256, PG. 839)

NORTH 300.0' (D) N 16°05'49" W 300.00' (M)

N 16°05'49" W 264.96' (M)

30' INGRESS/EGRESS EASEMENT (INSTR. 2007011167)

GRAVEL DRIVEWAY

MARCIA PAULINE JAMES & ROBERT JOHN JAMES PROPERTY (INSTR. # 2005-010396)

ZBS FRANKLIN REAL ESTATE II, LLC PROPERTY (INSTR. # 2018-000657)

1.73 ACRES ± (75,313.0 SQ. FT.)

SOUTHEAST 300' (D) S 16°05'49" E 300.00' (M)

S 16°05'49" E 264.96' (M)

US HIGHWAY 31 (SOUTHBOUND)

US HIGHWAY 31 (NORTHBOUND)

5/8-INCH DIAMETER REBAR (FOUND)

FIRST FINANCIAL BANK

FIRST FINANCIAL BANK

EXISTING DETAINED AREA NORTH: 0.56 AC
GROUP B PERVIOUS: 0.22 AC
GROUP C PERVIOUS: 0.07 AC
IMPERVIOUS: 0.26 AC

12" RCP CULVERT FOR SWALE OUTLET CONTROL IE = 769.90

EXISTING DETAINED AREA SOUTH: 0.50 AC
GROUP B PERVIOUS: 0.08 AC
GROUP C PERVIOUS: 0.08 AC
IMPERVIOUS: 0.34 AC

12" RCP CULVERT FOR SWALE OUTLET CONTROL IE = 770.05

SOUTHEAST 38.04' (D) S 16°05'49" E 38.04' (M)

5/8-INCH DIAMETER

EXISTING UNDEVELOPED: 1.47 AC
GROUP C PERVIOUS: 1.41 AC
IMPERVIOUS: 0.05 AC

0 30 60 120
15 45 90
SCALE: 1"=60'

EXHIBIT LEGEND

BASIN LINE

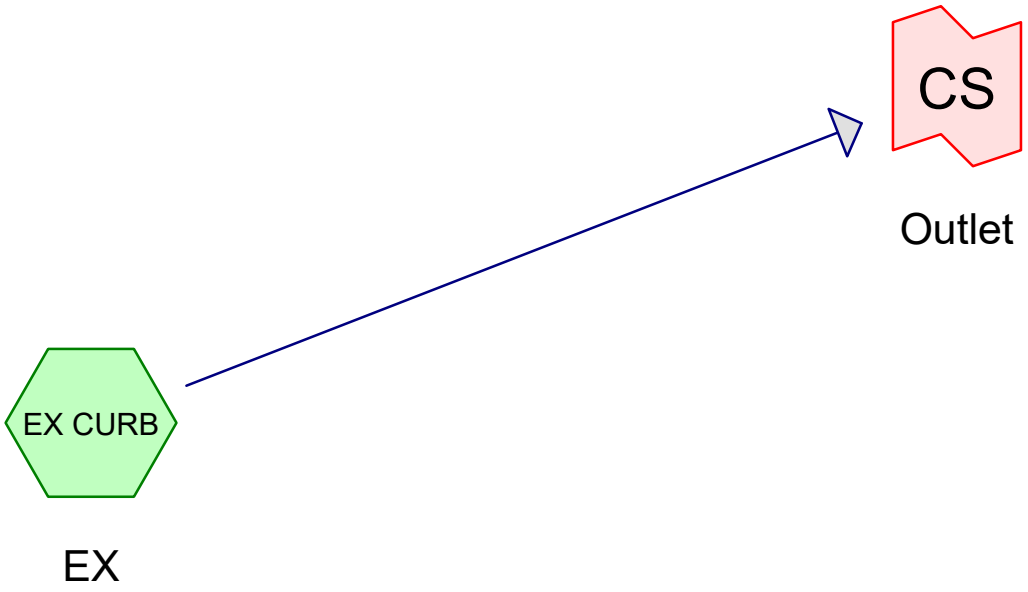
TIME OF CONCENTRATION

TITLE: EXISTING CONDITIONS BASIN MAP	PROJECT: FRANKLIN ANIMAL CLINIC OWNER: FRANKLIN ANIMAL CLINIC 2990 NORTH MORTON STREET FRANKLIN, INDIANA	Cripe Solutions by Design Since 1937	3939 PRIORITY WAY SOUTH DRIVE, SUITE 200 INDIANAPOLIS, INDIANA 46240 (317) 844-6777 www.cripe.biz ● ARCHITECTURE + INTERIORS ● CIVIL ENGINEERING ● SURVEY +3D LASER SCANNING ● ENERGY + FACILITIES ● EQUIPMENT PLANNING ● REAL ESTATE SERVICES	SCALE: 1" = 60' PROJECT NO: 210092-20000 Date: 10-06-2021	SHEET No. 1 of 1

Events for Subcatchment EX CURB: EX

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-Year 6 hour	2.05	0.75	0.036	0.31
2-Year 12 hour	2.44	1.05	0.057	0.50
2-Year 24 hour	2.92	1.43	0.088	0.76
10-Year 6 hour	3.03	2.27	0.095	0.83
10-Year 12 hour	3.53	2.66	0.131	1.14
10-Year 24 hour	4.09	3.02	0.175	1.52
100-Year 6 hour	4.77	5.76	0.233	2.02
100-Year 12 hour	5.36	**5.92**	0.285	2.48
100-Year 24 hour	**5.89**	5.83	**0.334**	**2.90**

10yr POST = 2yr PRE = **1.43cfs**
100yr POST = 10yr PRE = **3.02cfs**



Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by Cripe, Printed 10/6/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year 24 hour	Type II 24-hr		Default	24.00	1	2.92	2
2	10-Year 24 hour	Type II 24-hr		Default	24.00	1	4.09	2
3	100-Year 12 hour	Type II 12-hr		Default	12.00	1	5.36	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.330	61	>75% Grass cover, Good, HSG B (EX CURB)
1.000	74	>75% Grass cover, Good, HSG C (EX CURB)
0.050	98	Paved parking, HSG B (EX CURB)
1.380	**72**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.380	HSG B	EX CURB
1.000	HSG C	EX CURB
0.000	HSG D	
0.000	Other	
1.380		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.330	1.000	0.000	0.000	1.330	>75% Grass cover, Good	EX CURB
0.000	0.050	0.000	0.000	0.000	0.050	Paved parking	EX CURB
0.000	**0.380**	**1.000**	**0.000**	**0.000**	**1.380**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX CURB: EX Runoff Area=1.380 ac 3.62% Impervious Runoff Depth=0.76"
Flow Length=386' Tc=11.6 min CN=72 Runoff=1.43 cfs 0.088 af

Link CS: Outlet Inflow=1.43 cfs 0.088 af
Primary=1.43 cfs 0.088 af

Total Runoff Area = 1.380 ac Runoff Volume = 0.088 af Average Runoff Depth = 0.76"
96.38% Pervious = 1.330 ac 3.62% Impervious = 0.050 ac

Summary for Subcatchment EX CURB: EX

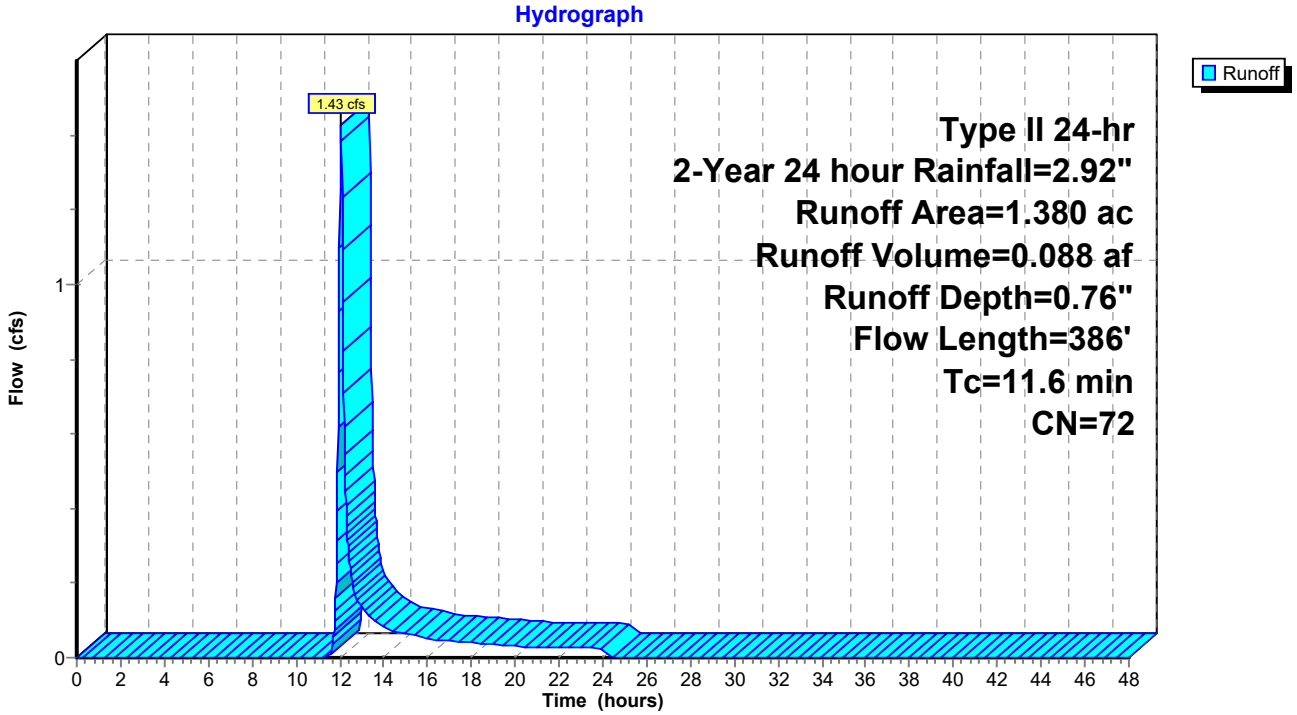
Runoff = 1.43 cfs @ 12.05 hrs, Volume= 0.088 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-Year 24 hour Rainfall=2.92"

Area (ac)	CN	Description
0.050	98	Paved parking, HSG B
1.000	74	>75% Grass cover, Good, HSG C
0.330	61	>75% Grass cover, Good, HSG B
1.380	72	Weighted Average
1.330		96.38% Pervious Area
0.050		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.22		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.66"
4.2	286	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
11.6	386	Total			

Subcatchment EX CURB: EX



Hydrograph for Subcatchment EX CURB: EX

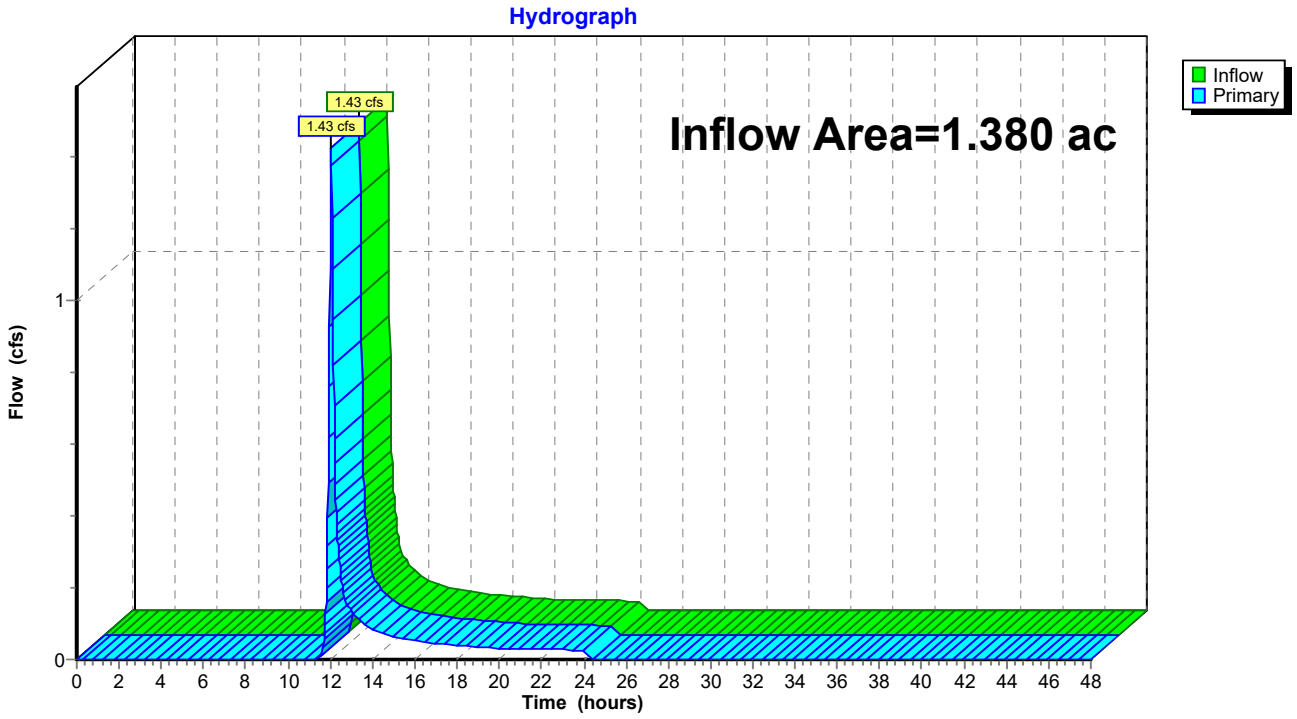
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.00	0.00
6.00	0.23	0.00	0.00
7.00	0.29	0.00	0.00
8.00	0.35	0.00	0.00
9.00	0.43	0.00	0.00
10.00	0.53	0.00	0.00
11.00	0.69	0.00	0.00
12.00	1.94	0.27	**1.25**
13.00	2.25	0.41	**0.13**
14.00	2.39	0.47	0.08
15.00	2.49	0.52	0.07
16.00	2.57	0.57	0.05
17.00	2.63	0.60	0.05
18.00	2.69	0.63	0.04
19.00	2.74	0.66	0.04
20.00	2.78	0.68	0.03
21.00	2.82	0.70	0.03
22.00	2.85	0.72	0.03
23.00	2.89	0.74	0.03
24.00	**2.92**	**0.76**	0.03
25.00	2.92	0.76	0.00
26.00	2.92	0.76	0.00
27.00	2.92	0.76	0.00
28.00	2.92	0.76	0.00
29.00	2.92	0.76	0.00
30.00	2.92	0.76	0.00
31.00	2.92	0.76	0.00
32.00	2.92	0.76	0.00
33.00	2.92	0.76	0.00
34.00	2.92	0.76	0.00
35.00	2.92	0.76	0.00
36.00	2.92	0.76	0.00
37.00	2.92	0.76	0.00
38.00	2.92	0.76	0.00
39.00	2.92	0.76	0.00
40.00	2.92	0.76	0.00
41.00	2.92	0.76	0.00
42.00	2.92	0.76	0.00
43.00	2.92	0.76	0.00
44.00	2.92	0.76	0.00
45.00	2.92	0.76	0.00
46.00	2.92	0.76	0.00
47.00	2.92	0.76	0.00
48.00	2.92	0.76	0.00

Summary for Link CS: Outlet

Inflow Area = 1.380 ac, 3.62% Impervious, Inflow Depth = 0.76" for 2-Year 24 hour event
Inflow = 1.43 cfs @ 12.05 hrs, Volume= 0.088 af
Primary = 1.43 cfs @ 12.05 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Link CS: Outlet



Hydrograph for Link CS: Outlet

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
1.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00
12.00	**1.25**	0.00	**1.25**
13.00	**0.13**	0.00	**0.13**
14.00	0.08	0.00	0.08
15.00	0.07	0.00	0.07
16.00	0.05	0.00	0.05
17.00	0.05	0.00	0.05
18.00	0.04	0.00	0.04
19.00	0.04	0.00	0.04
20.00	0.03	0.00	0.03
21.00	0.03	0.00	0.03
22.00	0.03	0.00	0.03
23.00	0.03	0.00	0.03
24.00	0.03	0.00	0.03
25.00	0.00	0.00	0.00
26.00	0.00	0.00	0.00
27.00	0.00	0.00	0.00
28.00	0.00	0.00	0.00
29.00	0.00	0.00	0.00
30.00	0.00	0.00	0.00
31.00	0.00	0.00	0.00
32.00	0.00	0.00	0.00
33.00	0.00	0.00	0.00
34.00	0.00	0.00	0.00
35.00	0.00	0.00	0.00
36.00	0.00	0.00	0.00
37.00	0.00	0.00	0.00
38.00	0.00	0.00	0.00
39.00	0.00	0.00	0.00
40.00	0.00	0.00	0.00
41.00	0.00	0.00	0.00
42.00	0.00	0.00	0.00
43.00	0.00	0.00	0.00
44.00	0.00	0.00	0.00
45.00	0.00	0.00	0.00
46.00	0.00	0.00	0.00
47.00	0.00	0.00	0.00
48.00	0.00	0.00	0.00

Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentEX CURB: EX Runoff Area=1.380 ac 3.62% Impervious Runoff Depth=1.52"
Flow Length=386' Tc=11.6 min CN=72 Runoff=3.02 cfs 0.175 af

Link CS: Outlet Inflow=3.02 cfs 0.175 af
Primary=3.02 cfs 0.175 af

Total Runoff Area = 1.380 ac Runoff Volume = 0.175 af Average Runoff Depth = 1.52"
96.38% Pervious = 1.330 ac 3.62% Impervious = 0.050 ac

Summary for Subcatchment EX CURB: EX

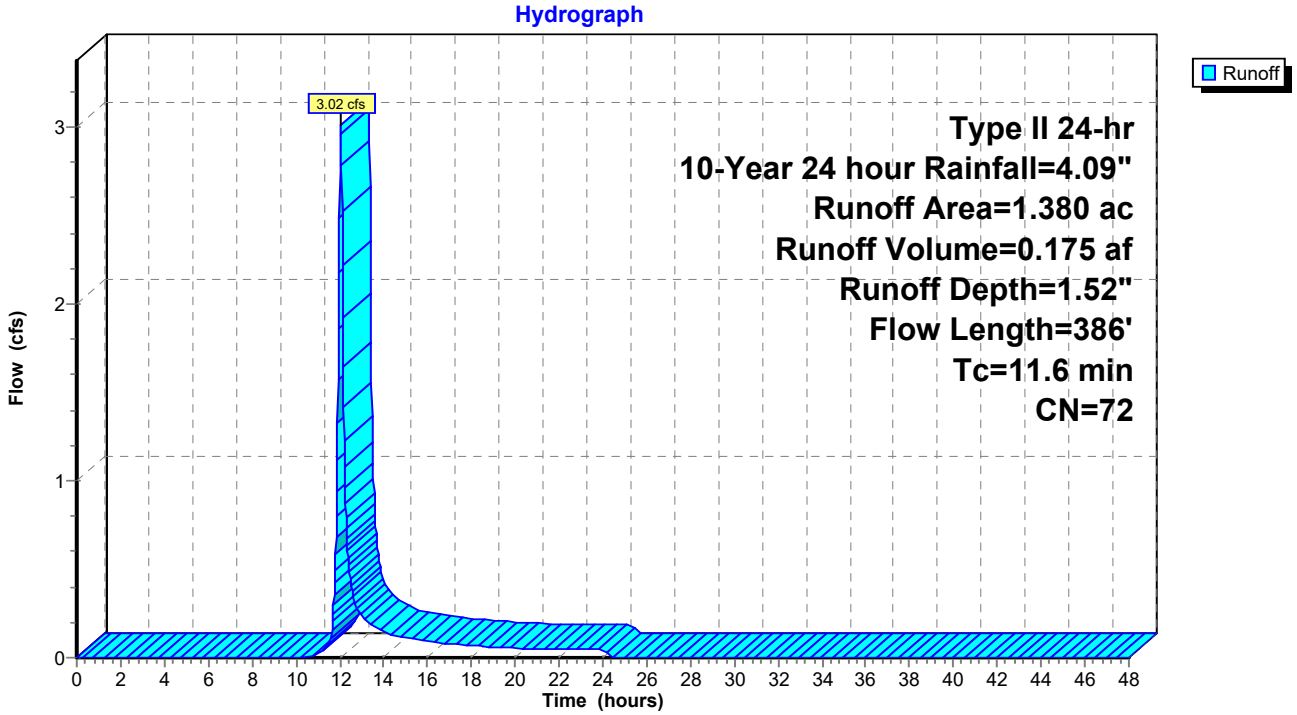
Runoff = 3.02 cfs @ 12.04 hrs, Volume= 0.175 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-Year 24 hour Rainfall=4.09"

Area (ac)	CN	Description
0.050	98	Paved parking, HSG B
1.000	74	>75% Grass cover, Good, HSG C
0.330	61	>75% Grass cover, Good, HSG B
1.380	72	Weighted Average
1.330		96.38% Pervious Area
0.050		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.22		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.66"
4.2	286	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
11.6	386	Total			

Subcatchment EX CURB: EX



Hydrograph for Subcatchment EX CURB: EX

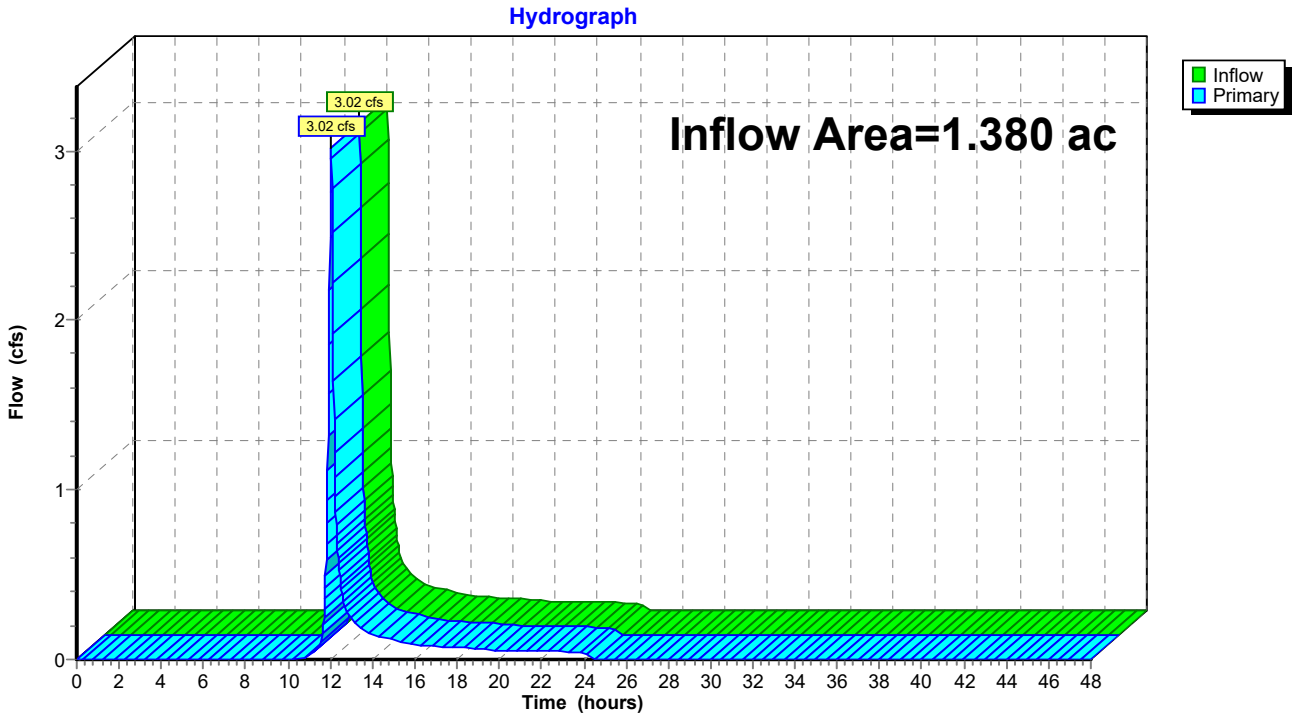
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.04	0.00	0.00
2.00	0.09	0.00	0.00
3.00	0.14	0.00	0.00
4.00	0.20	0.00	0.00
5.00	0.26	0.00	0.00
6.00	0.33	0.00	0.00
7.00	0.40	0.00	0.00
8.00	0.49	0.00	0.00
9.00	0.60	0.00	0.00
10.00	0.74	0.00	0.00
11.00	0.96	0.01	0.02
12.00	2.71	0.64	**2.76**
13.00	3.16	0.90	**0.24**
14.00	3.35	1.03	0.15
15.00	3.49	1.11	0.12
16.00	3.60	1.19	0.09
17.00	3.69	1.25	0.08
18.00	3.77	1.30	0.07
19.00	3.84	1.35	0.06
20.00	3.89	1.39	0.05
21.00	3.95	1.42	0.05
22.00	4.00	1.46	0.05
23.00	4.04	1.49	0.05
24.00	**4.09**	**1.52**	0.04
25.00	4.09	1.52	0.00
26.00	4.09	1.52	0.00
27.00	4.09	1.52	0.00
28.00	4.09	1.52	0.00
29.00	4.09	1.52	0.00
30.00	4.09	1.52	0.00
31.00	4.09	1.52	0.00
32.00	4.09	1.52	0.00
33.00	4.09	1.52	0.00
34.00	4.09	1.52	0.00
35.00	4.09	1.52	0.00
36.00	4.09	1.52	0.00
37.00	4.09	1.52	0.00
38.00	4.09	1.52	0.00
39.00	4.09	1.52	0.00
40.00	4.09	1.52	0.00
41.00	4.09	1.52	0.00
42.00	4.09	1.52	0.00
43.00	4.09	1.52	0.00
44.00	4.09	1.52	0.00
45.00	4.09	1.52	0.00
46.00	4.09	1.52	0.00
47.00	4.09	1.52	0.00
48.00	4.09	1.52	0.00

Summary for Link CS: Outlet

Inflow Area = 1.380 ac, 3.62% Impervious, Inflow Depth = 1.52" for 10-Year 24 hour event
Inflow = 3.02 cfs @ 12.04 hrs, Volume= 0.175 af
Primary = 3.02 cfs @ 12.04 hrs, Volume= 0.175 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Link CS: Outlet



Hydrograph for Link CS: Outlet

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
1.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00
11.00	0.02	0.00	0.02
12.00	**2.76**	0.00	**2.76**
13.00	**0.24**	0.00	**0.24**
14.00	0.15	0.00	0.15
15.00	0.12	0.00	0.12
16.00	0.09	0.00	0.09
17.00	0.08	0.00	0.08
18.00	0.07	0.00	0.07
19.00	0.06	0.00	0.06
20.00	0.05	0.00	0.05
21.00	0.05	0.00	0.05
22.00	0.05	0.00	0.05
23.00	0.05	0.00	0.05
24.00	0.04	0.00	0.04
25.00	0.00	0.00	0.00
26.00	0.00	0.00	0.00
27.00	0.00	0.00	0.00
28.00	0.00	0.00	0.00
29.00	0.00	0.00	0.00
30.00	0.00	0.00	0.00
31.00	0.00	0.00	0.00
32.00	0.00	0.00	0.00
33.00	0.00	0.00	0.00
34.00	0.00	0.00	0.00
35.00	0.00	0.00	0.00
36.00	0.00	0.00	0.00
37.00	0.00	0.00	0.00
38.00	0.00	0.00	0.00
39.00	0.00	0.00	0.00
40.00	0.00	0.00	0.00
41.00	0.00	0.00	0.00
42.00	0.00	0.00	0.00
43.00	0.00	0.00	0.00
44.00	0.00	0.00	0.00
45.00	0.00	0.00	0.00
46.00	0.00	0.00	0.00
47.00	0.00	0.00	0.00
48.00	0.00	0.00	0.00

Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentEX CURB: EX Runoff Area=1.380 ac 3.62% Impervious Runoff Depth=2.48"
Flow Length=386' Tc=11.6 min CN=72 Runoff=5.92 cfs 0.285 af

Link CS: Outlet Inflow=5.92 cfs 0.285 af
Primary=5.92 cfs 0.285 af

Total Runoff Area = 1.380 ac Runoff Volume = 0.285 af Average Runoff Depth = 2.48"
96.38% Pervious = 1.330 ac 3.62% Impervious = 0.050 ac

Summary for Subcatchment EX CURB: EX

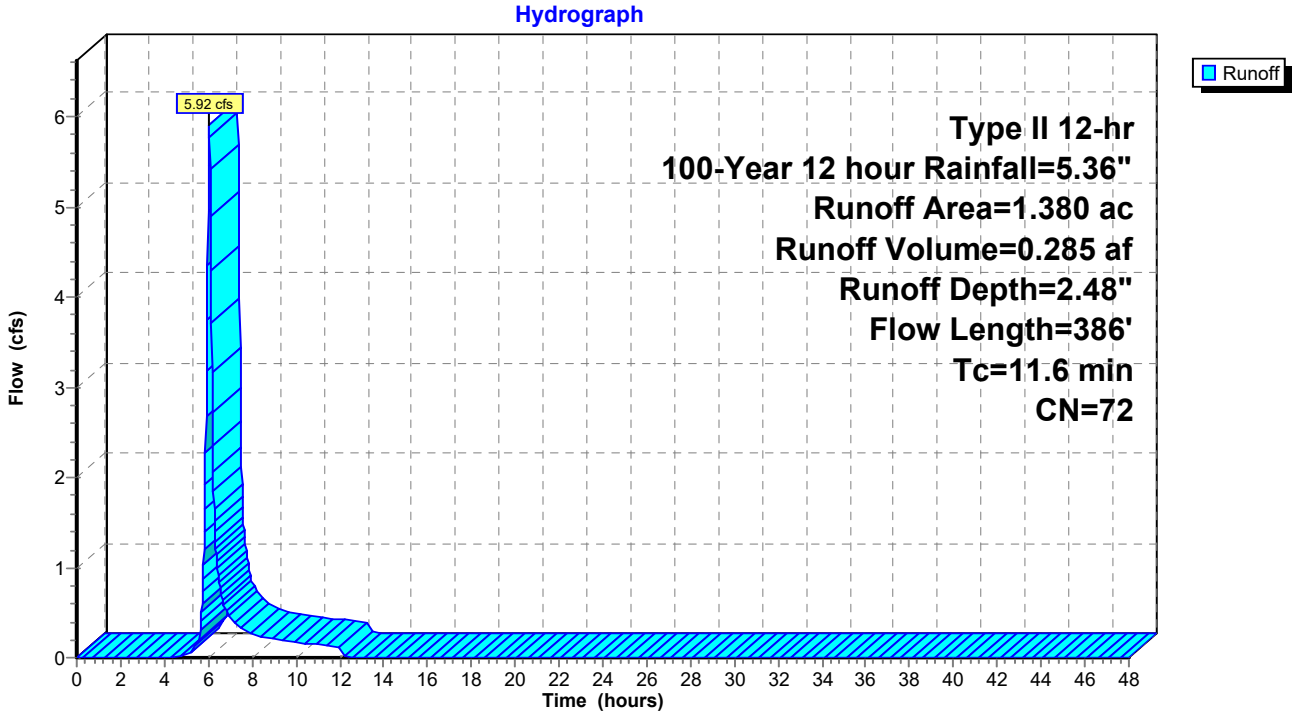
Runoff = 5.92 cfs @ 6.04 hrs, Volume= 0.285 af, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type II 12-hr 100-Year 12 hour Rainfall=5.36"

Area (ac)	CN	Description
0.050	98	Paved parking, HSG B
1.000	74	>75% Grass cover, Good, HSG C
0.330	61	>75% Grass cover, Good, HSG B
1.380	72	Weighted Average
1.330		96.38% Pervious Area
0.050		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.22		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.66"
4.2	286	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
11.6	386	Total			

Subcatchment EX CURB: EX



Hydrograph for Subcatchment EX CURB: EX

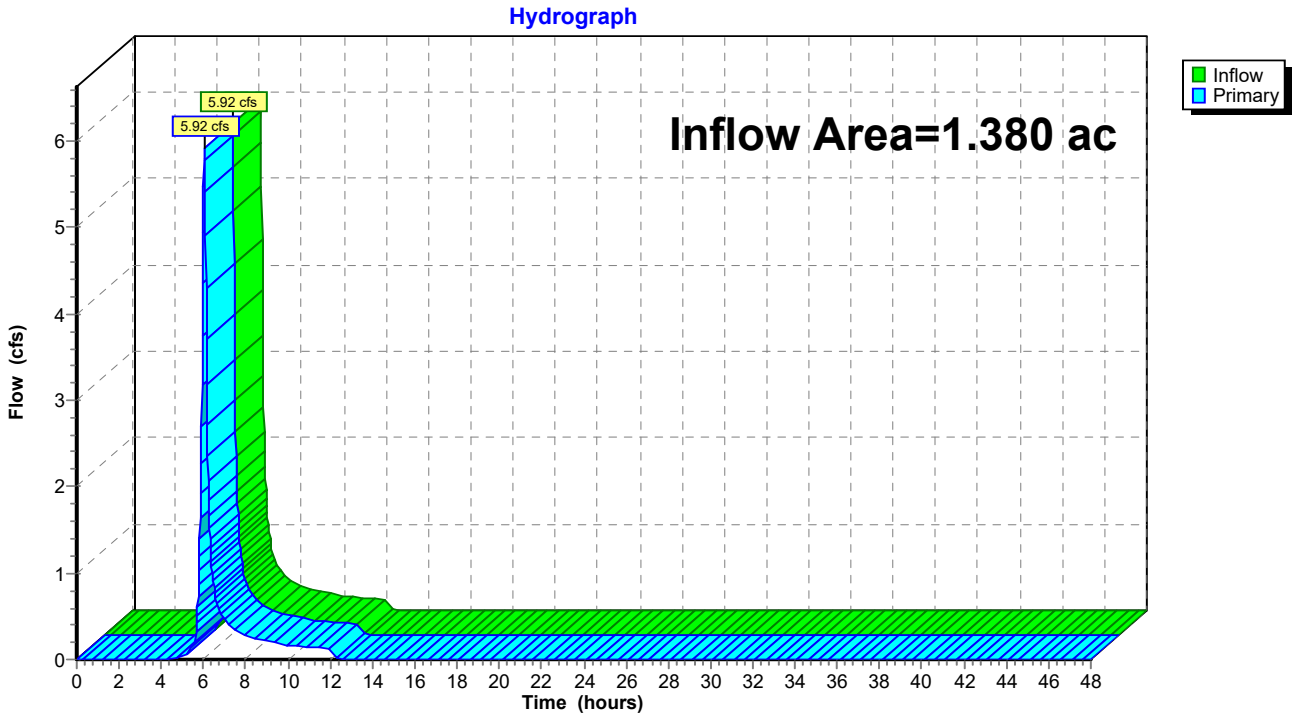
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.12	0.00	0.00
2.00	0.25	0.00	0.00
3.00	0.43	0.00	0.00
4.00	0.64	0.00	0.00
5.00	0.99	0.01	0.04
6.00	3.72	1.26	**5.47**
7.00	4.41	1.75	**0.45**
8.00	4.72	1.98	0.27
9.00	4.93	2.14	0.21
10.00	5.10	2.27	0.17
11.00	5.24	2.38	0.15
12.00	**5.36**	**2.48**	0.13
13.00	5.36	2.48	0.00
14.00	5.36	2.48	0.00
15.00	5.36	2.48	0.00
16.00	5.36	2.48	0.00
17.00	5.36	2.48	0.00
18.00	5.36	2.48	0.00
19.00	5.36	2.48	0.00
20.00	5.36	2.48	0.00
21.00	5.36	2.48	0.00
22.00	5.36	2.48	0.00
23.00	5.36	2.48	0.00
24.00	5.36	2.48	0.00
25.00	5.36	2.48	0.00
26.00	5.36	2.48	0.00
27.00	5.36	2.48	0.00
28.00	5.36	2.48	0.00
29.00	5.36	2.48	0.00
30.00	5.36	2.48	0.00
31.00	5.36	2.48	0.00
32.00	5.36	2.48	0.00
33.00	5.36	2.48	0.00
34.00	5.36	2.48	0.00
35.00	5.36	2.48	0.00
36.00	5.36	2.48	0.00
37.00	5.36	2.48	0.00
38.00	5.36	2.48	0.00
39.00	5.36	2.48	0.00
40.00	5.36	2.48	0.00
41.00	5.36	2.48	0.00
42.00	5.36	2.48	0.00
43.00	5.36	2.48	0.00
44.00	5.36	2.48	0.00
45.00	5.36	2.48	0.00
46.00	5.36	2.48	0.00
47.00	5.36	2.48	0.00
48.00	5.36	2.48	0.00

Summary for Link CS: Outlet

Inflow Area = 1.380 ac, 3.62% Impervious, Inflow Depth = 2.48" for 100-Year 12 hour event
Inflow = 5.92 cfs @ 6.04 hrs, Volume= 0.285 af
Primary = 5.92 cfs @ 6.04 hrs, Volume= 0.285 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Link CS: Outlet



Hydrograph for Link CS: Outlet

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
1.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00
5.00	0.04	0.00	0.04
6.00	**5.47**	0.00	**5.47**
7.00	**0.45**	0.00	**0.45**
8.00	0.27	0.00	0.27
9.00	0.21	0.00	0.21
10.00	0.17	0.00	0.17
11.00	0.15	0.00	0.15
12.00	0.13	0.00	0.13
13.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00
22.00	0.00	0.00	0.00
23.00	0.00	0.00	0.00
24.00	0.00	0.00	0.00
25.00	0.00	0.00	0.00
26.00	0.00	0.00	0.00
27.00	0.00	0.00	0.00
28.00	0.00	0.00	0.00
29.00	0.00	0.00	0.00
30.00	0.00	0.00	0.00
31.00	0.00	0.00	0.00
32.00	0.00	0.00	0.00
33.00	0.00	0.00	0.00
34.00	0.00	0.00	0.00
35.00	0.00	0.00	0.00
36.00	0.00	0.00	0.00
37.00	0.00	0.00	0.00
38.00	0.00	0.00	0.00
39.00	0.00	0.00	0.00
40.00	0.00	0.00	0.00
41.00	0.00	0.00	0.00
42.00	0.00	0.00	0.00
43.00	0.00	0.00	0.00
44.00	0.00	0.00	0.00
45.00	0.00	0.00	0.00
46.00	0.00	0.00	0.00
47.00	0.00	0.00	0.00
48.00	0.00	0.00	0.00

Events for Subcatchment EX CURB: EX

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-Year 24 hour	2.92	1.43	0.088	0.76
10-Year 24 hour	4.09	3.02	0.175	1.52
100-Year 12 hour	**5.36**	**5.92**	**0.285**	**2.48**

Events for Link CS: Outlet

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-Year 24 hour	1.43	1.43	**0.00**
10-Year 24 hour	3.02	3.02	0.00
100-Year 12 hour	**5.92**	**5.92**	0.00

Existing Conditions
Prepared by Cripe

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Appendix B

Proposed Drainage Exhibit and Calculations

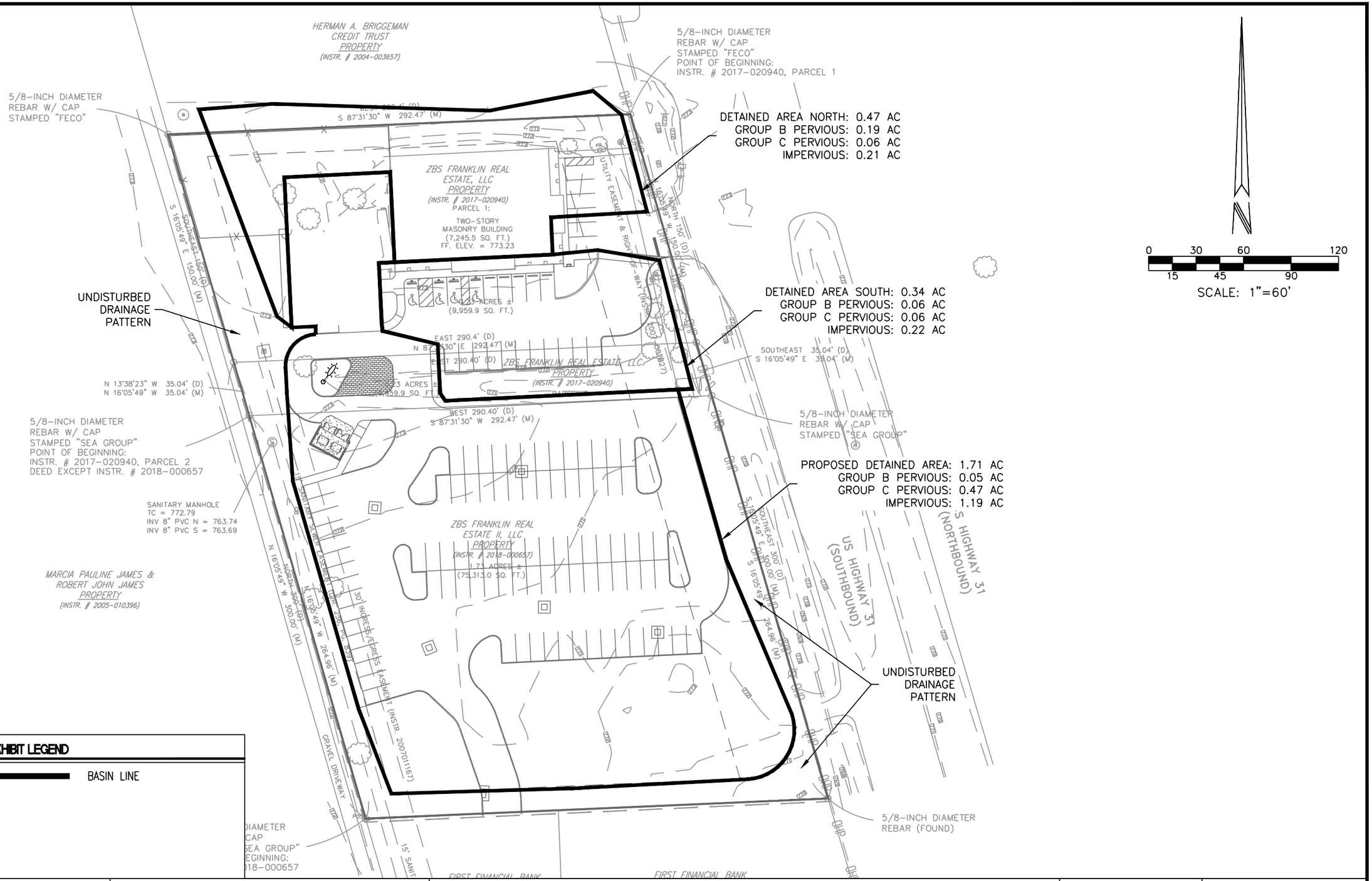


EXHIBIT LEGEND

BASIN LINE

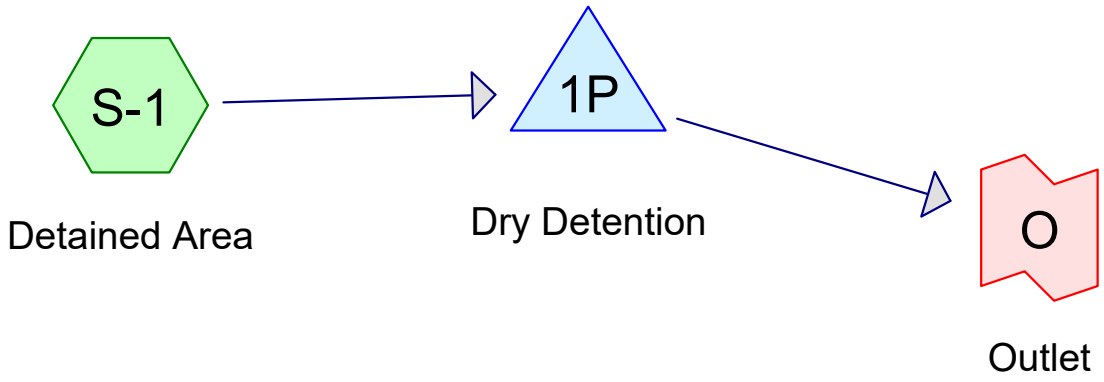
TITLE: PROPOSED CONDITIONS BASIN MAP	PROJECT: FRANKLIN ANIMAL CLINIC OWNER: FRANKLIN ANIMAL CLINIC 2990 NORTH MORTON STREET FRANKLIN, INDIANA	Cripe® Solutions by Design Since 1937 3939 PRIORITY WAY SOUTH DRIVE, SUITE 200 INDIANAPOLIS, INDIANA 46240 (317) 844-6777 www.cripe.biz ● ARCHITECTURE + INTERIORS ● CIVIL ENGINEERING ● SURVEY +3D LASER SCANNING ● ENERGY + FACILITIES ● EQUIPMENT PLANNING ● REAL ESTATE SERVICES	SCALE: 1" = 60' PROJECT NO: 210092-20000 Date: 10-06-2021

SHEET No.

1 of 1

Events for Pond 1P: Dry Detention

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year 6 hour	4.24	1.11	769.79	2,613
2-Year 12 hour	4.58	1.15	769.88	3,031
2-Year 24 hour	4.93	1.19	769.97	3,454
10-Year 6 hour	7.34	1.33	770.39	5,628
10-Year 12 hour	7.51	1.36	770.46	5,989
10-Year 24 hour	7.59	1.37	770.49	6,203
100-Year 6 hour	**12.92**	**2.97**	**771.27**	**11,020**
100-Year 12 hour	12.44	2.80	771.25	10,902
100-Year 24 hour	11.66	2.28	771.19	10,483



Subcat Reach Pond Link

Routing Diagram for Proposed Conditions
Prepared by Cripe, Printed 10/6/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-Year 24 hour	Type II 24-hr		Default	24.00	1	4.09	2
2	100-Year 6 hour	Type II 6-hr		Default	6.00	1	4.77	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.050	61	>75% Grass cover, Good, HSG B (S-1)
0.470	74	>75% Grass cover, Good, HSG C (S-1)
1.190	98	Paved parking, HSG C (S-1)
1.710	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.050	HSG B	S-1
1.660	HSG C	S-1
0.000	HSG D	
0.000	Other	
1.710		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.050	0.470	0.000	0.000	0.520	>75% Grass cover, Good	S-1
0.000	0.000	1.190	0.000	0.000	1.190	Paved parking	S-1
0.000	**0.050**	**1.660**	**0.000**	**0.000**	**1.710**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	768.15	767.85	100.0	0.0030	0.012	0.0	15.0	0.0

Time span=0.00-30.00 hrs, dt=0.02 hrs, 1501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S-1: Detained Area Runoff Area=1.710 ac 69.59% Impervious Runoff Depth=3.00"
Tc=10.0 min CN=90 Runoff=7.59 cfs 0.428 af

Pond 1P: Dry Detention Peak Elev=770.49' Storage=6,203 cf Inflow=7.59 cfs 0.428 af
Outflow=1.37 cfs 0.428 af

Link O: Outlet Inflow=1.37 cfs 0.428 af
Primary=1.37 cfs 0.428 af

Total Runoff Area = 1.710 ac Runoff Volume = 0.428 af Average Runoff Depth = 3.00"
30.41% Pervious = 0.520 ac 69.59% Impervious = 1.190 ac

Summary for Subcatchment S-1: Detained Area

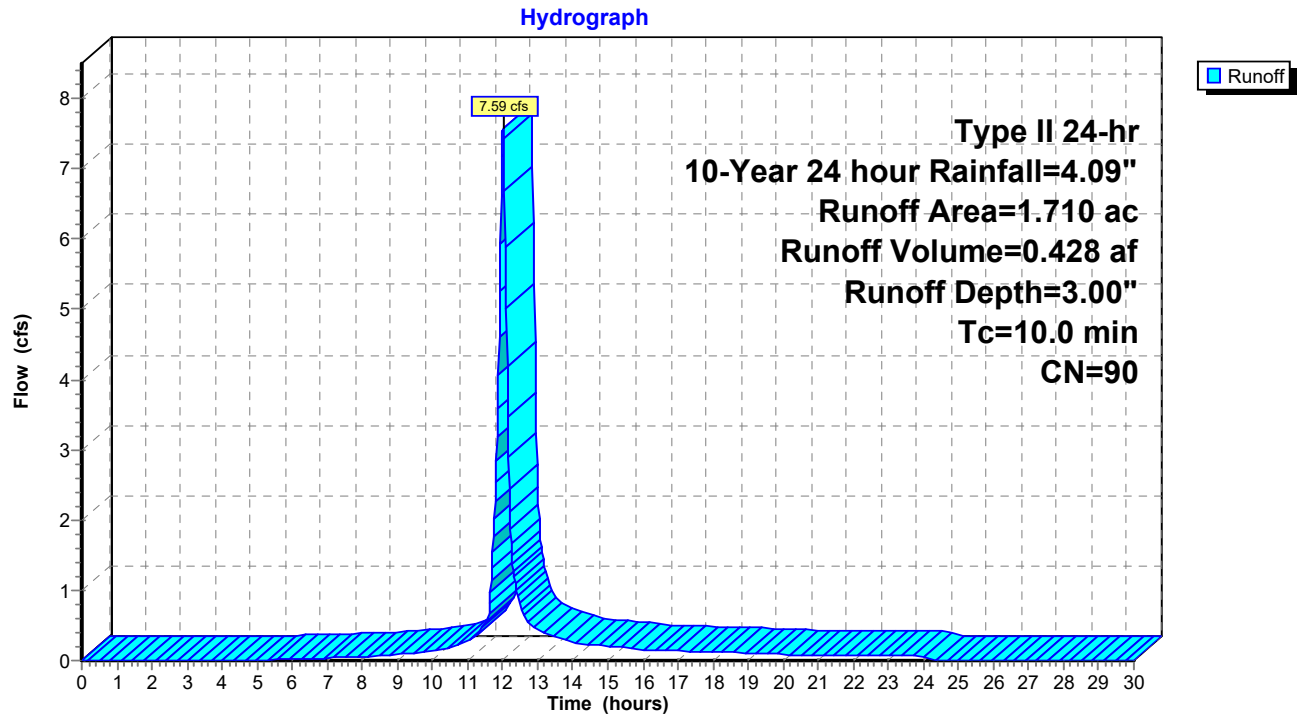
Runoff = 7.59 cfs @ 12.01 hrs, Volume= 0.428 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-Year 24 hour Rainfall=4.09"

Area (ac)	CN	Description
0.470	74	>75% Grass cover, Good, HSG C
0.050	61	>75% Grass cover, Good, HSG B
1.190	98	Paved parking, HSG C
1.710	90	Weighted Average
0.520		30.41% Pervious Area
1.190		69.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Prelim**

Subcatchment S-1: Detained Area



Hydrograph for Subcatchment S-1: Detained Area

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.40	0.02	0.00	0.00
0.80	0.03	0.00	0.00
1.20	0.05	0.00	0.00
1.60	0.07	0.00	0.00
2.00	0.09	0.00	0.00
2.40	0.11	0.00	0.00
2.80	0.13	0.00	0.00
3.20	0.15	0.00	0.00
3.60	0.17	0.00	0.00
4.00	0.20	0.00	0.00
4.40	0.22	0.00	0.00
4.80	0.24	0.00	0.00
5.20	0.27	0.00	0.01
5.60	0.30	0.00	0.01
6.00	0.33	0.01	0.02
6.40	0.36	0.01	0.02
6.80	0.39	0.02	0.03
7.20	0.42	0.03	0.04
7.60	0.46	0.04	0.04
8.00	0.49	0.05	0.05
8.40	0.53	0.07	0.06
8.80	0.58	0.09	0.08
9.20	0.63	0.11	0.10
9.60	0.68	0.13	0.11
10.00	0.74	0.16	0.14
10.40	0.81	0.21	0.18
10.80	0.91	0.26	0.24
11.20	1.03	0.34	0.35
11.60	1.25	0.50	0.63
12.00	2.71	1.72	**7.52**
12.40	2.97	1.95	**0.98**
12.80	3.10	2.08	0.52
13.20	3.21	2.17	0.39
13.60	3.29	2.25	0.32
14.00	3.35	2.31	0.26
14.40	3.41	2.37	0.23
14.80	3.47	2.42	0.21
15.20	3.51	2.46	0.20
15.60	3.56	2.50	0.18
16.00	3.60	2.54	0.16
16.40	3.64	2.58	0.15
16.80	3.67	2.61	0.14
17.20	3.70	2.64	0.14
17.60	3.74	2.67	0.13
18.00	3.77	2.70	0.12
18.40	3.80	2.73	0.12
18.80	3.82	2.75	0.11
19.20	3.85	2.78	0.10
19.60	3.87	2.80	0.10
20.00	3.89	2.82	0.09
20.40	3.91	2.84	0.09
20.80	3.94	2.86	0.08
21.20	3.96	2.88	0.08
21.60	3.98	2.90	0.08
22.00	4.00	2.92	0.08
22.40	4.02	2.93	0.08
22.80	4.03	2.95	0.08
23.20	4.05	2.97	0.08
23.60	4.07	2.99	0.08
24.00	**4.09**	**3.00**	0.07
24.40	4.09	3.00	0.00
24.80	4.09	3.00	0.00
25.20	4.09	3.00	0.00
25.60	4.09	3.00	0.00
26.00	4.09	3.00	0.00
26.40	4.09	3.00	0.00
26.80	4.09	3.00	0.00
27.20	4.09	3.00	0.00
27.60	4.09	3.00	0.00
28.00	4.09	3.00	0.00
28.40	4.09	3.00	0.00
28.80	4.09	3.00	0.00
29.20	4.09	3.00	0.00
29.60	4.09	3.00	0.00
30.00	4.09	3.00	0.00

Summary for Pond 1P: Dry Detention

Inflow Area = 1.710 ac, 69.59% Impervious, Inflow Depth = 3.00" for 10-Year 24 hour event
Inflow = 7.59 cfs @ 12.01 hrs, Volume= 0.428 af
Outflow = 1.37 cfs @ 12.28 hrs, Volume= 0.428 af, Atten= 82%, Lag= 16.3 min
Primary = 1.37 cfs @ 12.28 hrs, Volume= 0.428 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Peak Elev= 770.49' @ 12.28 hrs Surf.Area= 5,634 sf Storage= 6,203 cf

Plug-Flow detention time= 31.5 min calculated for 0.428 af (100% of inflow)
Center-of-Mass det. time= 31.5 min (829.8 - 798.3)

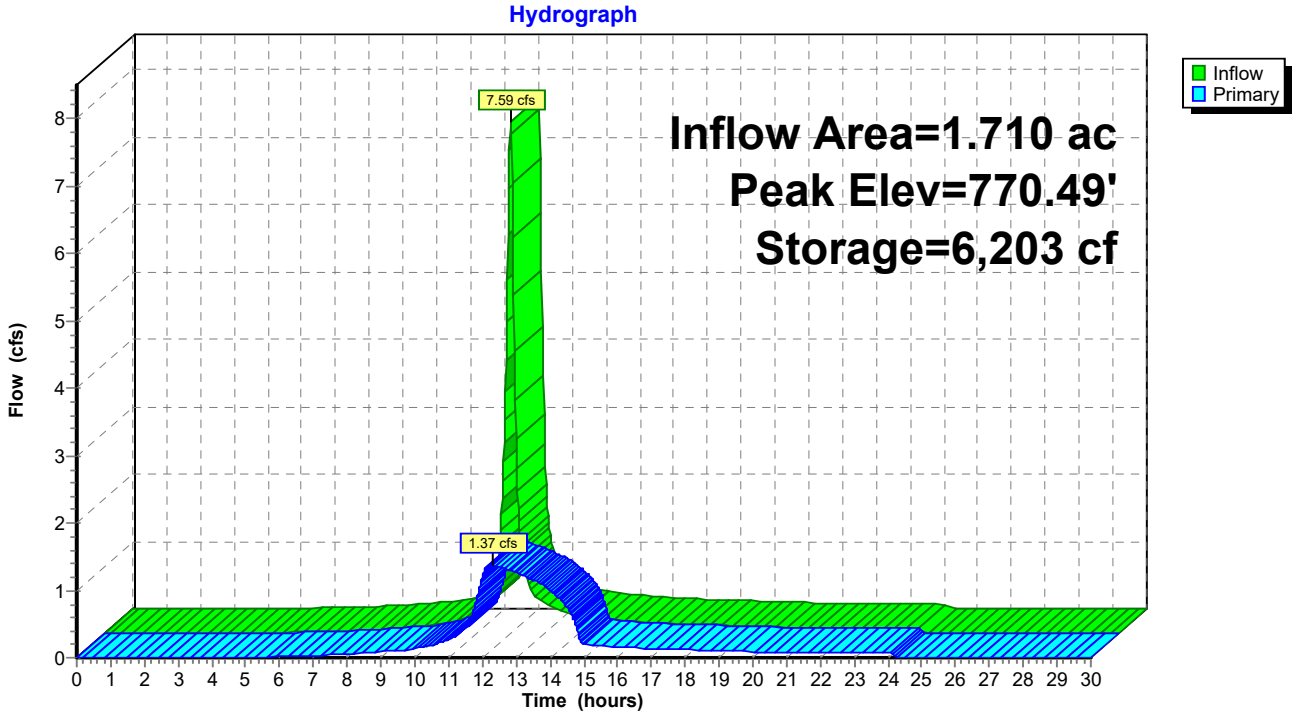
Volume	Invert	Avail.Storage	Storage Description
#1	768.15'	41,092 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
768.15	0	0.0	0	0	0
769.00	1,599	162.0	453	453	2,090
770.00	4,977	321.0	3,132	3,585	8,206
771.00	6,351	368.0	5,650	9,235	10,806
772.00	7,942	399.0	7,132	16,367	12,736
773.00	9,648	425.0	8,781	25,148	14,490
774.00	11,507	454.0	10,564	35,712	16,566
774.45	12,408	468.0	5,380	41,092	17,614

Device	Routing	Invert	Outlet Devices
#1	Primary	768.15'	**15.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 768.15' / 767.85' S= 0.0030 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	768.15'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	771.05'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.37 cfs @ 12.28 hrs HW=770.49' (Free Discharge)
└**1=Culvert** (Passes 1.37 cfs of 6.23 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.37 cfs @ 6.97 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Dry Detention



Hydrograph for Pond 1P: Dry Detention

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	768.15	0.00
1.00	0.00	0	768.15	0.00
2.00	0.00	0	768.15	0.00
3.00	0.00	0	768.15	0.00
4.00	0.00	0	768.15	0.00
5.00	0.00	0	768.18	0.00
6.00	0.02	0	768.23	0.02
7.00	0.03	1	768.26	0.03
8.00	0.05	2	768.28	0.05
9.00	0.09	4	768.33	0.09
10.00	0.14	8	768.37	0.14
11.00	0.29	29	768.49	0.28
12.00	**7.52**	**3,433**	**769.97**	**1.18**
13.00	**0.45**	**4,592**	**770.20**	**1.27**
14.00	0.26	1,681	769.53	1.00
15.00	0.20	18	768.44	0.21
16.00	0.16	11	768.39	0.16
17.00	0.14	9	768.37	0.14
18.00	0.12	7	768.36	0.12
19.00	0.11	6	768.34	0.11
20.00	0.09	4	768.33	0.09
21.00	0.08	4	768.32	0.08
22.00	0.08	4	768.32	0.08
23.00	0.08	4	768.31	0.08
24.00	0.07	3	768.31	0.07
25.00	0.00	0	768.15	0.00
26.00	0.00	0	768.15	0.00
27.00	0.00	0	768.15	0.00
28.00	0.00	0	768.15	0.00
29.00	0.00	0	768.15	0.00
30.00	0.00	0	768.15	0.00

Stage-Area-Storage for Pond 1P: Dry Detention

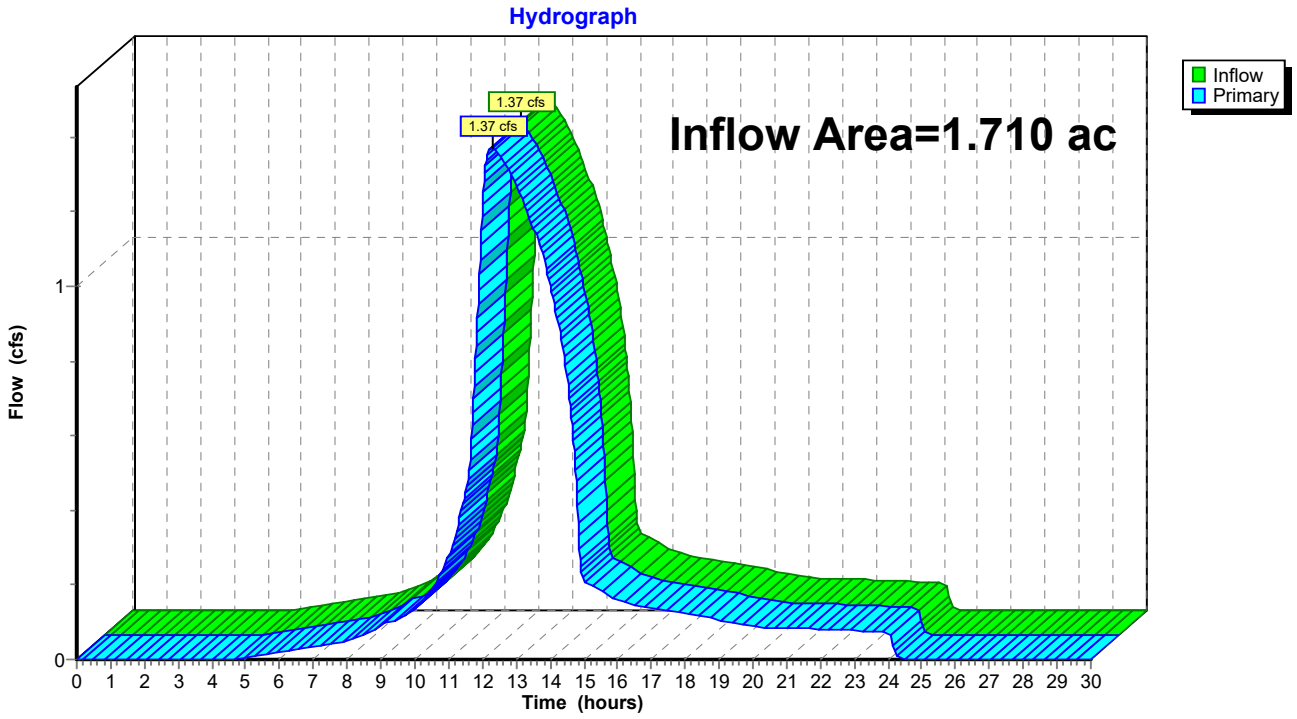
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
768.15	0	0
768.25	22	1
768.35	89	6
768.45	199	20
768.55	354	47
768.65	553	92
768.75	797	159
768.85	1,084	253
768.95	1,416	378
769.05	1,724	536
769.15	1,987	721
769.25	2,268	934
769.35	2,569	1,176
769.45	2,888	1,448
769.55	3,226	1,754
769.65	3,582	2,094
769.75	3,957	2,471
769.85	4,351	2,886
769.95	4,764	3,342
770.05	5,042	3,836
770.15	5,172	4,347
770.25	5,305	4,870
770.35	5,439	5,408
770.45	5,575	5,958
770.55	5,712	6,523
770.65	5,851	7,101
770.75	5,992	7,693
770.85	6,134	8,299
770.95	6,278	8,920
771.05	6,426	9,555
771.15	6,578	10,205
771.25	6,732	10,871
771.35	6,888	11,552
771.45	7,045	12,248
771.55	7,204	12,961
771.65	7,365	13,689
771.75	7,528	14,434
771.85	7,692	15,195
771.95	7,858	15,972
772.05	8,023	16,766
772.15	8,187	17,577
772.25	8,353	18,404
772.35	8,520	19,247
772.45	8,689	20,108
772.55	8,860	20,985
772.65	9,032	21,880
772.75	9,206	22,792
772.85	9,382	23,721
772.95	9,559	24,668
773.05	9,737	25,633
773.15	9,916	26,616
773.25	10,097	27,616
773.35	10,280	28,635
773.45	10,464	29,672
773.55	10,650	30,728
773.65	10,838	31,802
773.75	11,027	32,896
773.85	11,218	34,008
773.95	11,410	35,139
774.05	11,605	36,290
774.15	11,804	37,460
774.25	12,003	38,651
774.35	12,205	39,861
774.45	**12,408**	**41,092**

Summary for Link O: Outlet

Inflow Area = 1.710 ac, 69.59% Impervious, Inflow Depth = 3.00" for 10-Year 24 hour event
Inflow = 1.37 cfs @ 12.28 hrs, Volume= 0.428 af
Primary = 1.37 cfs @ 12.28 hrs, Volume= 0.428 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs

Link O: Outlet



Hydrograph for Link O: Outlet

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00
0.40	0.00	0.00	0.00
0.80	0.00	0.00	0.00
1.20	0.00	0.00	0.00
1.60	0.00	0.00	0.00
2.00	0.00	0.00	0.00
2.40	0.00	0.00	0.00
2.80	0.00	0.00	0.00
3.20	0.00	0.00	0.00
3.60	0.00	0.00	0.00
4.00	0.00	0.00	0.00
4.40	0.00	0.00	0.00
4.80	0.00	0.00	0.00
5.20	0.01	0.00	0.01
5.60	0.01	0.00	0.01
6.00	0.02	0.00	0.02
6.40	0.02	0.00	0.02
6.80	0.03	0.00	0.03
7.20	0.04	0.00	0.04
7.60	0.04	0.00	0.04
8.00	0.05	0.00	0.05
8.40	0.06	0.00	0.06
8.80	0.08	0.00	0.08
9.20	0.10	0.00	0.10
9.60	0.11	0.00	0.11
10.00	0.14	0.00	0.14
10.40	0.18	0.00	0.18
10.80	0.24	0.00	0.24
11.20	0.33	0.00	0.33
11.60	0.50	0.00	0.50
12.00	**1.18**	0.00	**1.18**
12.40	**1.36**	0.00	**1.36**
12.80	1.31	0.00	1.31
13.20	1.23	0.00	1.23
13.60	1.13	0.00	1.13
14.00	1.00	0.00	1.00
14.40	0.82	0.00	0.82
14.80	0.44	0.00	0.44
15.20	0.20	0.00	0.20
15.60	0.18	0.00	0.18
16.00	0.16	0.00	0.16
16.40	0.15	0.00	0.15
16.80	0.14	0.00	0.14
17.20	0.14	0.00	0.14
17.60	0.13	0.00	0.13
18.00	0.12	0.00	0.12
18.40	0.12	0.00	0.12
18.80	0.11	0.00	0.11
19.20	0.10	0.00	0.10
19.60	0.10	0.00	0.10
20.00	0.09	0.00	0.09
20.40	0.09	0.00	0.09
20.80	0.08	0.00	0.08
21.20	0.08	0.00	0.08
21.60	0.08	0.00	0.08
22.00	0.08	0.00	0.08
22.40	0.08	0.00	0.08
22.80	0.08	0.00	0.08
23.20	0.08	0.00	0.08
23.60	0.08	0.00	0.08
24.00	0.07	0.00	0.07
24.40	0.00	0.00	0.00
24.80	0.00	0.00	0.00
25.20	0.00	0.00	0.00
25.60	0.00	0.00	0.00
26.00	0.00	0.00	0.00
26.40	0.00	0.00	0.00
26.80	0.00	0.00	0.00
27.20	0.00	0.00	0.00
27.60	0.00	0.00	0.00
28.00	0.00	0.00	0.00
28.40	0.00	0.00	0.00
28.80	0.00	0.00	0.00
29.20	0.00	0.00	0.00
29.60	0.00	0.00	0.00
30.00	0.00	0.00	0.00

Time span=0.00-30.00 hrs, dt=0.02 hrs, 1501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S-1: Detained Area Runoff Area=1.710 ac 69.59% Impervious Runoff Depth=3.65"
Tc=10.0 min CN=90 Runoff=12.92 cfs 0.521 af

Pond 1P: Dry Detention Peak Elev=771.27' Storage=11,020 cf Inflow=12.92 cfs 0.521 af
Outflow=2.97 cfs 0.521 af

Link O: Outlet Inflow=2.97 cfs 0.521 af
Primary=2.97 cfs 0.521 af

Total Runoff Area = 1.710 ac Runoff Volume = 0.521 af Average Runoff Depth = 3.65"
30.41% Pervious = 0.520 ac 69.59% Impervious = 1.190 ac

Summary for Subcatchment S-1: Detained Area

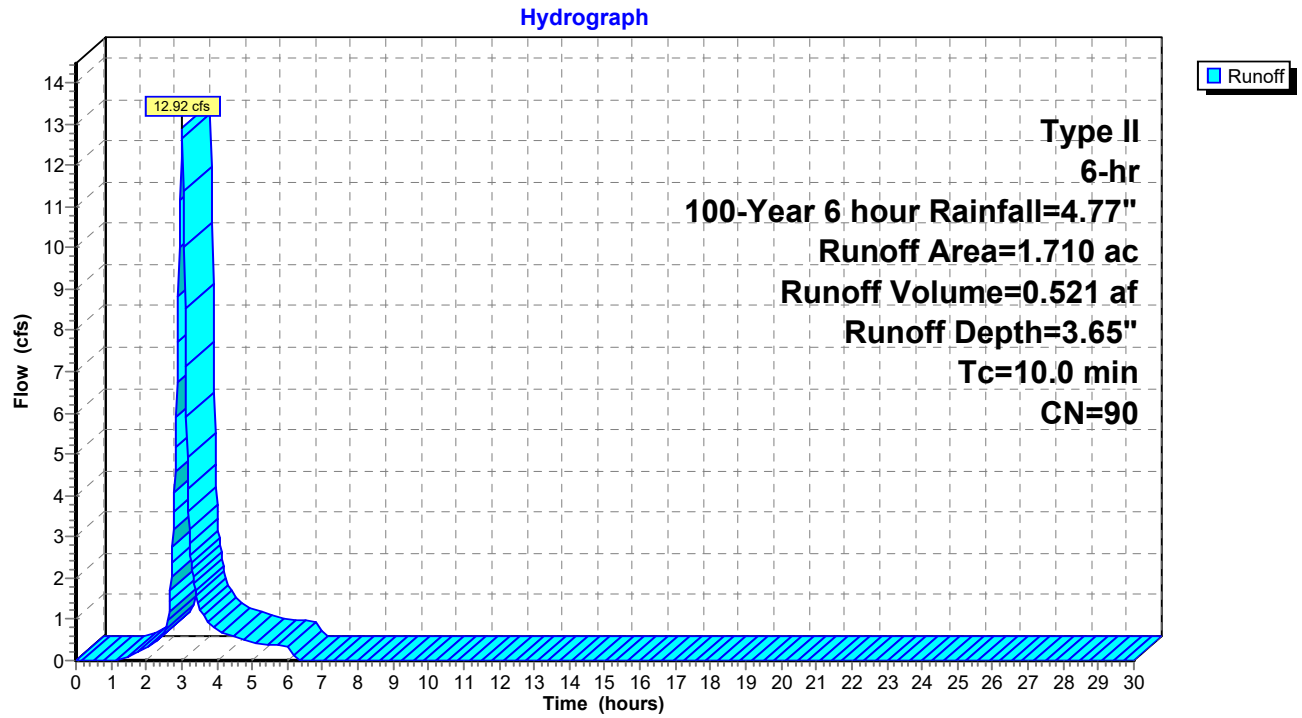
Runoff = 12.92 cfs @ 3.01 hrs, Volume= 0.521 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Type II 6-hr 100-Year 6 hour Rainfall=4.77"

Area (ac)	CN	Description
0.470	74	>75% Grass cover, Good, HSG C
0.050	61	>75% Grass cover, Good, HSG B
1.190	98	Paved parking, HSG C
1.710	90	Weighted Average
0.520		30.41% Pervious Area
1.190		69.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, Prelim**

Subcatchment S-1: Detained Area



Hydrograph for Subcatchment S-1: Detained Area

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.40	0.09	0.00	0.00
0.80	0.18	0.00	0.00
1.20	0.29	0.00	0.02
1.60	0.42	0.03	0.13
2.00	0.59	0.09	0.29
2.40	0.84	0.22	0.59
2.80	1.92	1.02	**4.07**
3.20	3.72	2.66	**3.60**
3.60	4.03	2.94	1.11
4.00	4.22	3.13	0.76
4.40	4.37	3.27	0.60
4.80	4.49	3.39	0.49
5.20	4.59	3.48	0.41
5.60	4.69	3.57	0.38
6.00	**4.77**	**3.65**	0.35
6.40	4.77	3.65	0.00
6.80	4.77	3.65	0.00
7.20	4.77	3.65	0.00
7.60	4.77	3.65	0.00
8.00	4.77	3.65	0.00
8.40	4.77	3.65	0.00
8.80	4.77	3.65	0.00
9.20	4.77	3.65	0.00
9.60	4.77	3.65	0.00
10.00	4.77	3.65	0.00
10.40	4.77	3.65	0.00
10.80	4.77	3.65	0.00
11.20	4.77	3.65	0.00
11.60	4.77	3.65	0.00
12.00	4.77	3.65	0.00
12.40	4.77	3.65	0.00
12.80	4.77	3.65	0.00
13.20	4.77	3.65	0.00
13.60	4.77	3.65	0.00
14.00	4.77	3.65	0.00
14.40	4.77	3.65	0.00
14.80	4.77	3.65	0.00
15.20	4.77	3.65	0.00
15.60	4.77	3.65	0.00
16.00	4.77	3.65	0.00
16.40	4.77	3.65	0.00
16.80	4.77	3.65	0.00
17.20	4.77	3.65	0.00
17.60	4.77	3.65	0.00
18.00	4.77	3.65	0.00
18.40	4.77	3.65	0.00
18.80	4.77	3.65	0.00
19.20	4.77	3.65	0.00
19.60	4.77	3.65	0.00
20.00	4.77	3.65	0.00
20.40	4.77	3.65	0.00
20.80	4.77	3.65	0.00
21.20	4.77	3.65	0.00
21.60	4.77	3.65	0.00
22.00	4.77	3.65	0.00
22.40	4.77	3.65	0.00
22.80	4.77	3.65	0.00
23.20	4.77	3.65	0.00
23.60	4.77	3.65	0.00
24.00	4.77	3.65	0.00
24.40	4.77	3.65	0.00
24.80	4.77	3.65	0.00
25.20	4.77	3.65	0.00
25.60	4.77	3.65	0.00
26.00	4.77	3.65	0.00
26.40	4.77	3.65	0.00
26.80	4.77	3.65	0.00
27.20	4.77	3.65	0.00
27.60	4.77	3.65	0.00
28.00	4.77	3.65	0.00
28.40	4.77	3.65	0.00
28.80	4.77	3.65	0.00
29.20	4.77	3.65	0.00
29.60	4.77	3.65	0.00
30.00	4.77	3.65	0.00

Summary for Pond 1P: Dry Detention

Inflow Area = 1.710 ac, 69.59% Impervious, Inflow Depth = 3.65" for 100-Year 6 hour event
Inflow = 12.92 cfs @ 3.01 hrs, Volume= 0.521 af
Outflow = 2.97 cfs @ 3.23 hrs, Volume= 0.521 af, Atten= 77%, Lag= 13.2 min
Primary = 2.97 cfs @ 3.23 hrs, Volume= 0.521 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Peak Elev= 771.27' @ 3.23 hrs Surf.Area= 6,766 sf Storage= 11,020 cf

Plug-Flow detention time= 63.3 min calculated for 0.520 af (100% of inflow)
Center-of-Mass det. time= 63.3 min (263.0 - 199.7)

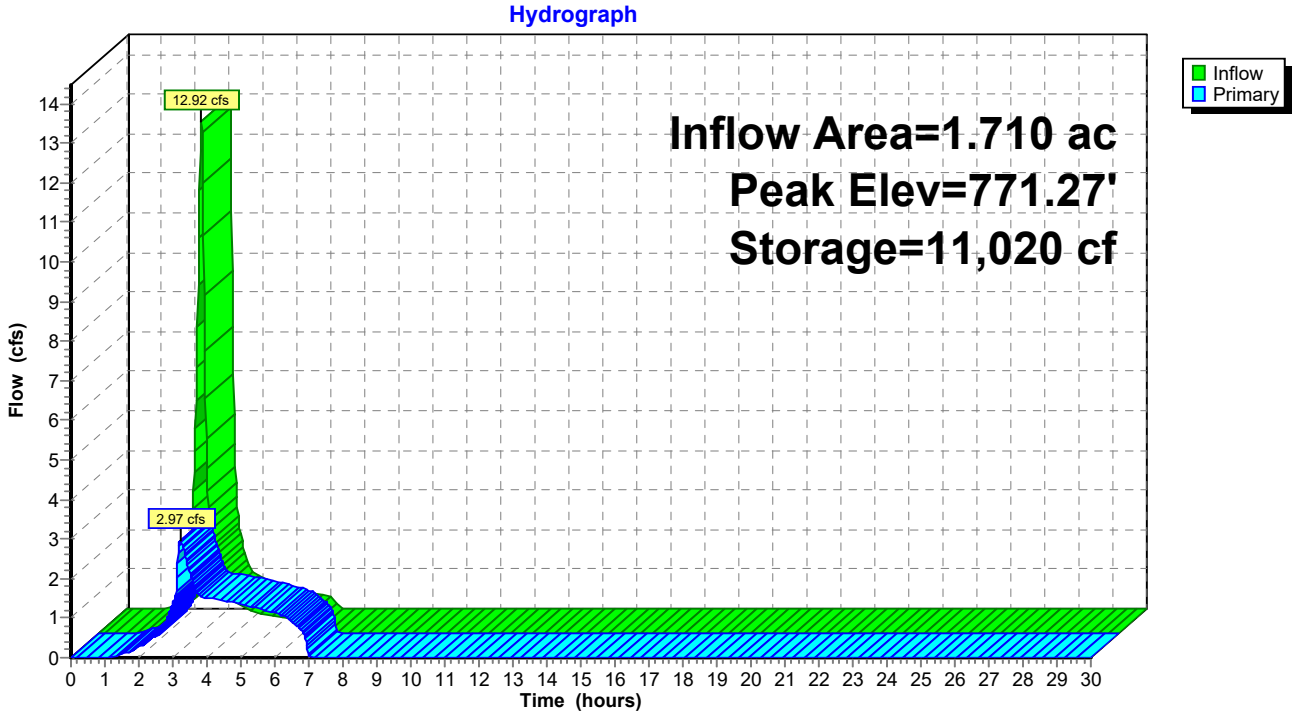
Volume	Invert	Avail.Storage	Storage Description
#1	768.15'	41,092 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
768.15	0	0.0	0	0	0
769.00	1,599	162.0	453	453	2,090
770.00	4,977	321.0	3,132	3,585	8,206
771.00	6,351	368.0	5,650	9,235	10,806
772.00	7,942	399.0	7,132	16,367	12,736
773.00	9,648	425.0	8,781	25,148	14,490
774.00	11,507	454.0	10,564	35,712	16,566
774.45	12,408	468.0	5,380	41,092	17,614

Device	Routing	Invert	Outlet Devices
#1	Primary	768.15'	**15.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 768.15' / 767.85' S= 0.0030 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	768.15'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	771.05'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.95 cfs @ 3.23 hrs HW=771.27' (Free Discharge)
└**1=Culvert** (Passes 2.95 cfs of 7.77 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.60 cfs @ 8.16 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.35 cfs @ 1.54 fps)

Pond 1P: Dry Detention



Hydrograph for Pond 1P: Dry Detention

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	768.15	0.00
1.00	0.00	0	768.15	0.00
2.00	0.29	27	768.48	0.27
3.00	**12.79**	**6,236**	**770.50**	**1.37**
4.00	**0.76**	**9,056**	**770.97**	**1.52**
5.00	0.45	5,959	770.45	1.35
6.00	0.35	2,860	769.84	1.14
7.00	0.00	1	768.24	0.03
8.00	0.00	0	768.15	0.00
9.00	0.00	0	768.15	0.00
10.00	0.00	0	768.15	0.00
11.00	0.00	0	768.15	0.00
12.00	0.00	0	768.15	0.00
13.00	0.00	0	768.15	0.00
14.00	0.00	0	768.15	0.00
15.00	0.00	0	768.15	0.00
16.00	0.00	0	768.15	0.00
17.00	0.00	0	768.15	0.00
18.00	0.00	0	768.15	0.00
19.00	0.00	0	768.15	0.00
20.00	0.00	0	768.15	0.00
21.00	0.00	0	768.15	0.00
22.00	0.00	0	768.15	0.00
23.00	0.00	0	768.15	0.00
24.00	0.00	0	768.15	0.00
25.00	0.00	0	768.15	0.00
26.00	0.00	0	768.15	0.00
27.00	0.00	0	768.15	0.00
28.00	0.00	0	768.15	0.00
29.00	0.00	0	768.15	0.00
30.00	0.00	0	768.15	0.00

Stage-Area-Storage for Pond 1P: Dry Detention

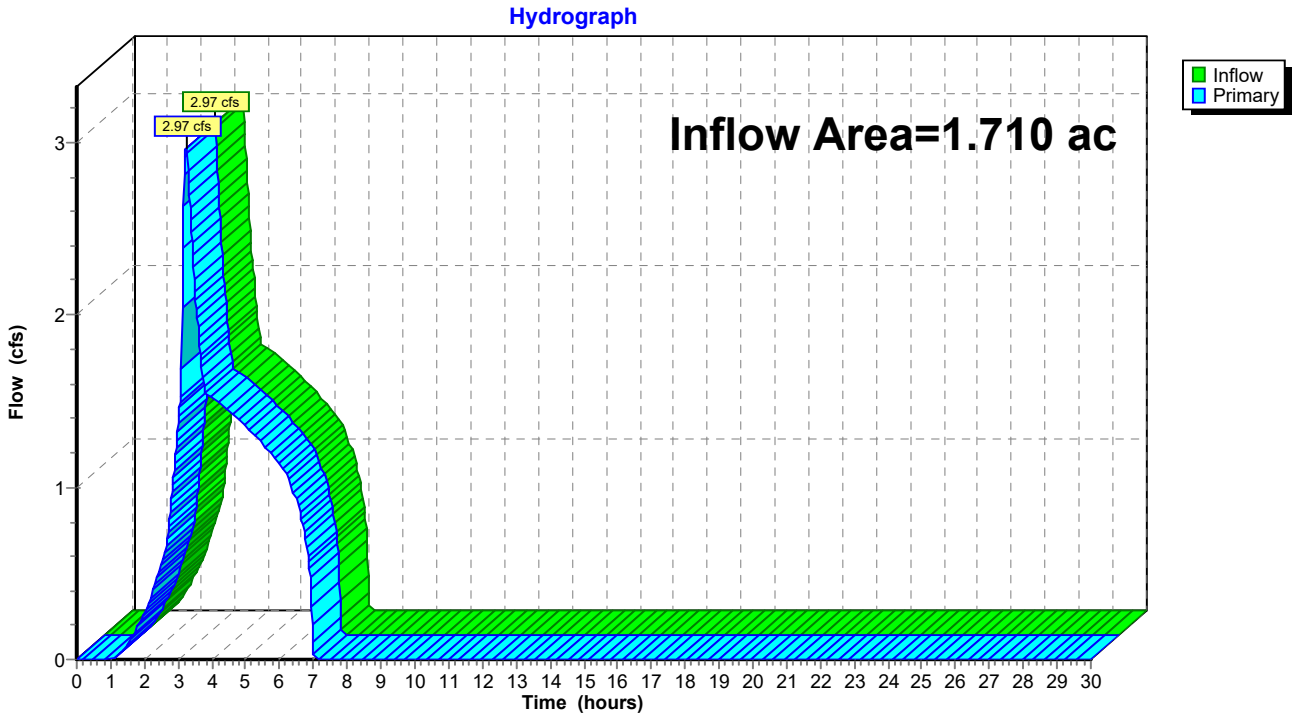
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
768.15	0	0
768.25	22	1
768.35	89	6
768.45	199	20
768.55	354	47
768.65	553	92
768.75	797	159
768.85	1,084	253
768.95	1,416	378
769.05	1,724	536
769.15	1,987	721
769.25	2,268	934
769.35	2,569	1,176
769.45	2,888	1,448
769.55	3,226	1,754
769.65	3,582	2,094
769.75	3,957	2,471
769.85	4,351	2,886
769.95	4,764	3,342
770.05	5,042	3,836
770.15	5,172	4,347
770.25	5,305	4,870
770.35	5,439	5,408
770.45	5,575	5,958
770.55	5,712	6,523
770.65	5,851	7,101
770.75	5,992	7,693
770.85	6,134	8,299
770.95	6,278	8,920
771.05	6,426	9,555
771.15	6,578	10,205
771.25	6,732	10,871
771.35	6,888	11,552
771.45	7,045	12,248
771.55	7,204	12,961
771.65	7,365	13,689
771.75	7,528	14,434
771.85	7,692	15,195
771.95	7,858	15,972
772.05	8,023	16,766
772.15	8,187	17,577
772.25	8,353	18,404
772.35	8,520	19,247
772.45	8,689	20,108
772.55	8,860	20,985
772.65	9,032	21,880
772.75	9,206	22,792
772.85	9,382	23,721
772.95	9,559	24,668
773.05	9,737	25,633
773.15	9,916	26,616
773.25	10,097	27,616
773.35	10,280	28,635
773.45	10,464	29,672
773.55	10,650	30,728
773.65	10,838	31,802
773.75	11,027	32,896
773.85	11,218	34,008
773.95	11,410	35,139
774.05	11,605	36,290
774.15	11,804	37,460
774.25	12,003	38,651
774.35	12,205	39,861
774.45	**12,408**	**41,092**

Summary for Link O: Outlet

Inflow Area = 1.710 ac, 69.59% Impervious, Inflow Depth = 3.65" for 100-Year 6 hour event
Inflow = 2.97 cfs @ 3.23 hrs, Volume= 0.521 af
Primary = 2.97 cfs @ 3.23 hrs, Volume= 0.521 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs

Link O: Outlet



Hydrograph for Link O: Outlet

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00	20.40	0.00	0.00	0.00
0.40	0.00	0.00	0.00	20.80	0.00	0.00	0.00
0.80	0.00	0.00	0.00	21.20	0.00	0.00	0.00
1.20	0.02	0.00	0.02	21.60	0.00	0.00	0.00
1.60	0.12	0.00	0.12	22.00	0.00	0.00	0.00
2.00	0.27	0.00	0.27	22.40	0.00	0.00	0.00
2.40	0.49	0.00	0.49	22.80	0.00	0.00	0.00
2.80	0.93	0.00	0.93	23.20	0.00	0.00	0.00
3.20	**2.92**	0.00	**2.92**	23.60	0.00	0.00	0.00
3.60	**1.87**	0.00	**1.87**	24.00	0.00	0.00	0.00
4.00	1.52	0.00	1.52	24.40	0.00	0.00	0.00
4.40	1.46	0.00	1.46	24.80	0.00	0.00	0.00
4.80	1.39	0.00	1.39	25.20	0.00	0.00	0.00
5.20	1.31	0.00	1.31	25.60	0.00	0.00	0.00
5.60	1.23	0.00	1.23	26.00	0.00	0.00	0.00
6.00	1.14	0.00	1.14	26.40	0.00	0.00	0.00
6.40	0.98	0.00	0.98	26.80	0.00	0.00	0.00
6.80	0.66	0.00	0.66	27.20	0.00	0.00	0.00
7.20	0.00	0.00	0.00	27.60	0.00	0.00	0.00
7.60	0.00	0.00	0.00	28.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	28.40	0.00	0.00	0.00
8.40	0.00	0.00	0.00	28.80	0.00	0.00	0.00
8.80	0.00	0.00	0.00	29.20	0.00	0.00	0.00
9.20	0.00	0.00	0.00	29.60	0.00	0.00	0.00
9.60	0.00	0.00	0.00	30.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00				
10.40	0.00	0.00	0.00				
10.80	0.00	0.00	0.00				
11.20	0.00	0.00	0.00				
11.60	0.00	0.00	0.00				
12.00	0.00	0.00	0.00				
12.40	0.00	0.00	0.00				
12.80	0.00	0.00	0.00				
13.20	0.00	0.00	0.00				
13.60	0.00	0.00	0.00				
14.00	0.00	0.00	0.00				
14.40	0.00	0.00	0.00				
14.80	0.00	0.00	0.00				
15.20	0.00	0.00	0.00				
15.60	0.00	0.00	0.00				
16.00	0.00	0.00	0.00				
16.40	0.00	0.00	0.00				
16.80	0.00	0.00	0.00				
17.20	0.00	0.00	0.00				
17.60	0.00	0.00	0.00				
18.00	0.00	0.00	0.00				
18.40	0.00	0.00	0.00				
18.80	0.00	0.00	0.00				
19.20	0.00	0.00	0.00				
19.60	0.00	0.00	0.00				
20.00	0.00	0.00	0.00				

Events for Subcatchment S-1: Detained Area

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
10-Year 24 hour	4.09	7.59	0.428	3.00
100-Year 6 hour	**4.77**	**12.92**	**0.521**	**3.65**

Events for Pond 1P: Dry Detention

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
10-Year 24 hour	7.59	1.37	770.49	6,203
100-Year 6 hour	**12.92**	**2.97**	**771.27**	**11,020**

Events for Link O: Outlet

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
10-Year 24 hour	1.37	1.37	**0.00**
100-Year 6 hour	**2.97**	**2.97**	0.00

Proposed Conditions
Prepared by Cripe

TABLE OF CONTENTS

Appendix C

Storm Sewer Basins Exhibit and Calculations

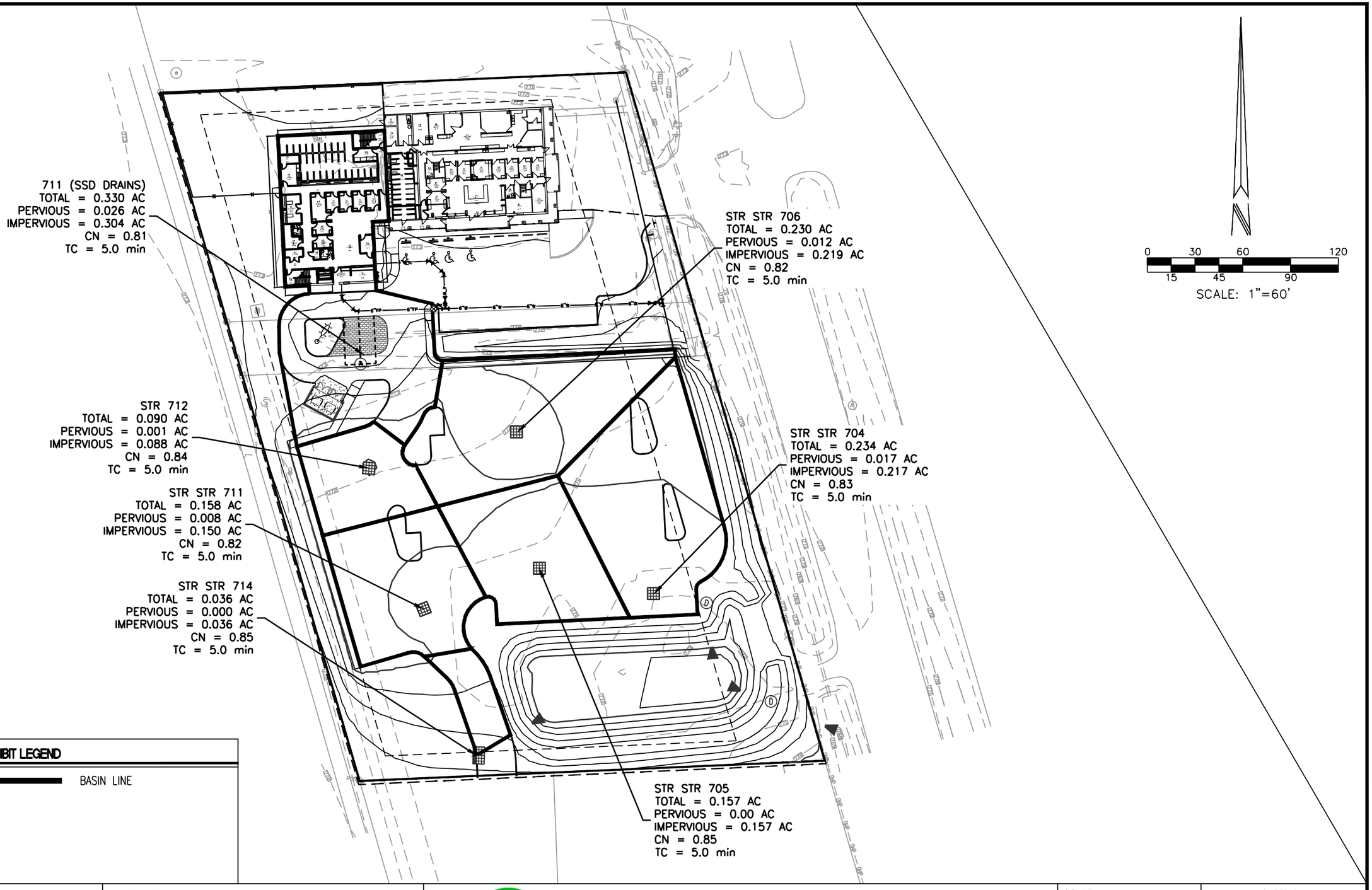


EXHIBIT LEGEND

BASIN LINE

TITLE: PROPOSED STORM BASIN MAP

PROJECT: FRANKLIN ANIMAL CLINIC

OWNER: FRANKLIN ANIMAL CLINIC
2990 NORTH MORTON STREET
FRANKLIN, INDIANA

Cripe®
Solutions by Design Since 1937

3939 PRIORITY WAY SOUTH DRIVE, SUITE 200
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(317) 844-6777
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- SURVEY +3D LASER SCANNING
- ENERGY + FACILITIES
- EQUIPMENT PLANNING
- REAL ESTATE SERVICES

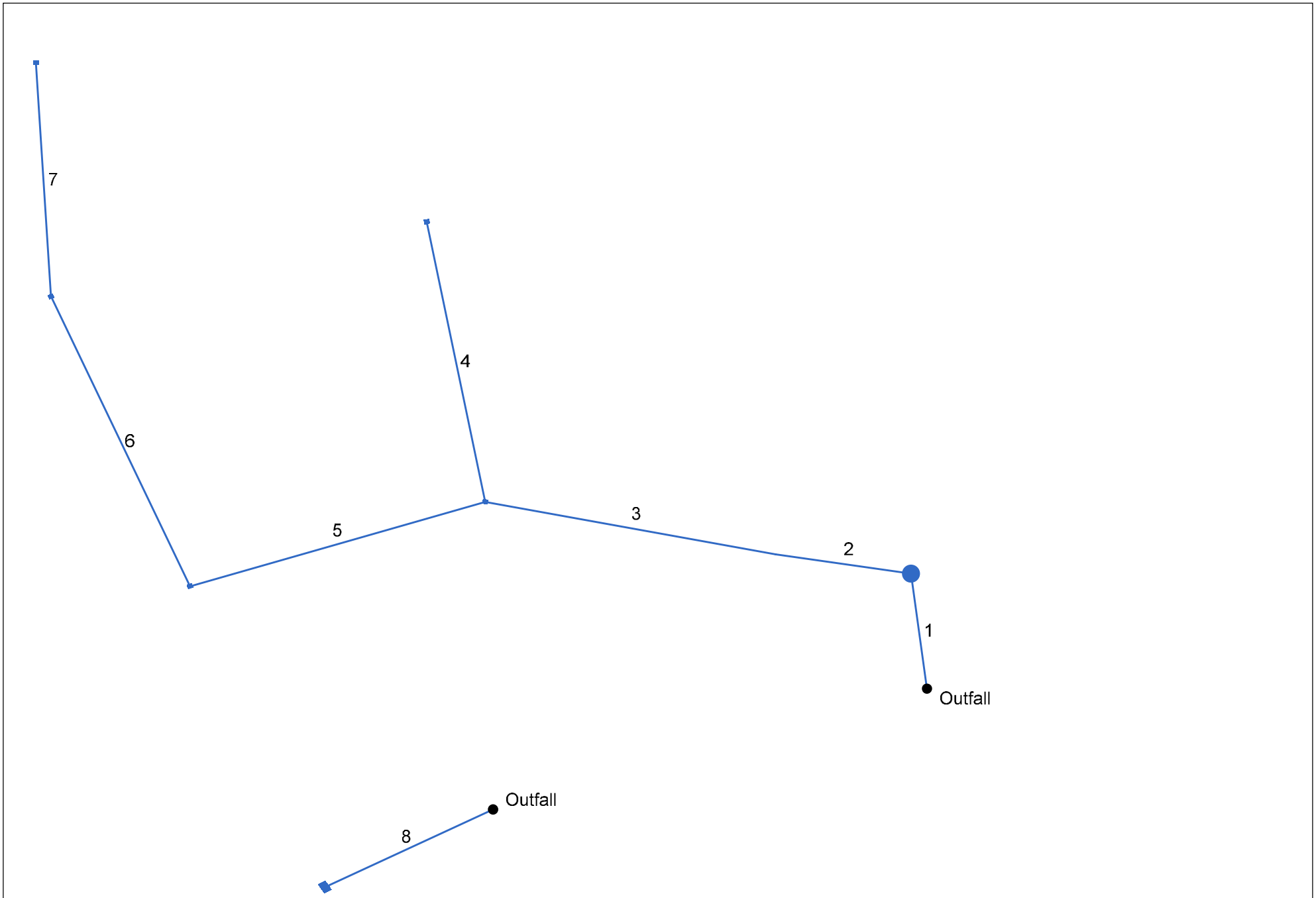
SCALE: 1" = 60'

PROJECT NO: 210092-20000

Date: 10-06-2021

SHEET No. 1 of 1

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Proposed.stm	Number of lines: 8	Date: 10/6/2021

FL-DOT Report

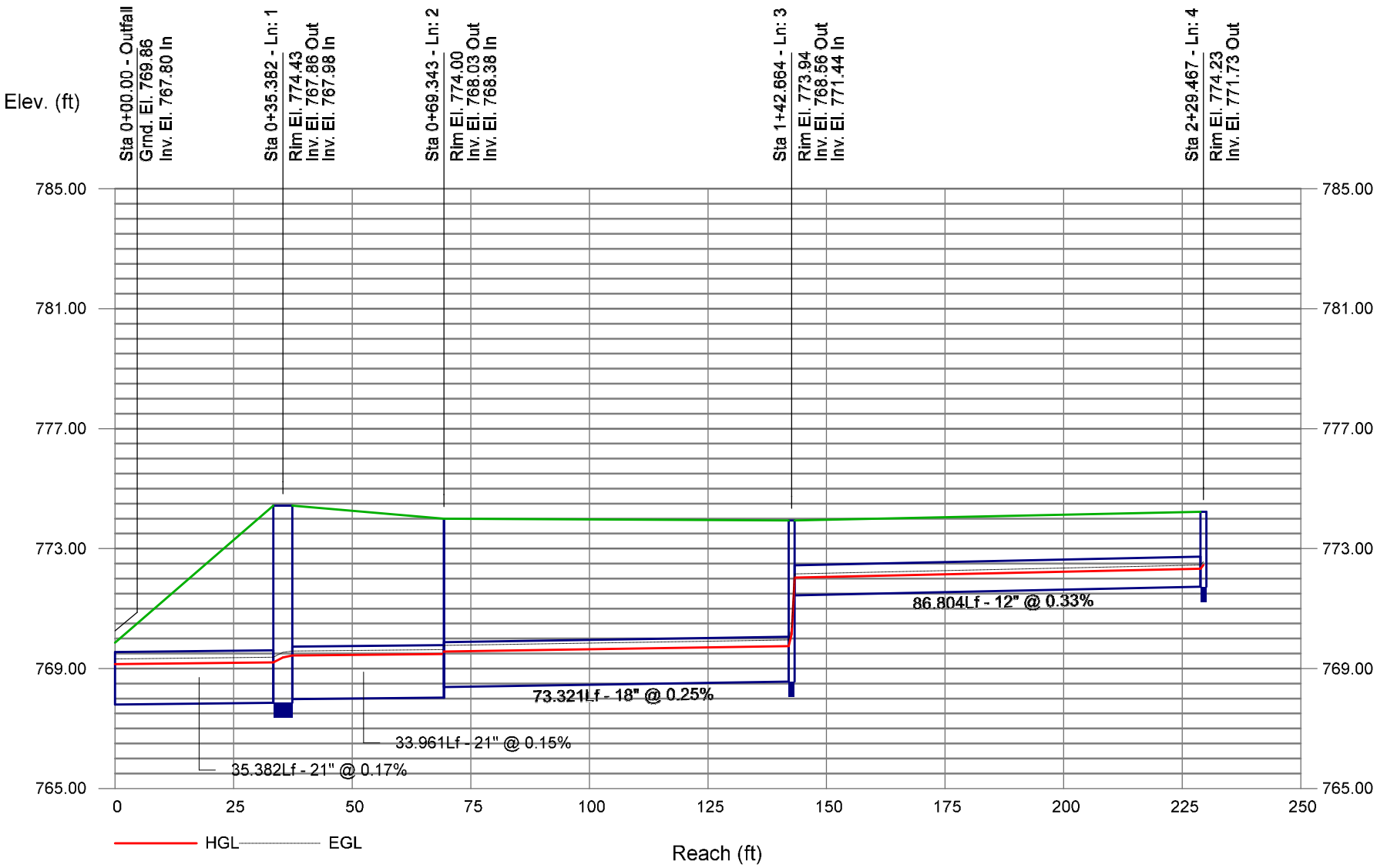
Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 10/6/2021
					C1 = 0.2 C2 = 0.5 C3 = 0.9							Total Flow		Elev of Crown			Span	Pipe	Full Flow		Frequency: 10 yrs
														Elev of Invert							Proj: Proposed.stm
					Increment (ac)	Sub-Total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	MH	0.012	35.382	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	7.07	0.21	6.68	0.99	0.00 6.62	774.43	769.20 769.61 767.86	769.14 769.55 767.80	0.06 0.06	21 21 Cir	0.17 0.17	3.34 2.94	6.62 7.07	13
2	1	Comb	0.012	33.961	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.86	0.20	6.74	0.99	0.00 6.67	774.00	769.48 769.78 768.03	769.43 769.73 767.98	0.05 0.05	21 21 Cir	0.15 0.15	3.12 2.74	6.67 6.59	12
3	2	DrGrt	0.012	73.321	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.47	0.39	6.84	0.80	0.00 5.46	773.94	769.75 770.06 768.56	769.57 769.88 768.38	0.18 0.18	18 18 Cir	0.25 0.25	3.63 3.19	5.46 5.64	4
4	3	DrGrt	0.013	86.804	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.83	7.24	0.19	0.00 1.37	774.23	772.33 772.73 771.73	772.04 772.44 771.44	0.29 0.29	12 12 Cir	0.33 0.33	2.80 2.62	1.37 2.06	5
5	3	DrGrt	0.013	77.181	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.99	0.48	6.96	0.47	0.00 3.30	774.25	770.33 770.42 769.17	770.15 770.16 768.91	0.17 0.26	15 15 Cir	0.23 0.34	2.74 3.05	3.30 3.75	8
6	5	DrGrt	0.012	94.868	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.48	0.51	7.10	0.34	0.00 2.43	774.90	770.83 770.92 769.92	770.51 770.52 769.52	0.32 0.40	12 12 Cir	0.34 0.42	3.17 3.19	2.43 2.51	9
7	6	DrGrt	0.013	71.429	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	0.48	7.24	0.27	0.00 1.93	772.70	771.20 771.20 770.20	771.02 771.02 770.02	0.18 0.18	12 12 Cir	0.25 0.25	2.46 2.28	1.93 1.79	11
8	End	Curb	0.013	47.828	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	2.54	7.24	0.03	0.00 0.25	772.45	770.40 771.20 770.20	770.10 770.90 769.90	0.30 0.30	12 12 Cir	0.64 0.63	2.17 3.59	0.25 2.82	10

NOTES: Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83 (in/hr) ; Time of flow in section is based on full flow.

Project File: Proposed.stm

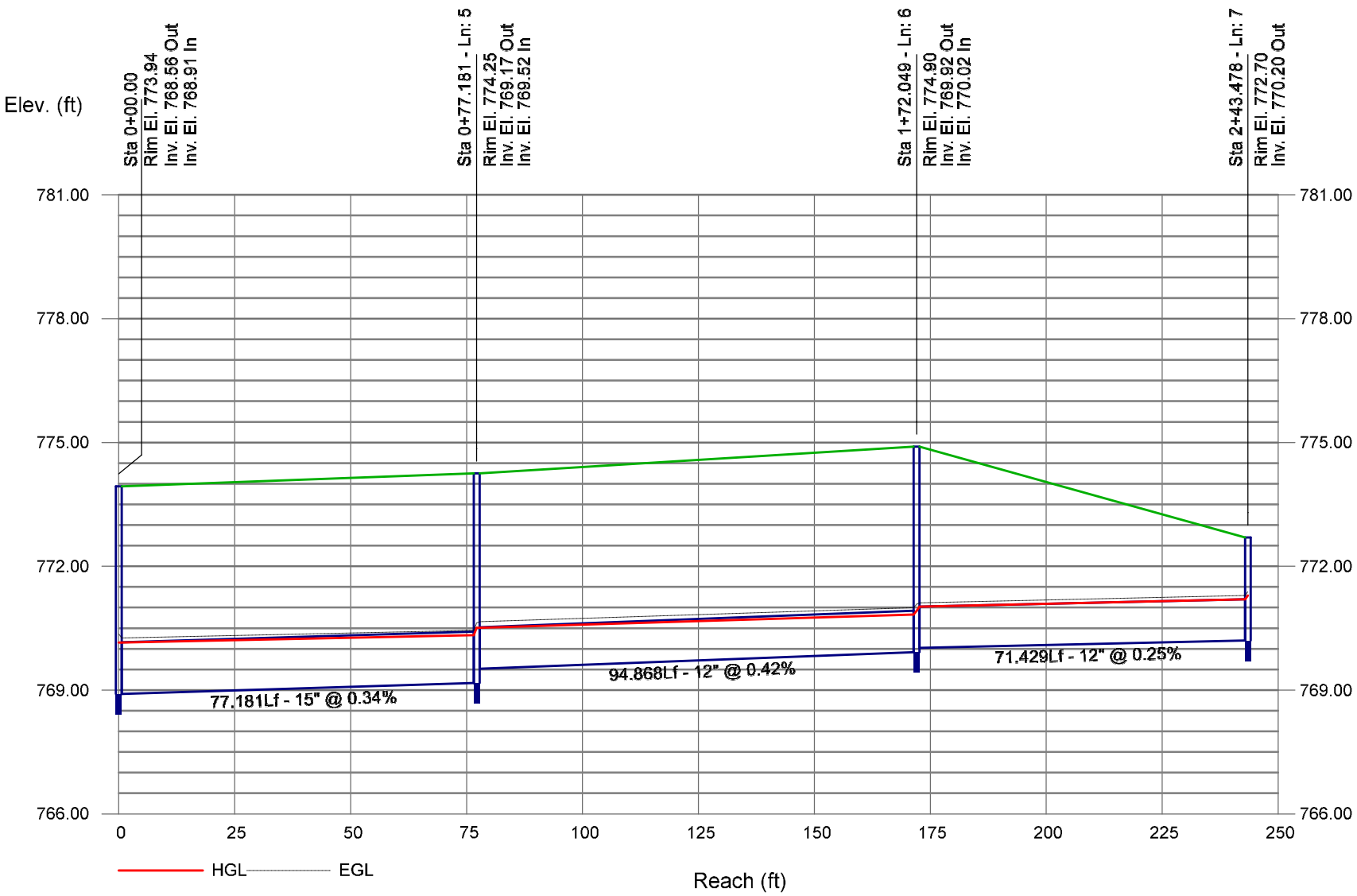
Storm Sewer Profile

Proj. file: Proposed.stm



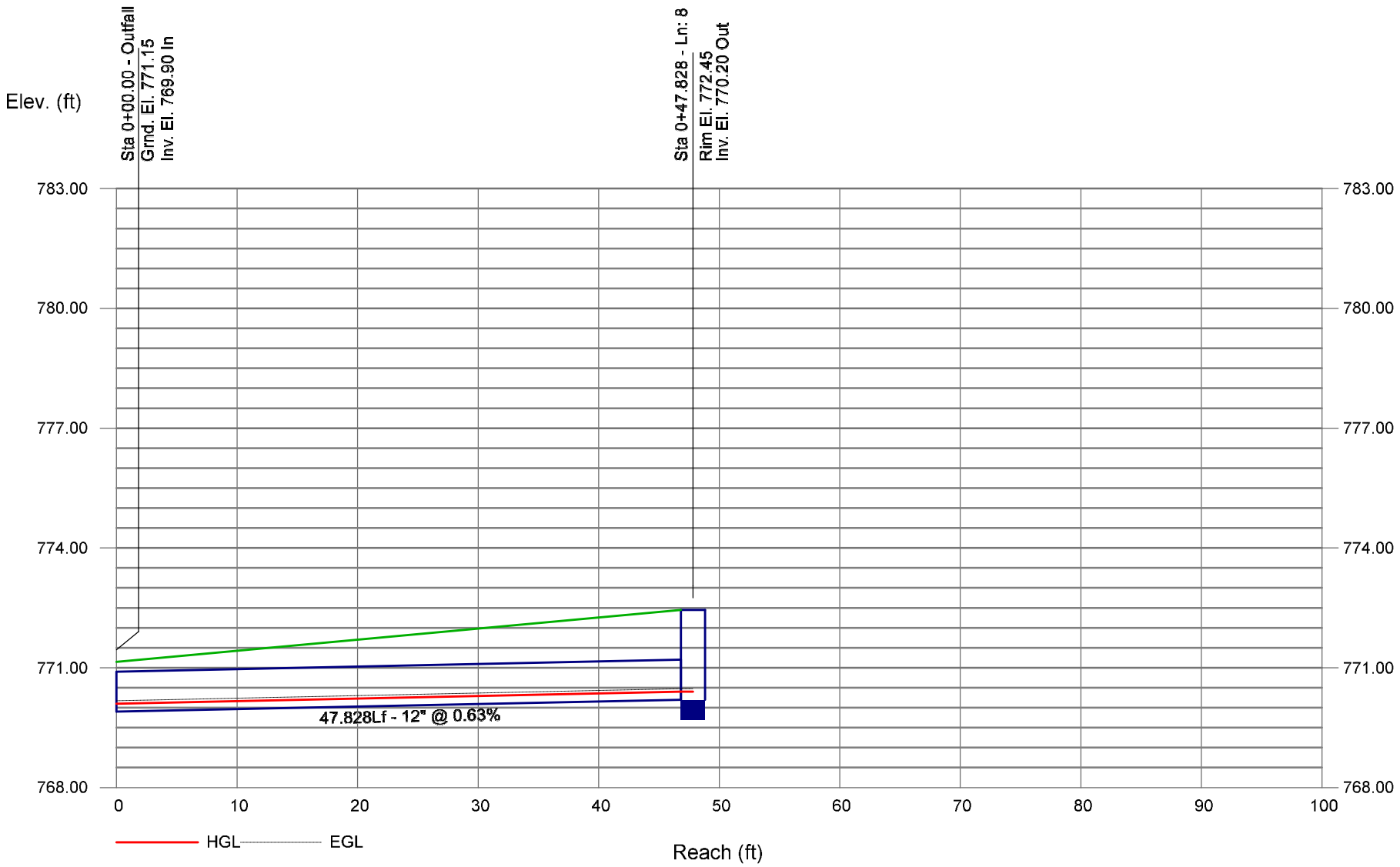
Storm Sewer Profile

Proj. file: Proposed.stm



Storm Sewer Profile

Proj. file: Proposed.stm



Appendix D

Spillway Calculations

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 5 2021

<Name>

Trapezoidal Weir

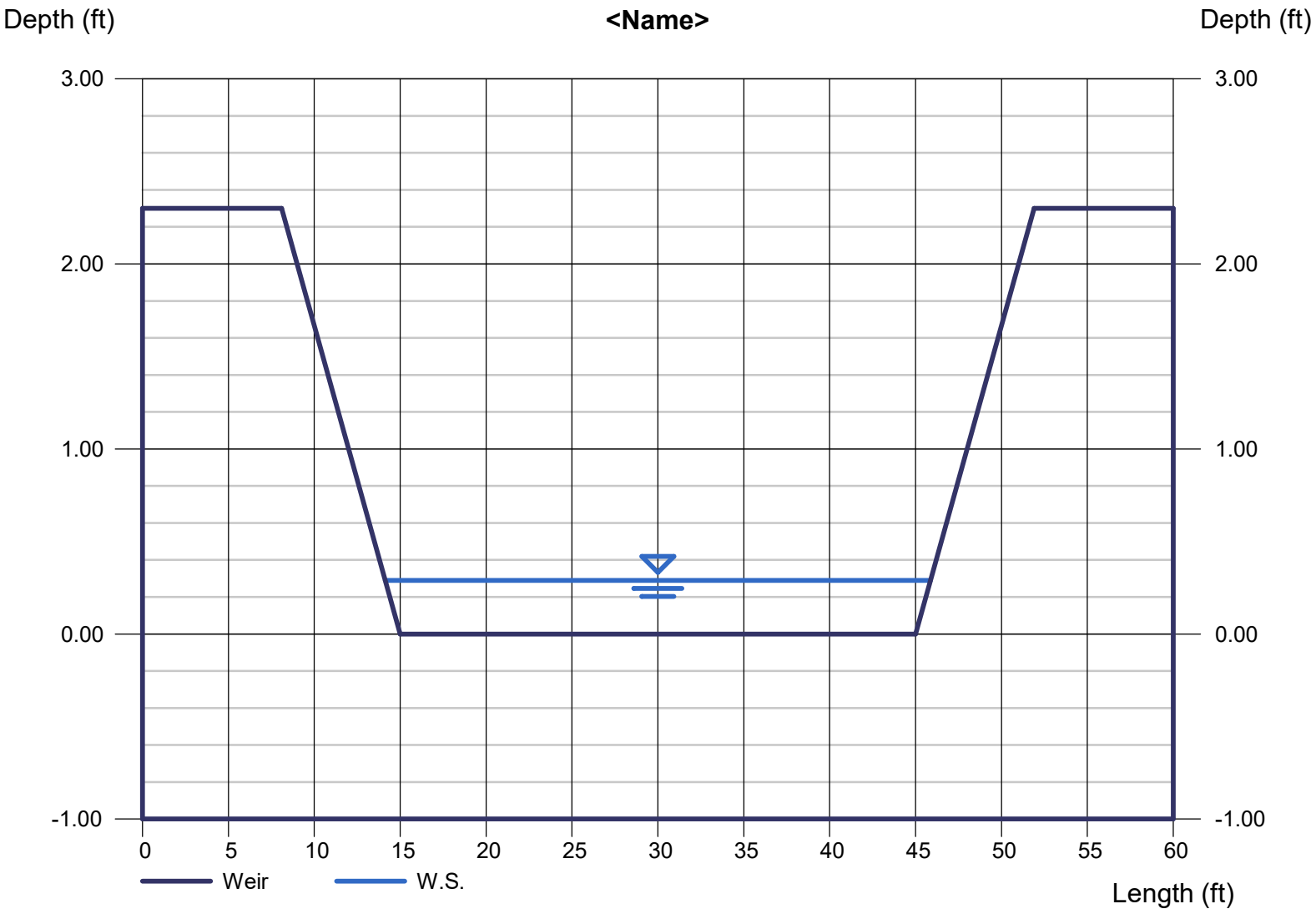
Crest	= Sharp
Bottom Length (ft)	= 30.00
Total Depth (ft)	= 2.30
Side Slope (z:1)	= 3.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 14.53

Highlighted

Depth (ft)	= 0.29
Q (cfs)	= 14.53
Area (sqft)	= 8.95
Velocity (ft/s)	= 1.62
Top Width (ft)	= 31.74



Appendix E

Animal House Drainage Report, May 2006

ANIMAL HOUSE
DRAINAGE REPORT
MAY 17, 2006

Existing Conditions:

A = 1.2 Acres D = 300' C = .3 S = .5% T = 25 min.

$I_2 = 2.25$	CA = 1.1 Acre @ .3 =	.33
$I_{10} = 3.45$	0.1 Acre @ .9 =	.09
$Q_2 = .42\ (2.25) = .95$ cfs		.42
$Q_{10} = .42\ (3.45) = 1.45$ cfs		

Future Conditions:

$I_{10} = 3.45$	CA = 0.6 Acre @ .9 =	.54
$I_{100} = 5.00$	0.6 Acre @ .3 =	.18
		.72

$Q_{10} = .72\ (3.45) = 2.48$ cfs
$Q_{100} = .72\ (5) = 3.6$ cfs

Qstore 100/10 = 3.6 - 1.45 = 2.15 cfs
Qstore 10/2 = 2.48 - .95 = 1.53 cfs

Limit Outfalls to .475 cfs each for 2 year and
.725 each for 10 year.

Use 4" Orifice in each 12"RCP

Peak Storage Required = .14 acre feet or .07 acre feet in each ditch = 3050 cf.

Provided = 300' x 2.5 x 20 x .5 x .5 = 3750 cf.

Prepared by:

Steven B. Williams

STEVEN B. WILLIAMS
REGISTERED
No.
17207
STATE OF
INDIANA

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 1.21 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= 2 DITCHES
Max. Elevation	= 773.28 ft	Max. Storage	= 5,997 cuft

Storage Indication method used.

Outflow hydrograph volume = 17,368 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
648	0.17	771.23	0.15	-----	-----	-----	-----	-----	-----	-----	-----	0.15
720	3.46	772.13	0.80	-----	-----	-----	-----	-----	-----	-----	-----	0.80
792	0.43	773.02	1.13	-----	-----	-----	-----	-----	-----	-----	-----	1.13
864	0.24	772.18	0.83	-----	-----	-----	-----	-----	-----	-----	-----	0.83
936	0.18	771.35	0.31	-----	-----	-----	-----	-----	-----	-----	-----	0.31
1008	0.14	771.23	0.15	-----	-----	-----	-----	-----	-----	-----	-----	0.15
1080	0.12	771.22	0.13	-----	-----	-----	-----	-----	-----	-----	-----	0.13

...End

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	2.75	6	732	11,416	---	-----	-----	EXIST
2	SCS Runoff	4.28	6	726	17,368	---	-----	-----	FUTURE
3	Reservoir	1.21	6	756	17,368	2	773.28	5,997	DETENTION

Proj. file: ANIMAL.gpw | Return Period: 100 yr | Run date: 05-17-2006

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.95 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= 2 DITCHES
Max. Elevation	= 772.51 ft	Max. Storage	= 2,842 cuft

Storage Indication method used.

Outflow hydrograph volume = 9,895 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
720	1.93	771.73	0.60	-----	-----	-----	-----	-----	-----	-----	-----	0.60
792	0.27	772.12	0.80	-----	-----	-----	-----	-----	-----	-----	-----	0.80
864	0.15	771.29	0.23	-----	-----	-----	-----	-----	-----	-----	-----	0.23
936	0.11	771.21	0.12	-----	-----	-----	-----	-----	-----	-----	-----	0.12

...End

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.25	6	732	5,471	---	-----	-----	EXIST
2	SCS Runoff	2.43	6	726	9,895	---	-----	-----	FUTURE
3	Reservoir	0.95	6	750	9,895	2	772.51	2,842	DETENTION

Proj. file: ANIMAL.gpw | Return Period: 10 yr | Run date: 05-17-2006

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.65 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 2	Reservoir name	= 2 DITCHES
Max. Elevation	= 771.82 ft	Max. Storage	= 1,002 cuft

Storage Indication method used.

Outflow hydrograph volume = 4,800 cuft

Hydrograph Discharge Table

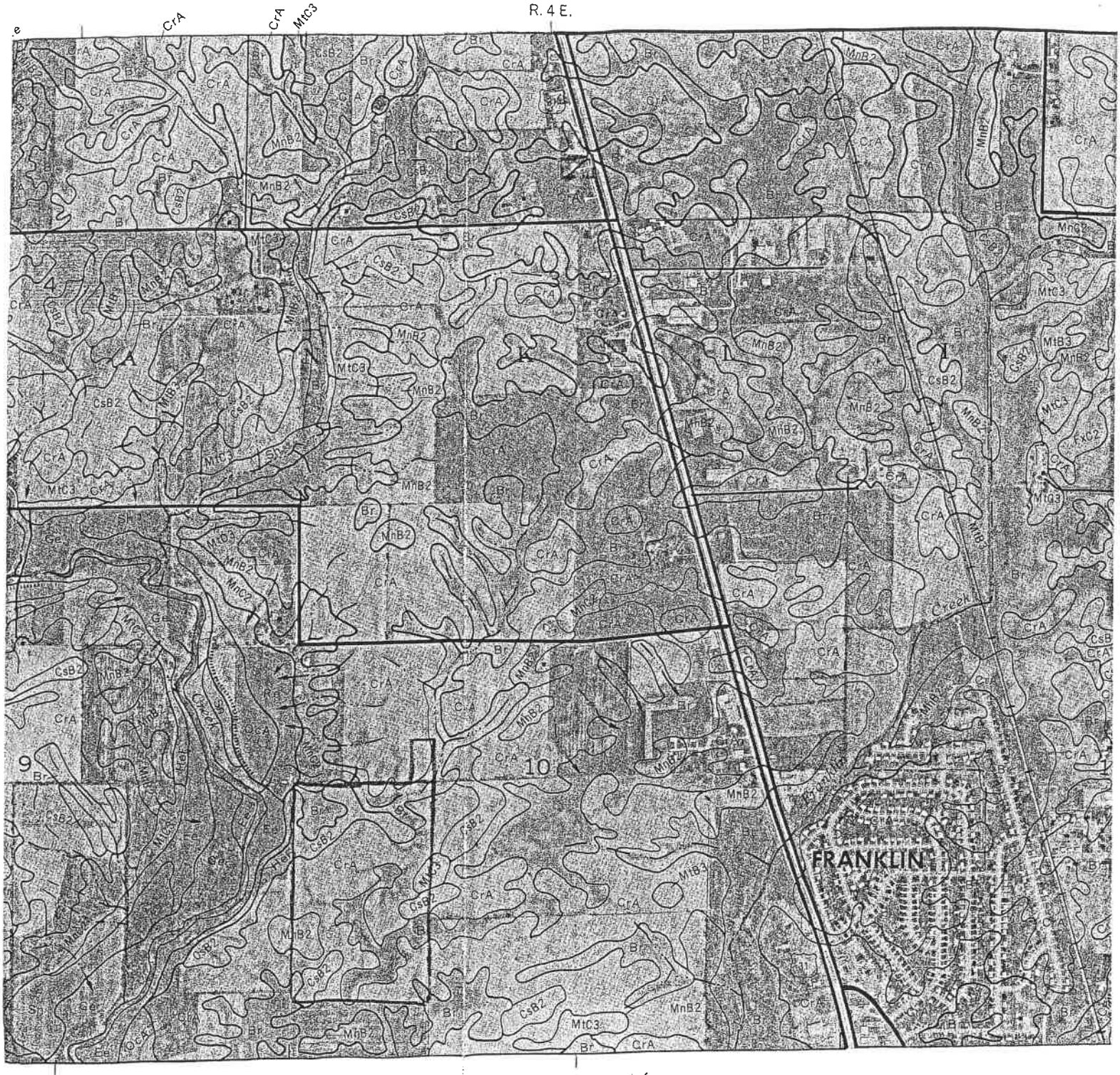
Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
720	0.87	771.41	0.37	-----	-----	-----	-----	-----	-----	-----	-----	0.37
792	0.14	771.37	0.33	-----	-----	-----	-----	-----	-----	-----	-----	0.33
864	0.08	771.19	0.09	-----	-----	-----	-----	-----	-----	-----	-----	0.09
936	0.06	771.17	0.07	-----	-----	-----	-----	-----	-----	-----	-----	0.07

...End

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.36	6	732	1,963	---	-----	-----	EXIST
2	SCS Runoff	1.15	6	732	4,800	---	-----	-----	FUTURE
3	Reservoir	0.65	6	744	4,800	2	771.82	1,002	DETENTION

Proj. file: ANIMAL.gpw | Return Period: 2 yr | Run date: 05-17-2006



1/2 Crosby
1/2 Brookston
Meadow = 65
Imp = 98

EXIST. = 68
Future = 82

Project ANIMAL Hosp. Detention Facility Design Return Period 100 yrs.

Designer SBW Release Rate Return Period 10 yrs.

Watershed Area 1.2 acres

Time of Concentration (undeveloped watershed) 25 minutes

Rainfall Intensity (i_U) 3.45 inches/hr

Undeveloped Runoff Coefficient (C_U) .42

Undeveloped Runoff Rate ($O = C_U i_U A_U$) 1.45 cfs

Developed Runoff Coefficient (C_D) .72

Storm Duration t_d (hrs)	Rainfall Intensity i_d (inches/hr)	Inflow Rate $I(t_d)$ $(C_D i_d A_D)$ (cfs) $CA = .72$	Outflow Rate O $(C_U i_U A_U)$ (cfs)	Storage Rate $I(t_d)-O$ (cfs)	Required Storage $\left[I(t_d)-O\right]\frac{t_d}{12}$ (acre-ft)
0.17	7.0	5.04	.725	4.3	.06
0.33	5.5	3.96		3.2	.09
0.50	4.5	3.24		2.5	.10
0.67	3.9	2.81		2.1	.12
0.83	3.4	2.45		1.7	.12
1.0	3.0	2.16		1.4	.12
1.5	2.5	1.80		1.1	.14 ← PK
2.0	2.0	1.44		0.7	.12
3.0	1.5	1.08		.35	.09
4.0	1.3	.94		.20	.07
5.0	1.0				
6.0	0.9				
7.0	0.75				
8.0	0.68				
9.0	0.62				
10.0	0.57				
11.0	0.52				
12.0	0.48				

Figure 6.2 Computation Sheet for Detention Storage Calculations Using the Rational Method

FIGURE 5

FLOW FOR CIRCULAR PIPE FLOWING FULL
BASED ON MANNING'S EQUATION n=0.013

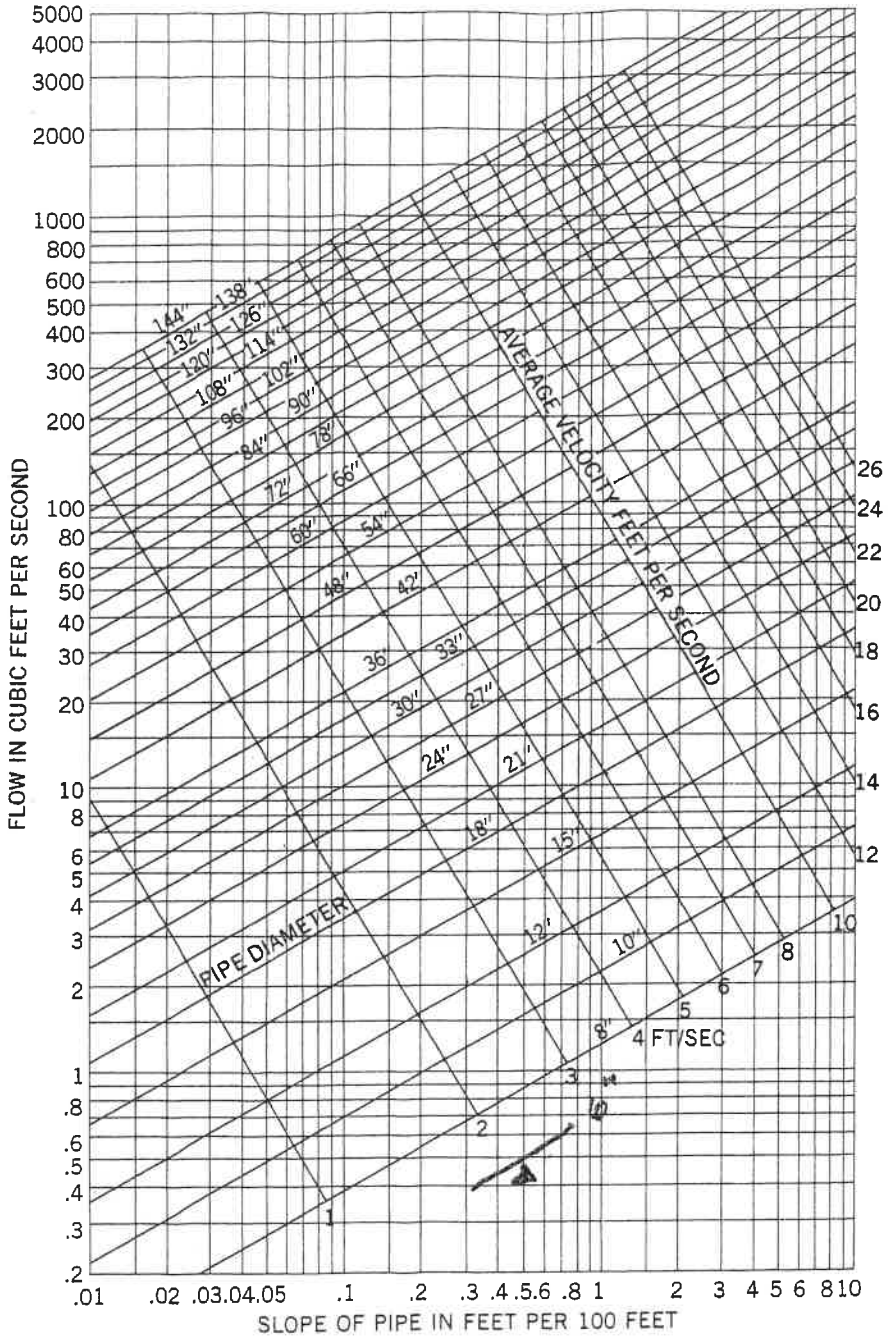
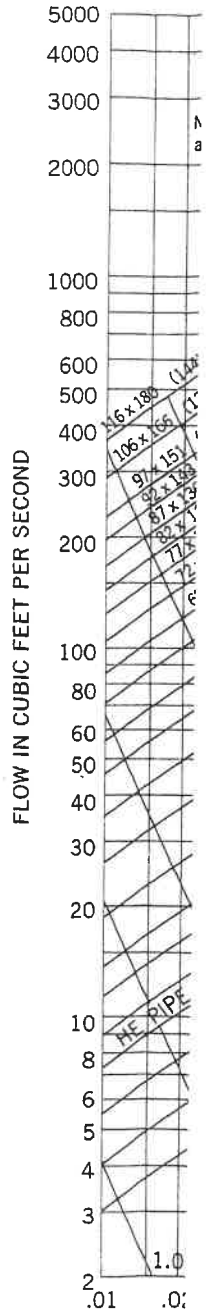


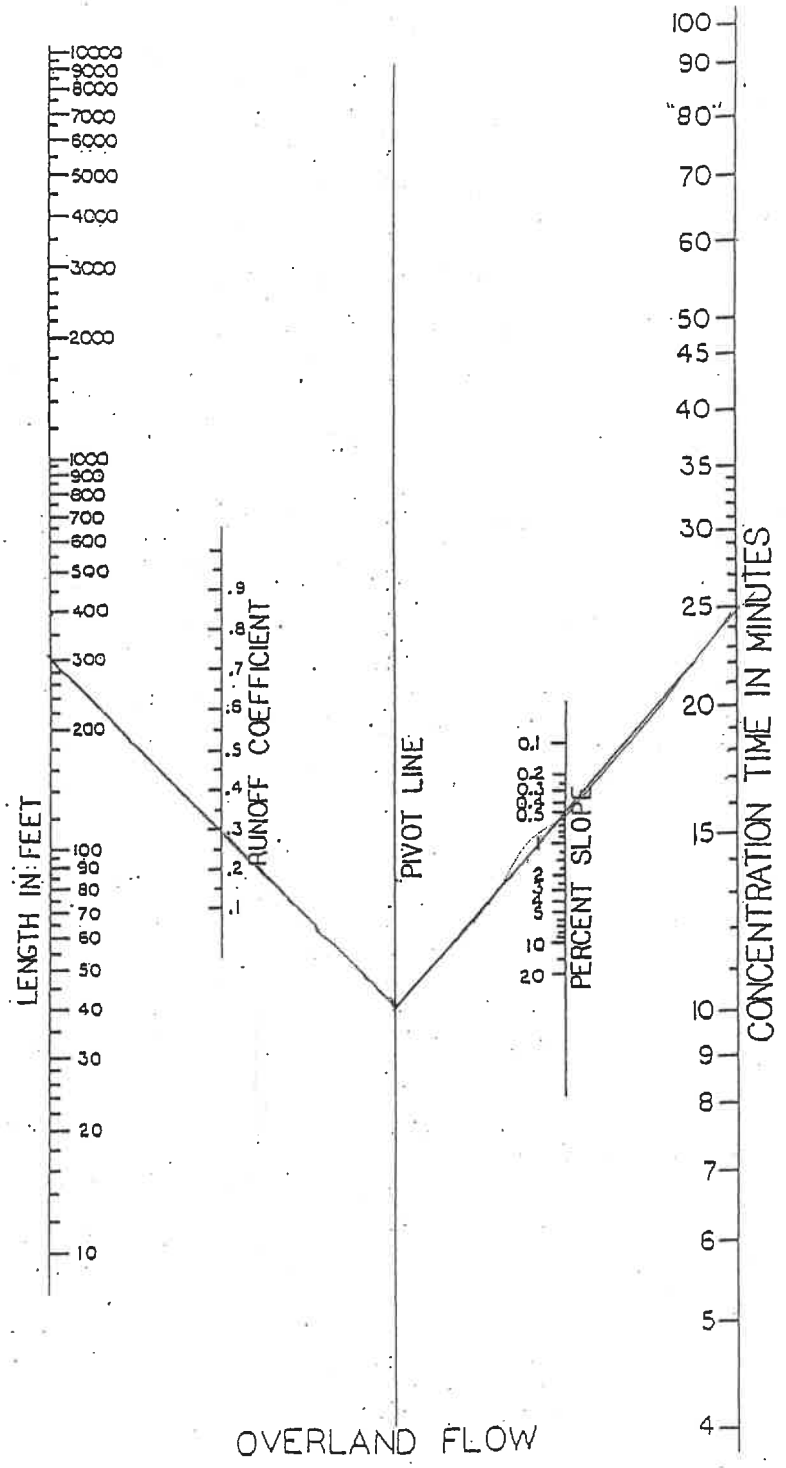
FIGURE 6

FLOW



OVERLAND FLOW AND RUN-OFF COEFFICIENT

FIGURE 5.3



RAINFALL INTENSITY VALUES

Indianapolis, Indiana

Duration (Minutes)	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5	4.50	5.50	6.30	7.30	8.00	8.50
6	4.30	5.30	6.00	7.00	7.70	8.20
7	4.10	5.10	5.75	6.75	7.40	7.90
8	3.90	4.90	5.50	6.50	7.10	7.60
9	3.70	4.70	5.25	6.25	6.80	7.30
10	3.50	4.50	5.00	6.00	6.50	7.00
15	2.90	3.70	4.40	5.10	5.60	6.10
20	2.50	3.30	3.80	4.50	5.00	5.50
25	2.25	2.95	3.45	4.05	4.50	5.00
30	2.00	2.60	3.10	3.60	4.00	4.50
40	1.65	2.25	2.60	3.10	3.50	3.90
50	1.45	2.00	2.30	2.75	3.10	3.40
60	1.25	1.75	2.10	2.50	2.70	3.00
120	0.78	1.10	1.30	1.60	1.70	2.00
180	0.58	0.80	1.00	1.20	1.30	1.50
240	0.47	0.65	0.80	0.95	1.10	1.30

For Additional Values See Referenced Publications

Values taken from graph prepared by U.S. Department of Commerce Weather Bureau based on recorded rainfalls from 1903 to 1951
See Technical Paper No. 25, Page 14, or Indiana State Highway Commission Hydraulic Design of Drainage Culverts, Page 35

References:

2019 Revised Storm Water Standards Design and Construction Specifications Manual
http://www.indy.gov/eGov/City/DPW/Business/Specs/Pages/UpdatedStormWaterManual.aspx

Soil map and Classification
http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Flood Insurance Rate Map
https://msc.fema.gov/portal/search?AddressQuery=hamilton%20county%2C%20indiana?AddressQuery=hamilton%20county%2C%20indiana#searchresultsanchor