DRAINAGE ANALYSIS FOR 622 SILVERLEAF COURT

TECHNICAL MEMORANDUM – 2/2018 - FINAL

PREPARED FOR: LEXINGTON FAYETTE URBAN COUNTY GOVERNMENT

PREPARED BY: BELL ENGINEERING

DATE: FEBRUARY, 2018

1.0 BACKGROUND

The Lexington Fayette Urban County Government (LFUCG) has contracted with Bell Engineering (Bell) to evaluate the cause of reported storm sewer surcharging and flooding into the home at 622 Silverleaf Court. The property consists of a 12,190 square foot lot containing a one story structure with a walkout basement. The finished floor elevation of the structure is approximately 985.06'. The property receives surface water flow from surrounding homes on Brynell Drive to the North, Silverleaf Drive to the East and Northside Drive from the West.

The property has what appears to be a Neenah R4350-D beehive grate inlet located in the backyard, see Figure 1. This drain inlet is part of LFUCG's drainage system. The inlet discharges to the East through a 15-inch reinforced concrete pipe that leads to a series of manholes and storm inlets on Silverleaf Drive. This structure experiences repeated surcharging. Given the surrounding contours, this area is a low spot, which results in flooding. An alternative analysis was conducted of this area that provides the best and most cost-effective solution to prevent future flooding at this location.

Figure 1. NE3_426SI in the driveway of 622 Silverleaf Court

2.0 BASIS OF DESIGN

In an effort to better understand the hydrology of the project area's storm system, a SCS-TR-20 type model was created using the modeling software HydroCad. Results of the model are included as Appendix D. For the model and other aspects of this technical memorandum, the following parameters were used:

1. The project area watersheds were delineated using LFUCG provided contours and surveyed points
2. A unique curve number (CN) was determined for each watershed. In general, the reflected CN was based off of 1/4 acre residential lots and soil data provided by USDA Web Soil Survey
3. It was discovered during the survey work that there is a bottle neck in the culvert beneath Silverleaf Drive, between NE3_429CI and NE3_430CI. There appears to be a 12-inch sleeve inside of the 15-inch pipe. For modeling purposes, this stretch of pipe was modeled as a 12-inch pipe
4. Data was obtained from USGS to determine a rainfall intensity for the June 23, 2017 storm. The storm was modeled as a 6 hour rainfall event utilizing a type II distribution pattern with a total rainfall depth of 2.87 inches.
5. The antecedent moisture condition was considered as "wet" for this analysis because of rainfall that occurred within 24 hours of the design storm.

3.0 RESULTS

LFUCG provided mapping indicating structure NE3_439CI, located in the street of 1900 Brynell Drive, is connected to structure NE3_426SI behind 622 Silverleaf Court. According to nearby residents, the structure on Brynell Drive has since been filled with concrete, and the storm connection to NE3_426SI has been abandoned. During surveying efforts, this was confirmed. However, an additional storm structure was found in the back yard of 1904 Brynell. The inlet pipe of the found structure appears to run along the back property lines of 1904 and 1900 Brynell Drive. This line is abandoned. The outlet pipe of the found structure runs in the direction of NE3_426SI. During the survey, no flow was seen in this line.

As previously mentioned, structure NE3_426SI has a R4350D beehive grate. The calculated peak flow to this structure, using a 4 in/hr. intensity, is 7.8 cfs. The inlet's capacity was obtained directly from the Neenah Foundry website using the R4350-D grate inlet parameters in an online capacity calculator. The capacity of the inlet varies depending on the depth of hydraulic head on the grate. The difference in elevation from the surface of the grate to the crown of the driveway of 622 Silverleaf Court is approximately 1.0 foot. Using a hydraulic head of 1.0 foot the capacity of the beehive inlet is 7.7 cfs. At one foot of elevation head over the beehive inlet the surface water reaches the crown of the driveway and drains towards the basement finished floor elevation. Therefore, in its current condition, the inlet does not have adequate capacity to pass a 4-inch per hour storm event without flooding the basement floor of the subject property.

The storm systems hydraulic grade line was calculated using the LFUCG 25 year 24 hour event and the June 23, 2017 event. These are included in Appendix C.

The model indicates that the problem in the area is related to undersized pipes. Starting from 622 Silverleaf Court to NE3 431 SI there is 15-inch reinforced concrete pipe. Then, a short section of 15-inch has been choked down to 12 inches between NE3 428MH and NE3 429CI, beneath Silverleaf Drive. Beyond NE3 431SI, the existing pipe increases to 18 inches. At NE3 431SI, the model indicates 23.5 cfs of flow for the 25 year 24 hour storm event. The capacity of an 18-inch RCP pipe, with a 1% slope is approximately 10.54 cfs. It should also be noted that there are pipe slopes in this area that have less than minimum grades allowed by current design and construction practice. The existing pipes are not only undersized, but are below minimum grades.

4.0 ALTERNATE 1 – SEALING OFF 622 SILVERLEAF COURT

This alternate replaces the beehive inlet NE3_426SI to increase capacity of the inlet but assumes that the inlet will surcharge. However, it takes steps to remove flooding in the basement of 622 Silverleaf. Under this alternate, the area beneath the wood deck in the back yard would be sealed off, and turned into an additional room for the owner. A doorway would be installed for access to the garage. The area around the new room, including the driveway will be regraded and repaved to provide positive drainage away from the new room. A map of this alternate is included in Appendix A. A detailed opinion of probable construction cost for this alternative is included in Appendix B.

4.1 ALTERNATE 2 – PURCHASING 622 SILVERLEAF COURT

Under this alternate the residence of 622 Silverleaf Court would be demolished and all pavements removed. The lot would be returned to a pervious condition and act as a retention basin during storm events. The beehive grate inlet will have the capacity to pass the peak flows since additional head will be able to be impressed on the system without flooding concerns. In addition, less impervious area would be contributing to the drainage area, thus reducing runoff. A map is included in Appendix A of this alternate. A detailed opinion of probable construction cost for this alternative is included in Appendix B.

4.1 ALTERNATE 3 – RELIEF STORM SEWER AT NE3_427

Alternate 1 consists of replacing the existing beehive inlet, NE3_426SI at 622 Silverleaf Court and upsizing the pipe to 18 inches from 622 Silverleaf to the downstream manhole, NE3_427. A new line will be installed beneath Silverleaf Drive, between structures NE3_427 to NE3_430, to eliminate the undersized pipe between NE3_429 and NE3_430. In addition, a 24-inch relief storm sewer will be installed starting at NE3_427 and run on the west side of the roadway to a new junction box near the corner of Silverleaf Drive and Silverleaf Court. The pipe will then turn east, beneath Silverleaf Drive, and run between 619 and 623 Silverleaf Drive. A stormwater easement will need to be purchased from these residents. The pipe will tie into an existing storm sewer in the back yard of 619 Silverleaf Drive, which discharges into a sink hole at the corner of Silverleaf Drive and Lombardy Drive. From the tie in point to the headwall, the storm sewer will be upsized.

The trees and shrubs inside of the sinkhole would be cleared, and grass will be planted. A security fence and signage should be placed around the property to prevent trespassing. The existing sinkhole should also be fitted with a new surface grate as none currently exists. A map of this alternate is included in Appendix A.

This alternate reduces the flooding that occurs at 622 Silverleaf Court. It also uses nearby natural drainage features, such as the sinkhole, to remove the excess runoff. It must be noted that under this alternate, the following assumptions have been made relating to the sinkhole area:

1. There appears to be an injection well inside the sinkhole. It is assume that the well does not contain any flow restrictions. The well was modeled as an orifice.
2. The sinkhole is assume to drain indefinitely.

As a result of changing the hydraulics to the sinkhole, we recommend that a flow/dump test be performed on the sinkhole. This test would include discharging a large volume of water into the sinkhole to confirm the sinkhole's ability to drain runoff. In addition, a geotechnical study should be performed on the sinkhole. This study would include an electrical resistivity test to map the sinkhole system followed by confirmation borings. The geotechnical study would further prove or disapprove the assumptions mentioned above and determine the potential need for future monitoring.

Discharging to the sinkhole under Alternate 1 falls under the Underground Injection Control (UIC) Class V Wells for Injection of Non-Hazardous Fluids into or Above Underground Sources of Drinking Water (USDWs) regulated by the EPA and permitting may be required. EPA establishes minimum requirements to prevent injection wells from contaminating underground sources of drinking water. In most cases, Class V wells are permitted without a permit as long as the owners:

- Submit inventory information to their permitting authority and verify that they are authorized to inject. The permitting authority will review the information to be sure that the well will not endanger a USDW.
- Operate the wells in a wat that does not endanger USDWs. The permitting authority will explain any specific requirements.
- Properly close their Class V wells when it is no longer being used. The well should be closed in a way that prevents movement of any contaminated fluids into USDWs.

After reviewing the owner's inventory information, the permitting authority may determine that an individual permit is necessary to prevent USDW contamination. In addition to this process, a KPDES permit may be required from KDOW depending on specifics of the site during construction.

This alternate maintains a maximum water surface elevation at the beehive inlet at 984.15, or an inch over the top of the beehive grate inlet and 11" below the basement FFE. However, this alternate does not eliminate surcharging that the model indicates on structures further downstream in the system that are outside of the project area. The model result for this alternate is included as Appendix E. A detailed opinion of probable construction cost for this alternative is included in Appendix B.

5.0 CONCLUSION

Based on the analysis performed under the constraints by LFUCG, several options were modeled to determine the best solutions to prevent the flooding at 622 Silverleaf Court. An option considered was to re-direct all the roof water from the surrounding homes to their respective fronting streets, since it was observed in the field that much of this water is currently directed toward the subject property. While this solution worked for the June 23, 2017 storm by keeping the beehive grate inlets surface water elevation below the finished floor elevation of the home, it did not work in the 25 year-24 hour event.

A retention pond was also considered for construction in the backyards of the homes fronting Lombardy Drive and Silverleaf Drive near the existing inlet NE3_431. This option was ruled out because there is not enough storage volume available in the area to retain the LFUCG design storms while maintaining an adequate elevation difference between the top of the ponded water and the finish flood elevation of the surrounding homes.

The problem is evident through the analysis that the drainage system is undersized and inadequate to carry the design storms. Given that this area sits in a low spot, there are limited alternate to improve the issue. Based off of the opinion of probable construction cost, we recommend that Alternate 1 be selected. The cost to upsize storm sewers downstream is not an economical solution compared to the recommended flood proofing alternate. By addressing the flooding concerns at 622 Silverleaf Court, we avoid changing the hydrology in the area and the potential for negatively impacting properties downstream.

5.1 PROJECT UPDATE (MAY 2018)

LFUCG selected Alternate 1 and Bell proceeded with Phase 2 of the project. Phase 2 involved completing a waterproofing plan schematic for the homeowner of 622 Silverleaf Court, Jeffrey Cox and reviewing the plan with Mr. Cox. The schematic drawing is attached in Appendix E. In summary, the schematic included the following components:

1. **Installation of a new waterproof half-wall under the back deck of the house, sealing off the basement from future flooding.**
2. **A large opening with a horizontal sliding waterproof garage door to allow access into the basement garage.**
3. **Regrading of the driveway was to establish positive drainage away from the residence and toward the yard inlet.**

After the review of the plans, Mr. Cox decided that he did not wish to proceed with the water proofing plans. Rather, Mr. Cox would prefer LFUCG explore the previously mentioned Alternate 2 and an agreement be prepared on purchasing his home. An email from Mr. Cox is included in Appendix E disclosing his desire to proceed with the purchase of his home.

Appendix A – Silverleaf Drainage Analysis Alternative Maps

N

1949 BRYNELL DR

8 in.

1919 BRYNELL DR

BRYNELL

557 NORTHSIDE DR

1916 BRYNELL DR

606 SILVERLEAF DR

1912 BRYNELL DR

NE3_429CI

NE3_428MH

NE3_427MH

NE3_430CI

SILVERLEAF

8 in.

NE3_434SI

611 SILVERLEAF DR

620 LOMBARDY DR

NE3_431SI

NE3_423MH

601 LOMBARDY DR

613 LOMBARDY DR

617 LOMBARDY DR

621 LOMBARDY DR

624 LOMBARDY DR

625 LOMBARDY DR

1908 BRYNELL DR

NEW NE3_426SI

610 SILVERLEAF DR

615 SILVERLEAF DR

NE3_438MH

NE3_439CI

1900 BRYNELL DR

1904 BRYNELL DR

614 SILVERLEAF DR

ENCLOSE THE AREA BENEATH THE DECK

REPLACE AND REGRADE DRIVEWAY

619 SILVERLEAF DR

628 LOMBARDY DR

NE3_432SI

LOMBARDY

601 NORTHSIDE DR

622 SILVERLEAF CT

623 SILVERLEAF DR

632 LOMBARDY DR

605 NORTHSIDE DR

626 SILVERLEAF CT

609 NORTHSIDE DR

638 SILVERLEAF DR

NE3_433HW

NORTHSIDE

608 NORTHSIDE DR

Legend

- Storm Structure
- Storm Sewer

Sewer Line

- Sewer Line
- Parcel
- Contour

SCALE: 1:850

DATE: FEBRUARY 2018

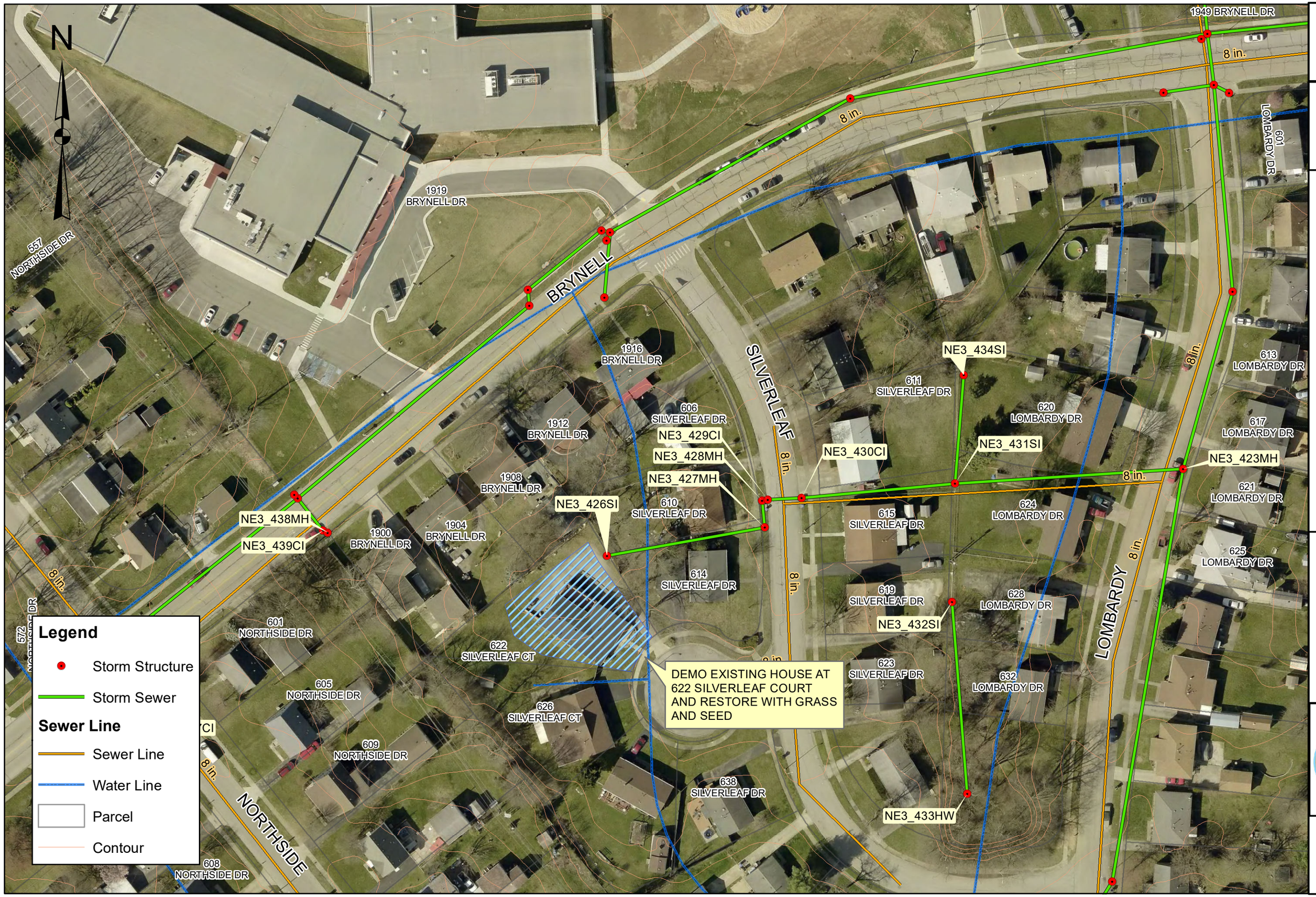
ALTERNATE 1 - ENCLOSING THE AREA BENEATH THE DECK

SILVERLEAF COURT DRAINAGE ANALYSIS

LEXINGTON, KENTUCKY

LEXINGTON FAYETTE URBAN COUNTY GOVERNMENT KENTUCKY 1775

bell engineering



SCALE: 1:850

DATE: DECEMBER 2017

ALTERNATE 2 - PURCHASING 622 SILVERLEAF CT
SILVERLEAF COURT DRAINAGE ANALYSIS
LFUCG
LEXINGTON, KENTUCKY

bell engineering

N

1949 BRYNELL DR

8 in.

1919 BRYNELL DR

BRYNELL

557 NORTHSIDE DR

1916 BRYNELL DR

606 SILVERLEAF DR

1912 BRYNELL DR

SILVERLEAF

NE3_434SI

611 SILVERLEAF DR

620 LOMBARDY DR

613 LOMBARDY DR

601 LOMBARDY DR

617 LOMBARDY DR

NE3_428MH

NE3_429CI

NE3_431SI

NE3_423MH

NE3_430CI

621 LOMBARDY DR

624 LOMBARDY DR

UNKNOWN STRUCTURE

REPLACE NE3_426SI

NEW 18-INCH STORM SEWER TO REPLACE EXISTING LINE

610 SILVERLEAF DR

615 SILVERLEAF DR

NE3_438MH

NE3_439CI

1900 BRYNELL DR

1904 BRYNELL DR

REPLACE NE3_427

625 LOMBARDY DR

NE3_432SI

614 SILVERLEAF DR

619 SILVERLEAF DR

628 LOMBARDY DR

622 SILVERLEAF CT

601 NORTHSIDE DR

572 NORTHSIDE DR

NEW CBI

NEW STORM MH

NEW RELIEF STORM SEWER

623 SILVERLEAF DR

632 LOMBARDY DR

605 NORTHSIDE DR

626 SILVERLEAF CT

609 NORTHSIDE DR

638 SILVERLEAF DR

REPLACE NE3_433HW

EXISTING SINKHOLE

LOMBARDY

NORTHSIDE

Legend

- Ex. Storm Structure
- Ex. Storm Sewer

Ex. Sewer Line

- Ex. Sewer Line
- Parcel
- Contour

SCALE: 1:850

DATE: JANUARY 2018

ALTERNATE 3 - RELIEF STORM SEWER
SILVERLEAF COURT DRAINAGE ANALYSIS
LFUCG
LEXINGTON, KENTUCKY

FAYETTE URBAN COUNTY GOVERNMENT LEXINGTON KENTUCKY 1775

bell engineering

Appendix B – Opinion of Probable Construction Costs

ENGINEERS' OPINION OF PROBABLE CONSTRUCTION COSTS
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
DRAINAGE ANALYSIS FOR 622 SILVERLEAF COURT - ALTERNATE 1
FEBRUARY, 2018

No.	Item	Amount	Unit	Unit Cost	Total
1	Enclose area beneath wooden deck	360	SF	$110.00	$39,600.00
2	Remove Bituminous Concrete Pavement	250	SY	$9.00	$2,250.00
3	Bituminous Base	15	TN	$95.00	$1,425.00
4	Bituminous Surface Less than 50 tons	15	TN	$115.00	$1,725.00
5	Surface Inlet Type "A"	1	Ea	$2,500.00	$2,500.00
6	Sod / Remediate Yards	1	LS	$3,500.00	$3,500.00
7	SubTotal				$51,000.00
8	Contingency (10%)				$5,100.00
9	**Total Opinion of Probable Construction Costs**				**$56,100.00**

ENGINEERS' OPINION OF PROBABLE CONSTRUCTION COSTS
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
DRAINAGE ANALYSIS FOR 622 SILVERLEAF COURT - ALTERNATE 2
FEBRUARY, 2018

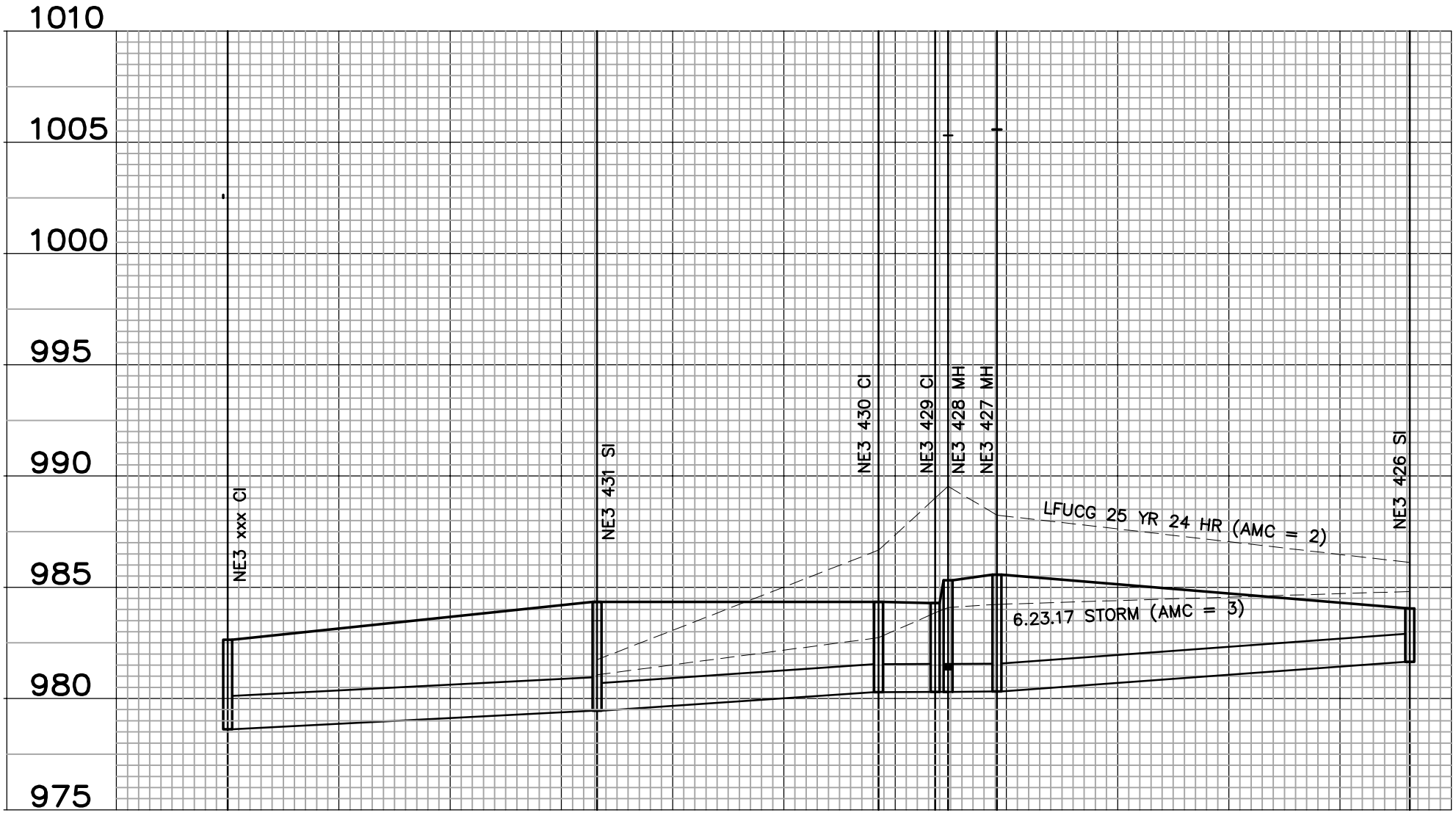
No.	Item	Amount	Unit	Unit Cost	Total
1	Purchase Home at 622 Silverleaf Ct.	1	L.S	$125,000.00	$125,000.00
2	Transfer / Title Work	1	L.S	$3,000.00	$3,000.00
3	Demolish 622 Silverleaf Ct. Structure	1	L.S	$25,000.00	$25,000.00
4	Asbestos Treatment	1	L.S	$5,000.00	$5,000.00
5	Remove Pavements at 622 Silverleaf Ct.	1	L.S	$1,000.00	$1,000.00
6	Seed and Straw	1	L.S	$2,500.00	$2,500.00
	SubTotal				$161,500.00
	Total Opinion of Probable Construction Costs				**$161,500.00**

ENGINEERS' OPINION OF PROBABLE CONSTRUCTION COSTS
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
DRAINAGE ANALYSIS FOR 622 SILVERLEAF COURT - ALTERNATE 3
FEBRUARY, 2018

No.	Item	Amount	Unit	Unit Cost	Total
1	Surface Inlet Type "A"	1	Ea	$2,500.00	$2,500.00
2	4' Diameter Manhole	2	Ea	$4,000.00	$8,000.00
3	Curb Box Inlet Type C	2	Ea	$3,750.00	$7,500.00
4	Straight Headwall	1	Ea	$2,500.00	$2,500.00
5	18" RCP Storm Sewer	180	LF	$50.00	$9,000.00
6	24" RCP Storm Sewer	400	LF	$75.00	$30,000.00
7	Tie existing pipe into new storm structure	2	Ea	$1,000.00	$2,000.00
8	Remove Sidewalk	65	SY	$11.50	$700.00
9	6" Concrete Sidewalk (4' wide)	65	SY	$45.00	$2,900.00
10	Remove Curb and Gutter	150	L.F.	$8.00	$1,200.00
11	Curb and Gutter, Type 1	150	L.F.	$21.50	$3,200.00
12	6" Concrete Entrance Pavement	15	SY	$60.00	$900.00
13	Bituminous Pavement Milling and Texturing	35	Tons	$47.00	$1,600.00
14	Class 1, Bituminous Surface (including driveways)	35	Tons	$115.00	$4,000.00
15	Class 1, Bituminous Base	10	Tons	$98.20	$1,000.00
16	Clearing and Grubbing sinkhole	1	L.S	$5,000.00	$5,000.00
17	Fencing and Signage Surrounding Sinkhole	1	L.S	$10,000.00	$10,000.00
18	Grate fitted on Sinkhole outlet	1	L.S	$2,500.00	$2,500.00
19	Electrical Resistivity Test (Geotechnical Report)	1	L.S	$15,000.00	$15,000.00
20	Confirmation Boring (Geotechnical Report)	1	L.S	$10,000.00	$10,000.00
21	Sod / Remediate Yards	1	L.S	$5,000.00	$5,000.00
22	Erosion and Sediment Control (silt fence, inlet protection)	1	L.S	$5,000.00	$5,000.00
23	Prepare SWPP	1	L.S	$1,250.00	$1,300.00
24	Permanent/Temporary Construction Easement	1	L.S.	$10,000.00	$10,000.00
25	Utility Relocation	1	L.S.	$3,000.00	$3,000.00
26	Mobilization/Demobilization	1	L.S.	$5,250.00	$5,300.00
27	Traffic Control	1	L.S	$3,000.00	$3,000.00
	SubTotal				$152,000.00
	Contingency (10%)				$15,200.00
	Total Opinion of Probable Construction Costs				**$167,200.00**

Appendix C – Hydraulic Profile of Subject System

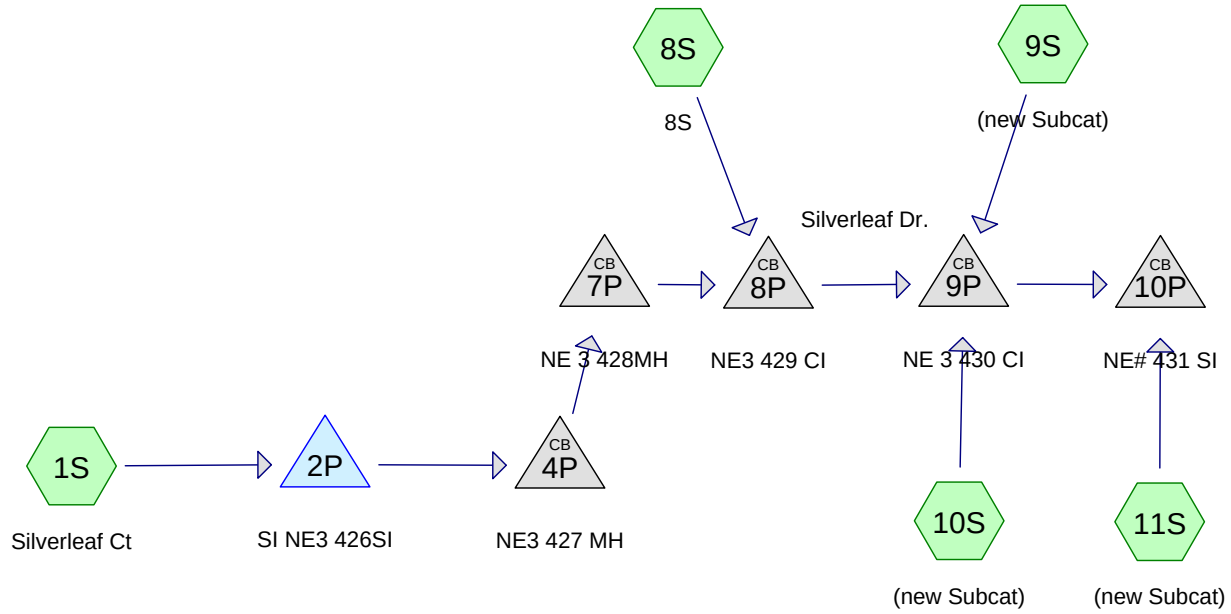
for the June 23, 2017 storm and the LFUCG 25 year -24 hour storm.



HYDRAULIC GRADE LINE – SILVERLEAF COURT

Appendix D – HydroCad Model Output

for the June 23, 2017 storm and the LFUCG 25 year -24 hour storm.



Subcat Reach Pond Link

Routing Diagram for 622 Silverleaf Modified CNs
Prepared by Microsoft, Printed 12/6/2017

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.716	79	1 acre lots, 20% imp, HSG C (11S)
5.447	83	1/4 acre lots, 38% imp, HSG C (8S, 9S, 10S)
2.469	80	<50% Grass cover, Poor, HSG C (1S)
8.631	**82**	**TOTAL AREA**

622 Silverleaf Modified CNs

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	10S	0.00	0.00	250.0	0.0050	0.013	15.0	0.0	0.0
2	2P	981.65	980.32	129.0	0.0103	0.015	15.0	0.0	0.0
3	4P	980.32	980.30	21.9	0.0009	0.015	15.0	0.0	0.0
4	7P	980.30	980.29	1.8	0.0056	0.010	12.0	0.0	0.0
5	8P	980.29	980.24	25.5	0.0020	0.013	15.0	0.0	0.0
6	9P	980.24	979.45	126.5	0.0062	0.013	15.0	0.0	0.0
7	10P	979.45	978.62	166.0	0.0050	0.013	18.0	0.0	0.0

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Silverleaf Ct Runoff Area=107,531 sf 0.00% Impervious Runoff Depth=1.09"
Flow Length=288' Tc=9.7 min CN=80 Runoff=2.74 cfs 0.224 af

Subcatchment 8S: 8S Runoff Area=85,464 sf 38.00% Impervious Runoff Depth=1.27"
Flow Length=537' Tc=18.6 min CN=83 Runoff=2.28 cfs 0.208 af

Subcatchment 9S: (new Subcat) Runoff Area=85,793 sf 38.00% Impervious Runoff Depth=1.27"
Flow Length=572' Tc=15.6 min CN=83 Runoff=2.34 cfs 0.209 af

Subcatchment 10S: (new Subcat) Runoff Area=66,000 sf 38.00% Impervious Runoff Depth=1.27"
Flow Length=416' Tc=12.2 min CN=83 Runoff=1.85 cfs 0.161 af

Subcatchment 11S: (new Subcat) Runoff Area=31,170 sf 20.00% Impervious Runoff Depth=1.03"
Flow Length=250' Slope=0.0100 '/' Tc=26.5 min CN=79 Runoff=0.68 cfs 0.061 af

Pond 2P: SI NE3 426SI Peak Elev=985.26' Storage=999 cf Inflow=2.74 cfs 0.224 af
15.0" Round Culvert n=0.015 L=129.0' S=0.0103 '/' Outflow=7.57 cfs 0.232 af

Pond 4P: NE3 427 MH Peak Elev=985.97' Inflow=7.57 cfs 0.232 af
15.0" Round Culvert n=0.015 L=21.9' S=0.0009 '/' Outflow=7.57 cfs 0.232 af

Pond 7P: NE 3 428MH Peak Elev=986.68' Inflow=7.57 cfs 0.232 af
12.0" Round Culvert n=0.010 L=1.8' S=0.0056 '/' Outflow=7.57 cfs 0.232 af

Pond 8P: NE3 429 CI Peak Elev=985.66' Inflow=8.72 cfs 0.440 af
15.0" Round Culvert n=0.013 L=25.5' S=0.0020 '/' Outflow=8.72 cfs 0.440 af

Pond 9P: NE 3 430 CI Peak Elev=985.66' Inflow=10.36 cfs 0.809 af
15.0" Round Culvert n=0.013 L=126.5' S=0.0062 '/' Outflow=10.36 cfs 0.809 af

Pond 10P: NE# 431 SI Peak Elev=982.79' Inflow=10.88 cfs 0.871 af
18.0" Round Culvert n=0.013 L=166.0' S=0.0050 '/' Outflow=10.88 cfs 0.871 af

Total Runoff Area = 8.631 ac Runoff Volume = 0.862 af Average Runoff Depth = 1.20"
74.36% Pervious = 6.418 ac 25.64% Impervious = 2.213 ac

Summary for Subcatchment 1S: Silverleaf Ct

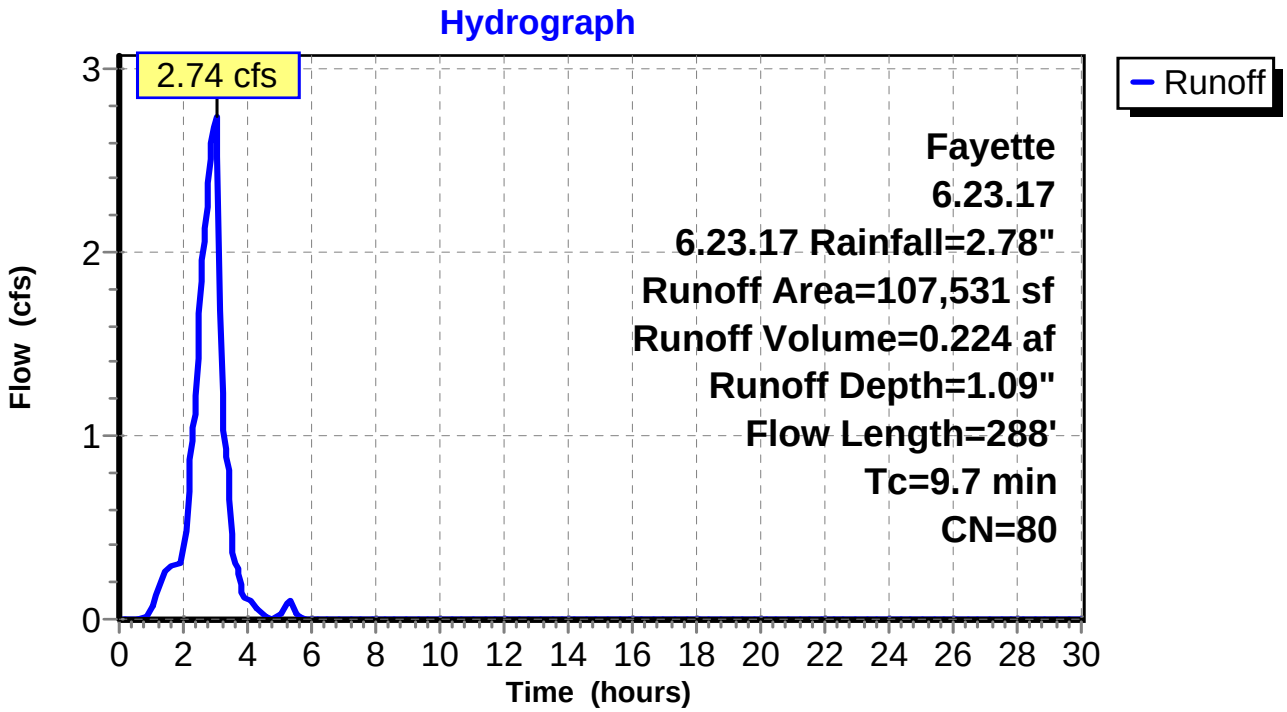
Runoff = 2.74 cfs @ 3.01 hrs, Volume= 0.224 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette 6.23.17 6.23.17 Rainfall=2.78"

	Area (sf)	CN	Description
*	107,531	80	<50% Grass cover, Poor, HSG C
	107,531		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	165	0.0660	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.3	30	0.0660	1.77		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
0.5	93	0.0320	2.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.7	288	Total			

Subcatchment 1S: Silverleaf Ct



Summary for Subcatchment 8S: 8S

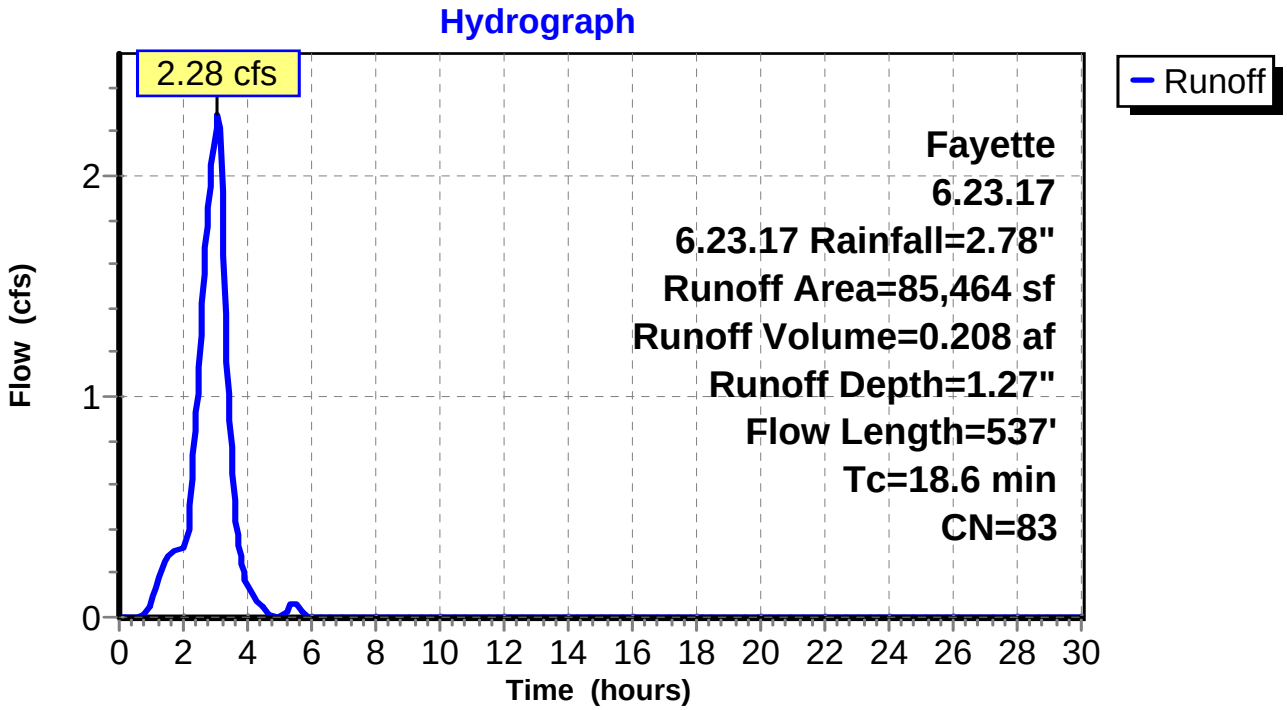
Runoff = 2.28 cfs @ 3.07 hrs, Volume= 0.208 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette 6.23.17 6.23.17 Rainfall=2.78"

Area (sf)	CN	Description
85,464	83	1/4 acre lots, 38% imp, HSG C
52,988		62.00% Pervious Area
32,476		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	300	0.0533	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
2.9	237	0.0046	1.38		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	537	Total			

Subcatchment 8S: 8S



Summary for Subcatchment 9S: (new Subcat)

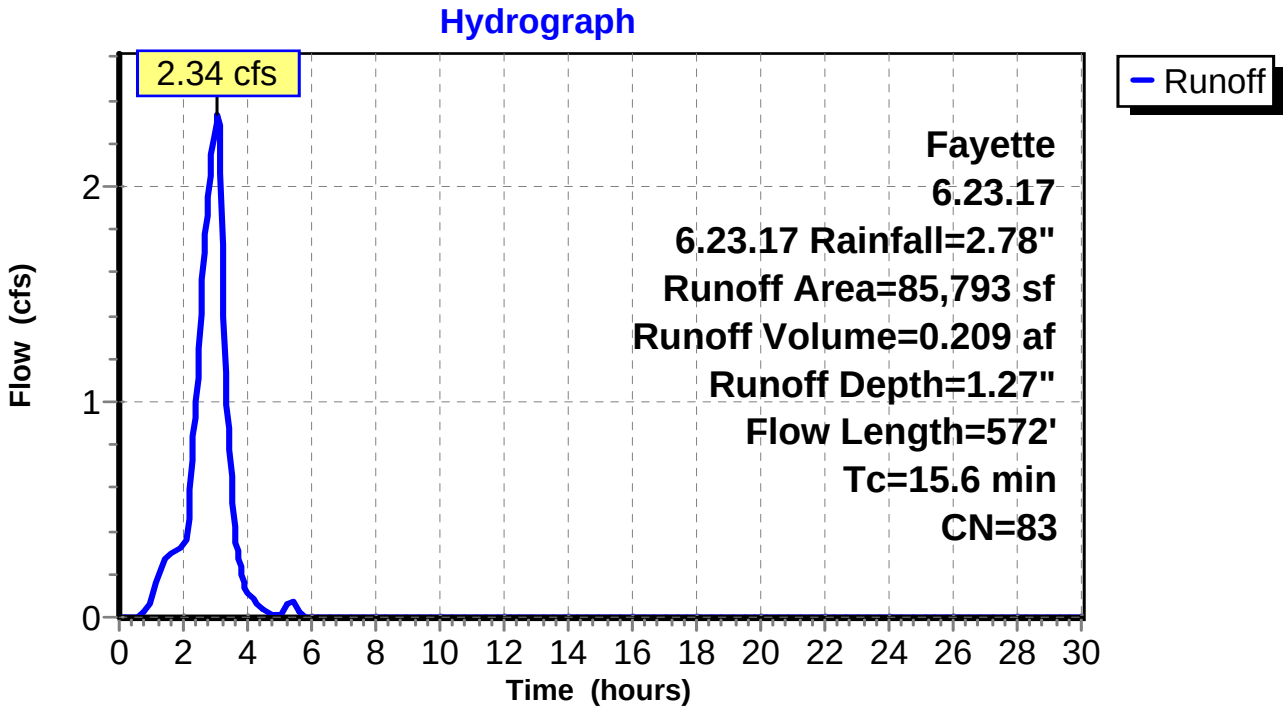
Runoff = 2.34 cfs @ 3.05 hrs, Volume= 0.209 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette 6.23.17 6.23.17 Rainfall=2.78"

Area (sf)	CN	Description
85,793	83	1/4 acre lots, 38% imp, HSG C
53,192		62.00% Pervious Area
32,601		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	265	0.0528	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
1.4	307	0.0315	3.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.6	572	Total			

Subcatchment 9S: (new Subcat)



Summary for Subcatchment 10S: (new Subcat)

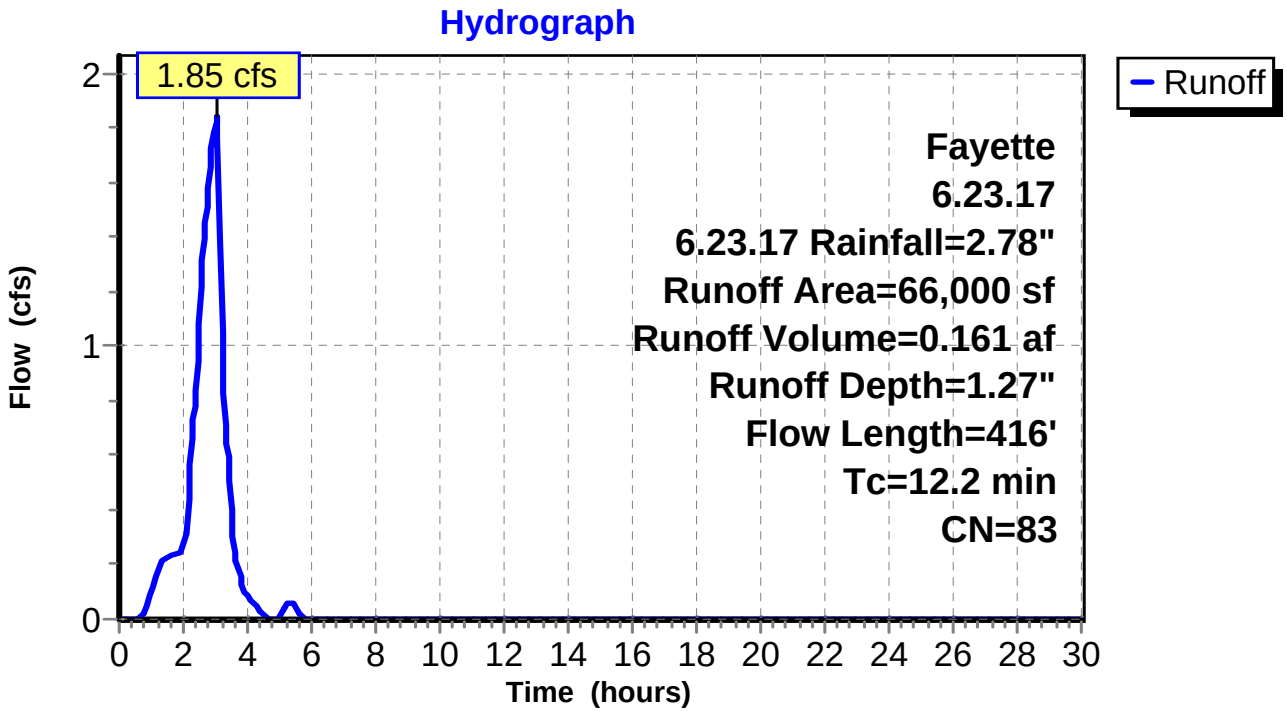
Runoff = 1.85 cfs @ 3.03 hrs, Volume= 0.161 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette 6.23.17 6.23.17 Rainfall=2.78"

Area (sf)	CN	Description
66,000	83	1/4 acre lots, 38% imp, HSG C
40,920		62.00% Pervious Area
25,080		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	166	0.0391	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
1.1	250	0.0050	3.72	4.57	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
12.2	416	Total			

Subcatchment 10S: (new Subcat)



Summary for Subcatchment 11S: (new Subcat)

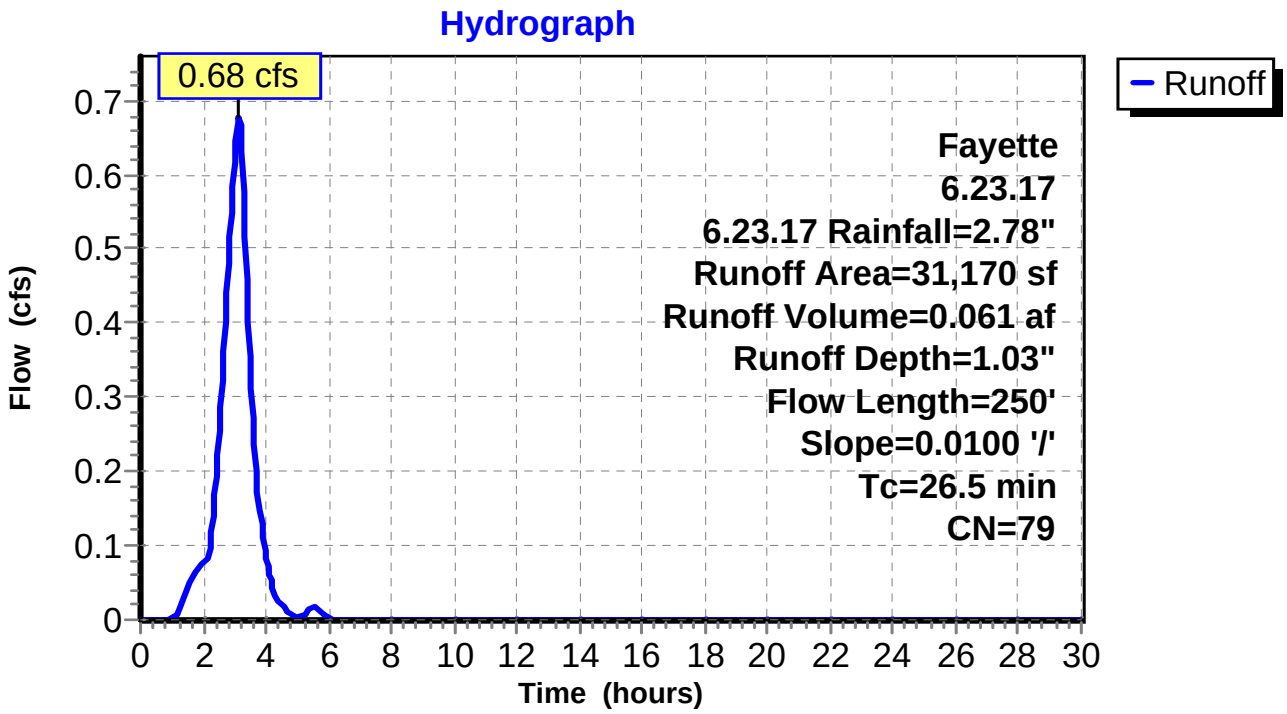
Runoff = 0.68 cfs @ 3.15 hrs, Volume= 0.061 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette 6.23.17 6.23.17 Rainfall=2.78"

Area (sf)	CN	Description
31,170	79	1 acre lots, 20% imp, HSG C
24,936		80.00% Pervious Area
6,234		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.5	250	0.0100	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"

Subcatchment 11S: (new Subcat)



Summary for Pond 2P: SI NE3 426SI

Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 1.09" for 6.23.17 event
Inflow = 2.74 cfs @ 3.01 hrs, Volume= 0.224 af
Outflow = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af, Atten= 0%, Lag= 20.2 min
Primary = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 985.26' @ 3.10 hrs Surf.Area= 2,186 sf Storage= 999 cf
Flood Elev= 984.05' Surf.Area= 100 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 3.6 min (170.5 - 166.9)

Volume	Invert	Avail.Storage	Storage Description
#1	984.05'	84,160 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

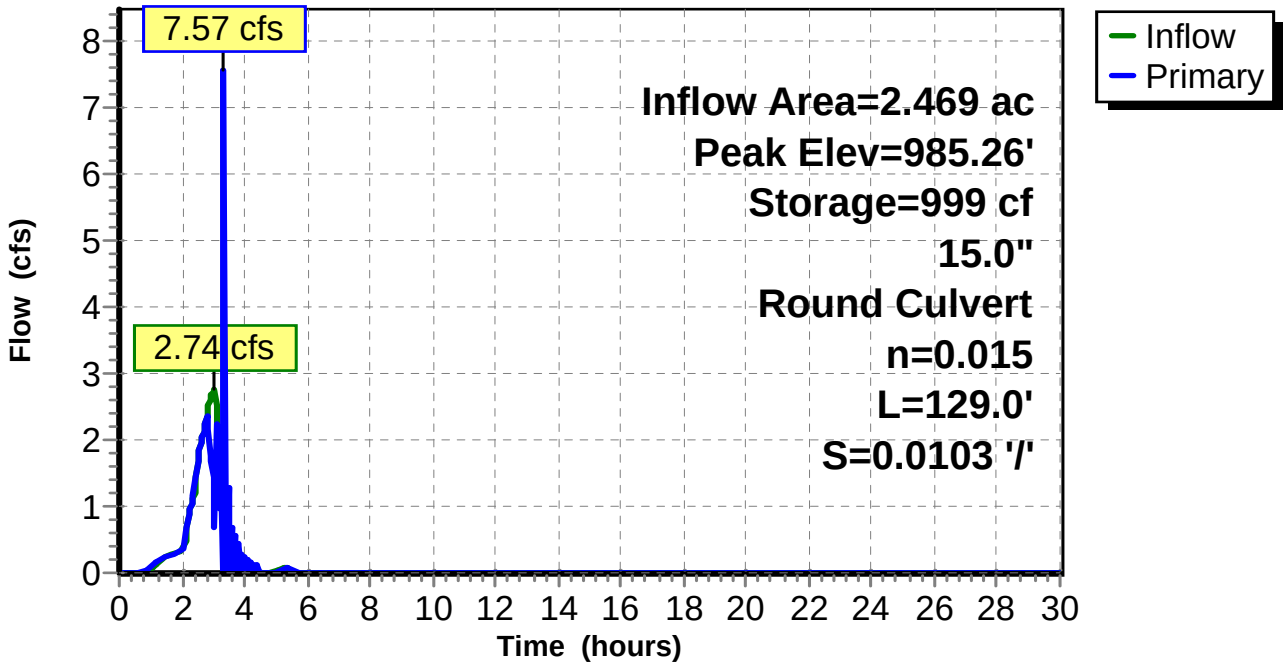
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
984.05	100	40.0	0	0	100
985.00	1,273	194.0	548	548	2,970
986.00	6,031	489.0	3,358	3,906	19,007
987.00	200,000	20,000.0	80,254	84,160	31,830,969

Device	Routing	Invert	Outlet Devices
#1	Primary	981.65'	**15.0" Round Culvert** L= 129.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 981.65' / 980.32' S= 0.0103 '/' Cc= 0.900 n= 0.015, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 3.35 hrs HW=984.82' TW=985.20' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond 2P: SI NE3 426SI

Hydrograph



Summary for Pond 4P: NE3 427 MH

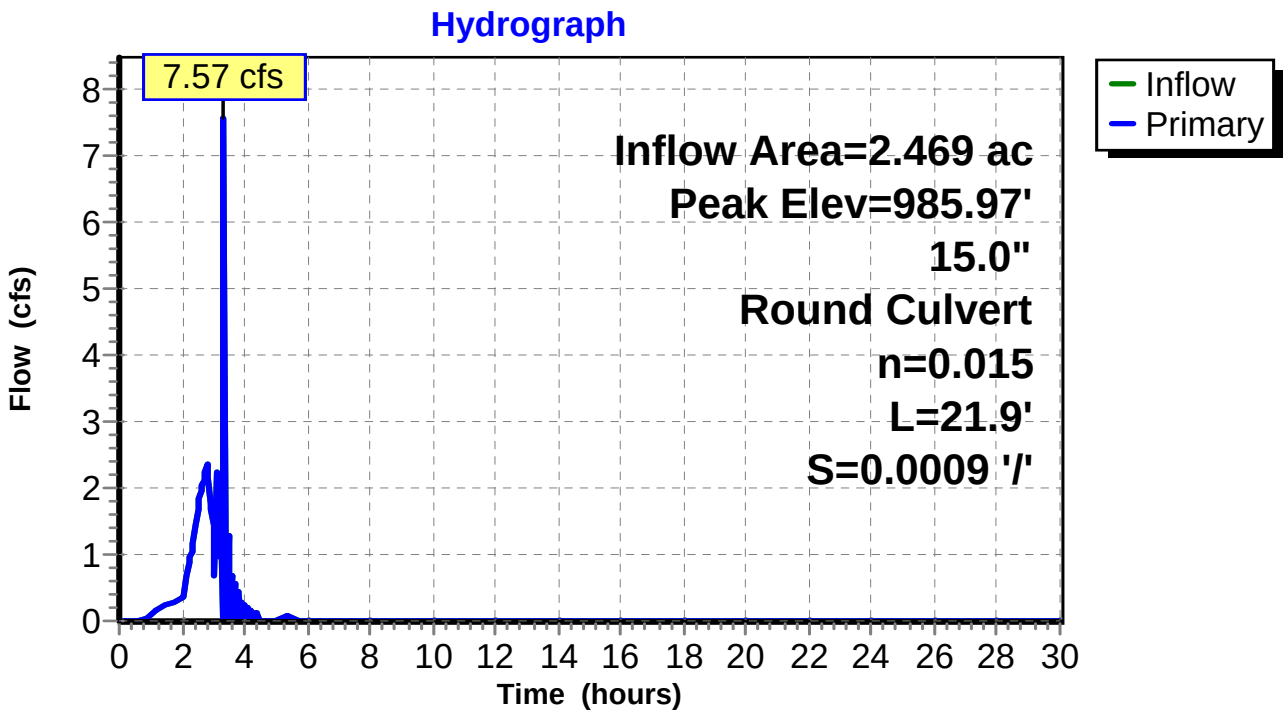
Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 1.13" for 6.23.17 event
Inflow = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af
Outflow = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min
Primary = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 985.97' @ 3.23 hrs
Flood Elev= 985.57'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.32'	**15.0" Round Culvert** L= 21.9' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 980.32' / 980.30' S= 0.0009 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 3.35 hrs HW=985.20' TW=986.68' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond 4P: NE3 427 MH



Summary for Pond 7P: NE 3 428MH

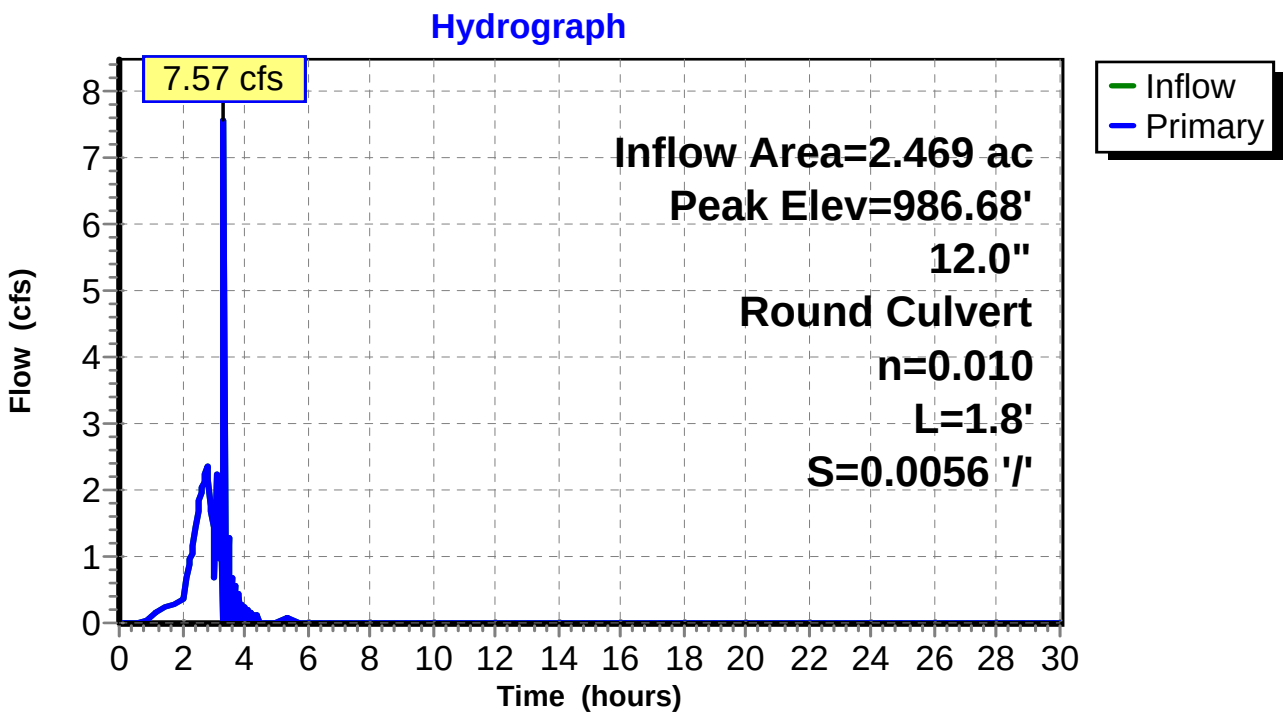
Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 1.13" for 6.23.17 event
Inflow = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af
Outflow = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min
Primary = 7.57 cfs @ 3.35 hrs, Volume= 0.232 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 986.68' @ 3.35 hrs
Flood Elev= 985.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.30'	**12.0" Round Culvert** L= 1.8' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 980.30' / 980.29' S= 0.0056 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=6.48 cfs @ 3.35 hrs HW=986.68' TW=983.74' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.48 cfs @ 8.25 fps)

Pond 7P: NE 3 428MH



Summary for Pond 8P: NE3 429 CI

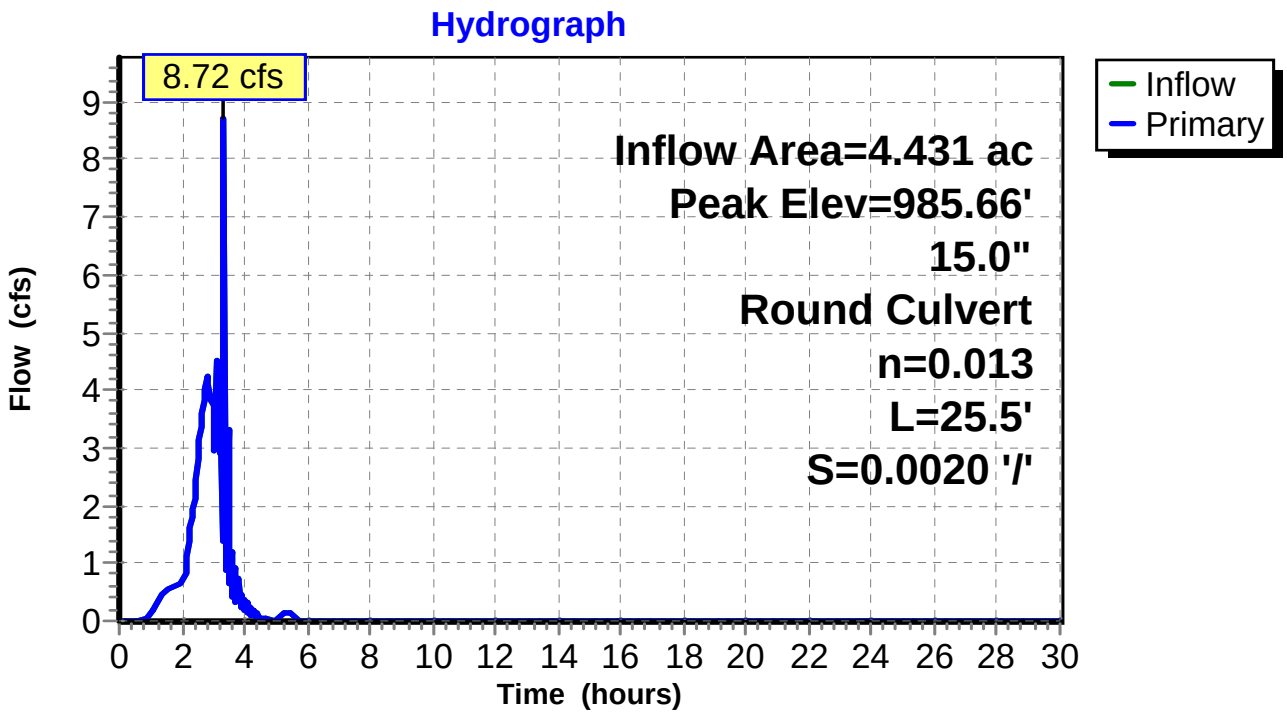
Inflow Area = 4.431 ac, 16.83% Impervious, Inflow Depth = 1.19" for 6.23.17 event
Inflow = 8.72 cfs @ 3.35 hrs, Volume= 0.440 af
Outflow = 8.72 cfs @ 3.35 hrs, Volume= 0.440 af, Atten= 0%, Lag= 0.0 min
Primary = 8.72 cfs @ 3.35 hrs, Volume= 0.440 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 985.66' @ 3.40 hrs
Flood Elev= 984.29'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.29'	**15.0" Round Culvert** L= 25.5' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 980.29' / 980.24' S= 0.0020 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 3.35 hrs HW=983.73' TW=985.57' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond 8P: NE3 429 CI



Summary for Pond 9P: NE 3 430 CI

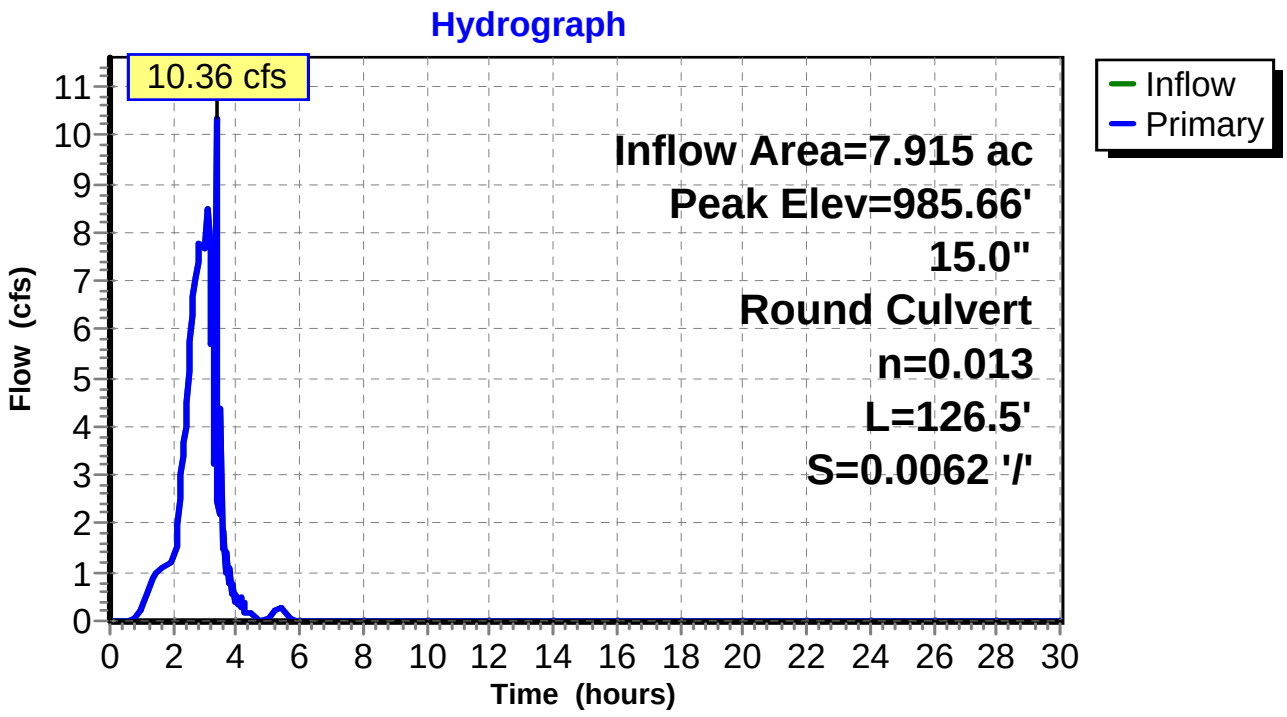
Inflow Area = 7.915 ac, 26.15% Impervious, Inflow Depth = 1.23" for 6.23.17 event
Inflow = 10.36 cfs @ 3.35 hrs, Volume= 0.809 af
Outflow = 10.36 cfs @ 3.35 hrs, Volume= 0.809 af, Atten= 0%, Lag= 0.0 min
Primary = 10.36 cfs @ 3.35 hrs, Volume= 0.809 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 985.66' @ 3.36 hrs
Flood Elev= 984.34'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.24'	**15.0" Round Culvert** L= 126.5' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 980.24' / 979.45' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=7.80 cfs @ 3.35 hrs HW=985.52' TW=982.73' (Dynamic Tailwater)
1=Culvert (Outlet Controls 7.80 cfs @ 6.35 fps)

Pond 9P: NE 3 430 CI



Summary for Pond 10P: NE# 431 SI

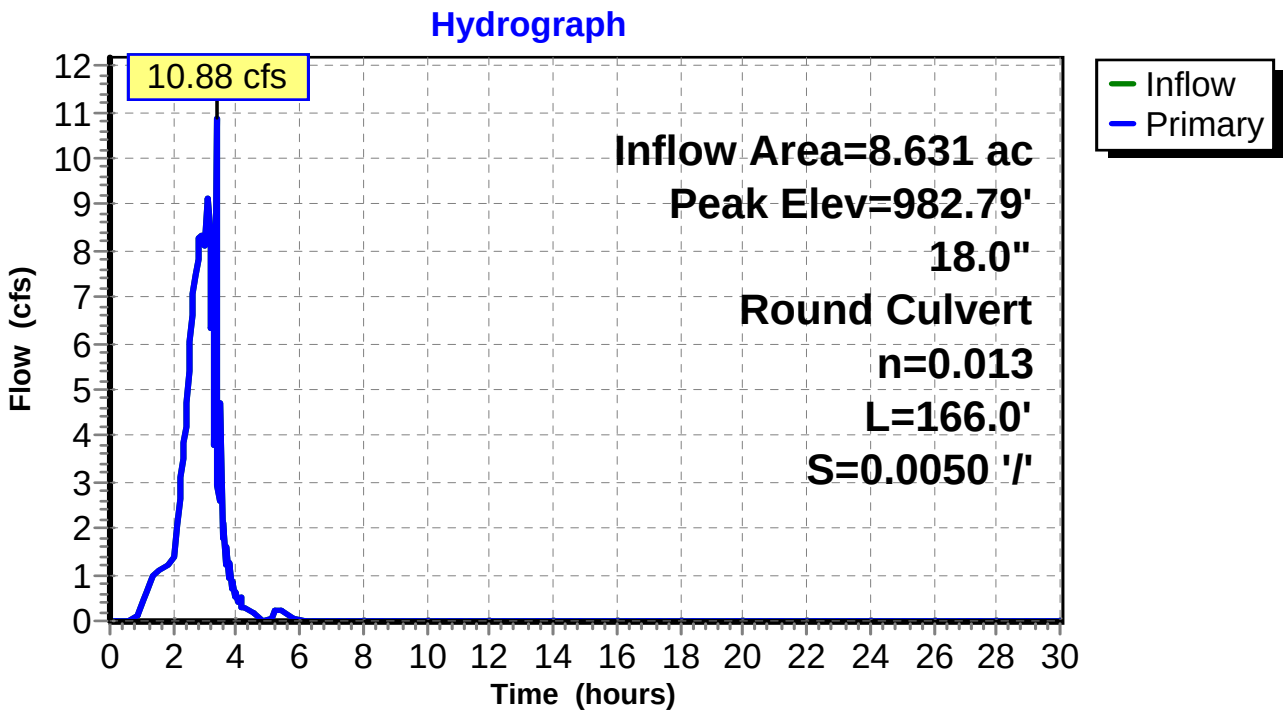
Inflow Area = 8.631 ac, 25.64% Impervious, Inflow Depth = 1.21" for 6.23.17 event
Inflow = 10.88 cfs @ 3.35 hrs, Volume= 0.871 af
Outflow = 10.88 cfs @ 3.35 hrs, Volume= 0.871 af, Atten= 0%, Lag= 0.0 min
Primary = 10.88 cfs @ 3.35 hrs, Volume= 0.871 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 982.79' @ 3.35 hrs
Flood Elev= 982.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	979.45'	**18.0" Round Culvert** L= 166.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 979.45' / 978.62' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=10.74 cfs @ 3.35 hrs HW=982.72' (Free Discharge)
1=Culvert (Barrel Controls 10.74 cfs @ 6.08 fps)

Pond 10P: NE# 431 SI



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Silverleaf Ct Runoff Area=107,531 sf 0.00% Impervious Runoff Depth=3.09"
Flow Length=288' Tc=9.7 min CN=80 Runoff=7.28 cfs 0.637 af

Subcatchment 8S: 8S Runoff Area=85,464 sf 38.00% Impervious Runoff Depth=3.38"
Flow Length=537' Tc=18.6 min CN=83 Runoff=5.75 cfs 0.553 af

Subcatchment 9S: (new Subcat) Runoff Area=85,793 sf 38.00% Impervious Runoff Depth=3.38"
Flow Length=572' Tc=15.6 min CN=83 Runoff=5.97 cfs 0.555 af

Subcatchment 10S: (new Subcat) Runoff Area=66,000 sf 38.00% Impervious Runoff Depth=3.38"
Flow Length=416' Tc=12.2 min CN=83 Runoff=4.76 cfs 0.427 af

Subcatchment 11S: (new Subcat) Runoff Area=31,170 sf 20.00% Impervious Runoff Depth=3.00"
Flow Length=250' Slope=0.0100 '/' Tc=26.5 min CN=79 Runoff=1.68 cfs 0.179 af

Pond 2P: SI NE3 426SI Peak Elev=986.28' Storage=8,984 cf Inflow=7.28 cfs 0.637 af
15.0" Round Culvert n=0.015 L=129.0' S=0.0103 '/' Outflow=9.58 cfs 0.644 af

Pond 4P: NE3 427 MH Peak Elev=996.39' Inflow=9.58 cfs 0.644 af
15.0" Round Culvert n=0.015 L=21.9' S=0.0009 '/' Outflow=9.58 cfs 0.644 af

Pond 7P: NE 3 428MH Peak Elev=1,000.01' Inflow=9.58 cfs 0.644 af
12.0" Round Culvert n=0.010 L=1.8' S=0.0056 '/' Outflow=9.58 cfs 0.644 af

Pond 8P: NE3 429 CI Peak Elev=1,008.44' Inflow=12.94 cfs 1.197 af
15.0" Round Culvert n=0.013 L=25.5' S=0.0020 '/' Outflow=12.94 cfs 1.197 af

Pond 9P: NE 3 430 CI Peak Elev=1,008.05' Inflow=22.45 cfs 2.180 af
15.0" Round Culvert n=0.013 L=126.5' S=0.0062 '/' Outflow=22.45 cfs 2.180 af

Pond 10P: NE# 431 SI Peak Elev=992.50' Inflow=23.45 cfs 2.359 af
18.0" Round Culvert n=0.013 L=166.0' S=0.0050 '/' Outflow=23.45 cfs 2.359 af

Total Runoff Area = 8.631 ac Runoff Volume = 2.351 af Average Runoff Depth = 3.27"
74.36% Pervious = 6.418 ac 25.64% Impervious = 2.213 ac

Summary for Subcatchment 1S: Silverleaf Ct

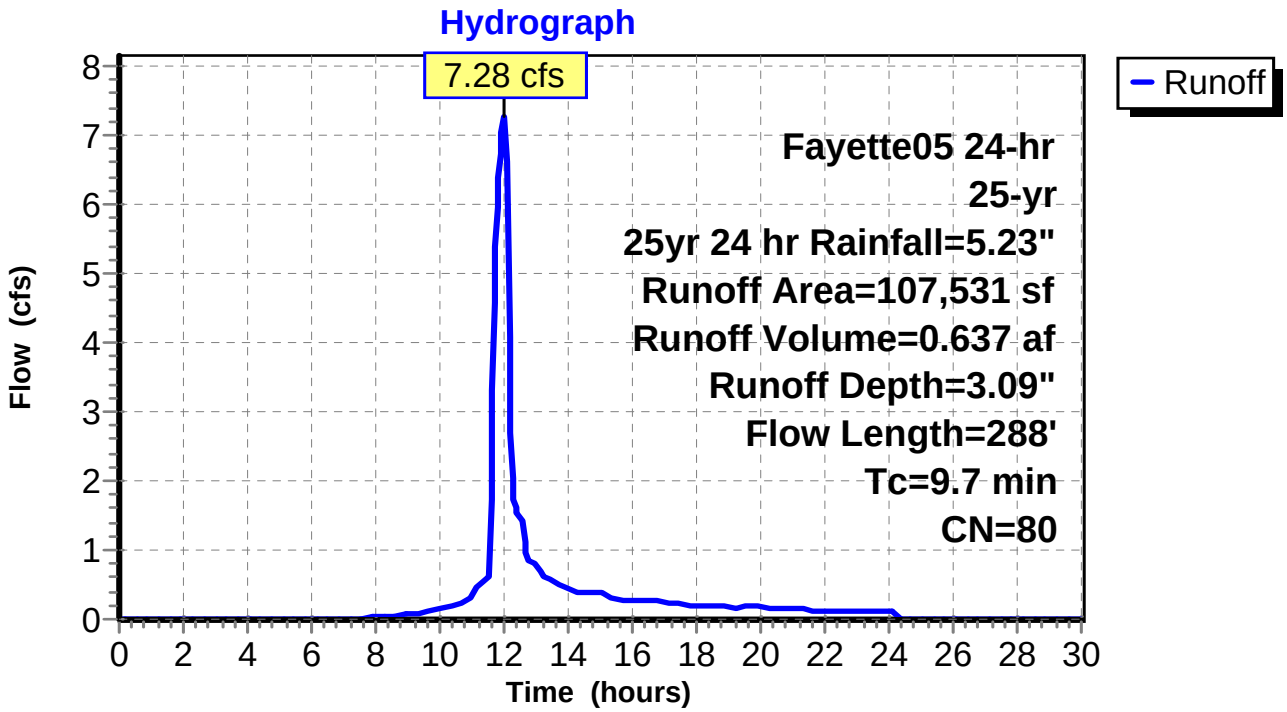
Runoff = 7.28 cfs @ 12.02 hrs, Volume= 0.637 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette05 24-hr 25-yr 25yr 24 hr Rainfall=5.23"

	Area (sf)	CN	Description
*	107,531	80	<50% Grass cover, Poor, HSG C
	107,531		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	165	0.0660	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.3	30	0.0660	1.77		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"
0.5	93	0.0320	2.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.7	288	Total			

Subcatchment 1S: Silverleaf Ct



Summary for Subcatchment 8S: 8S

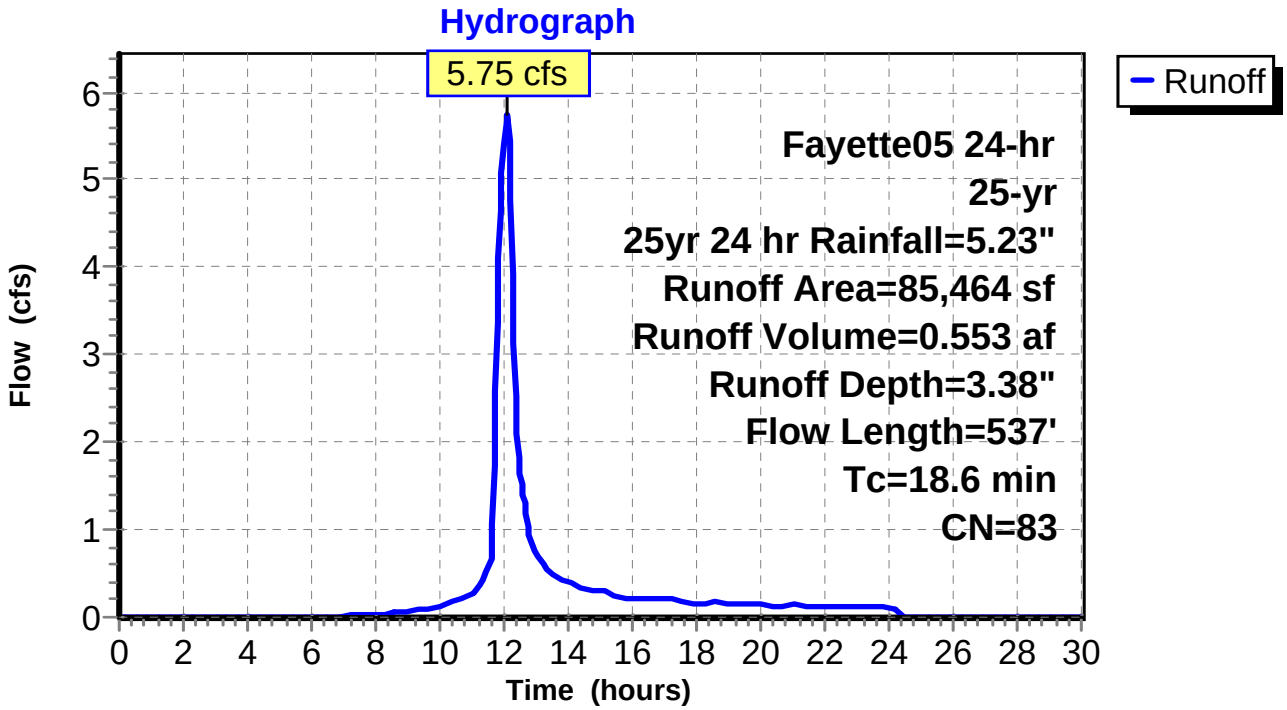
Runoff = 5.75 cfs @ 12.08 hrs, Volume= 0.553 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette05 24-hr 25-yr 25yr 24 hr Rainfall=5.23"

Area (sf)	CN	Description
85,464	83	1/4 acre lots, 38% imp, HSG C
52,988		62.00% Pervious Area
32,476		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	300	0.0533	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
2.9	237	0.0046	1.38		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	537	Total			

Subcatchment 8S: 8S



Summary for Subcatchment 9S: (new Subcat)

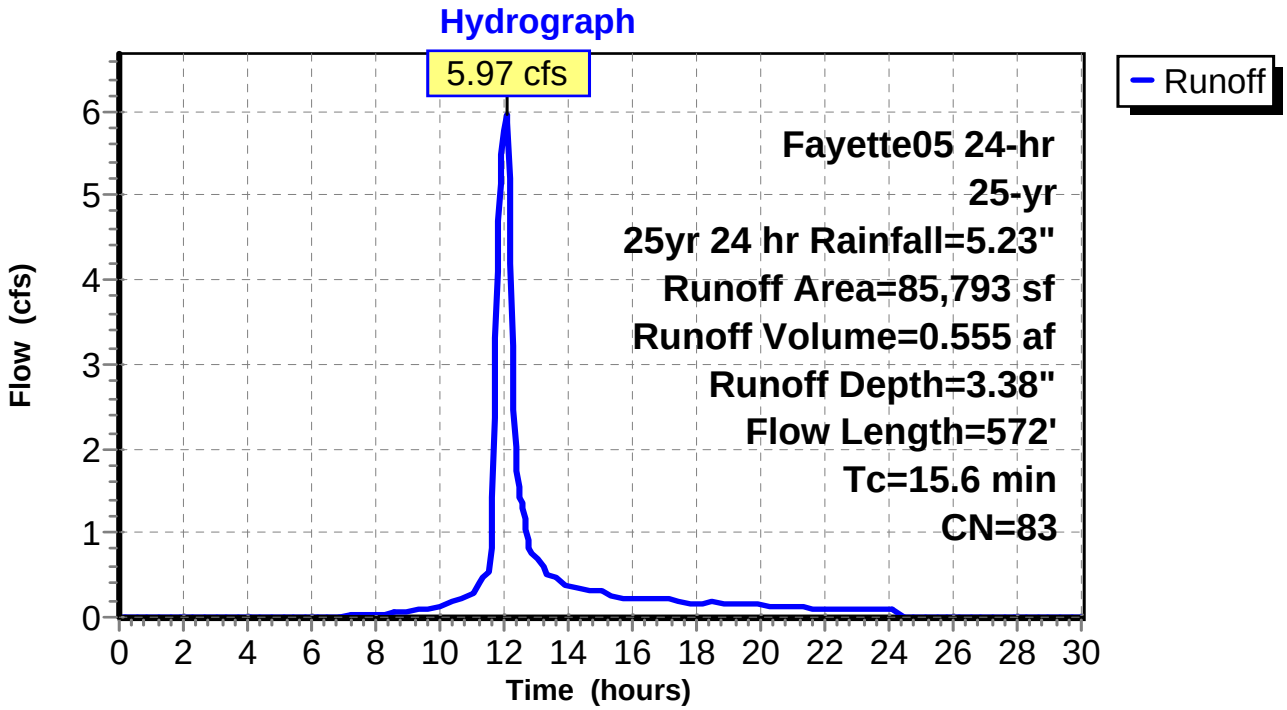
Runoff = 5.97 cfs @ 12.06 hrs, Volume= 0.555 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette05 24-hr 25-yr 25yr 24 hr Rainfall=5.23"

Area (sf)	CN	Description
85,793	83	1/4 acre lots, 38% imp, HSG C
53,192		62.00% Pervious Area
32,601		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	265	0.0528	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
1.4	307	0.0315	3.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.6	572	Total			

Subcatchment 9S: (new Subcat)



Summary for Subcatchment 10S: (new Subcat)

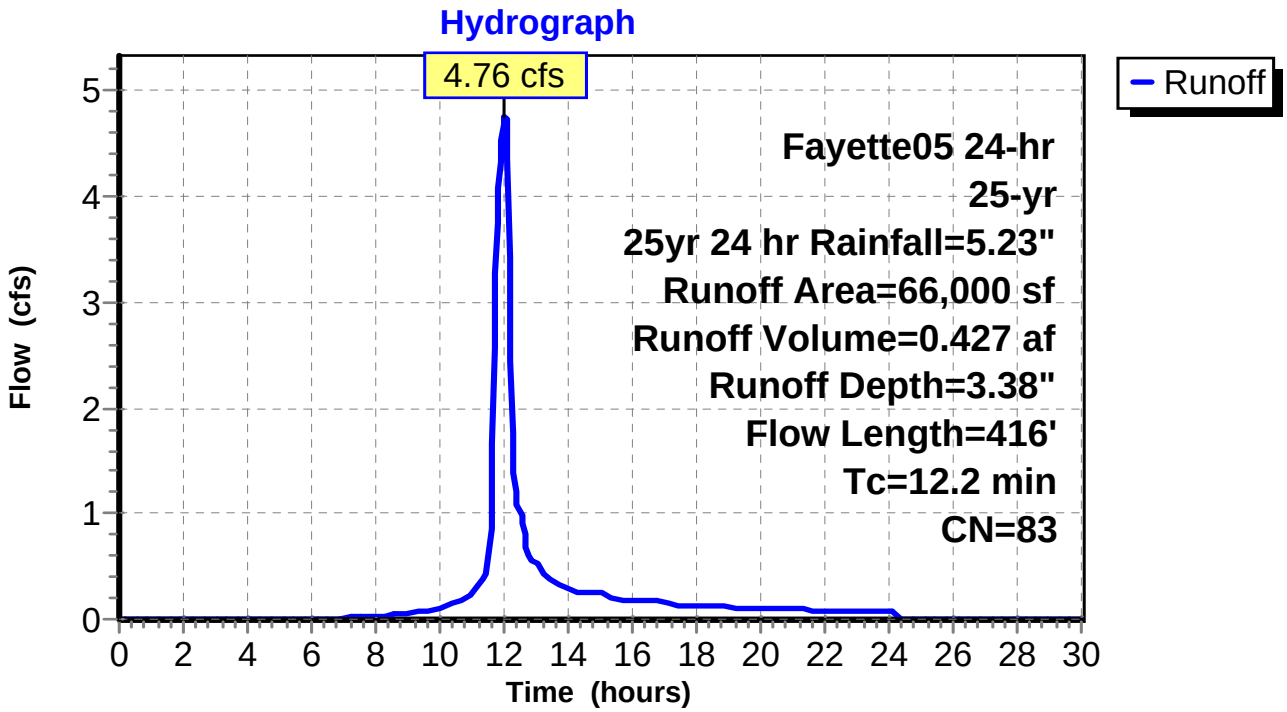
Runoff = 4.76 cfs @ 12.03 hrs, Volume= 0.427 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette05 24-hr 25-yr 25yr 24 hr Rainfall=5.23"

Area (sf)	CN	Description
66,000	83	1/4 acre lots, 38% imp, HSG C
40,920		62.00% Pervious Area
25,080		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	166	0.0391	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
1.1	250	0.0050	3.72	4.57	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
12.2	416	Total			

Subcatchment 10S: (new Subcat)



Summary for Subcatchment 11S: (new Subcat)

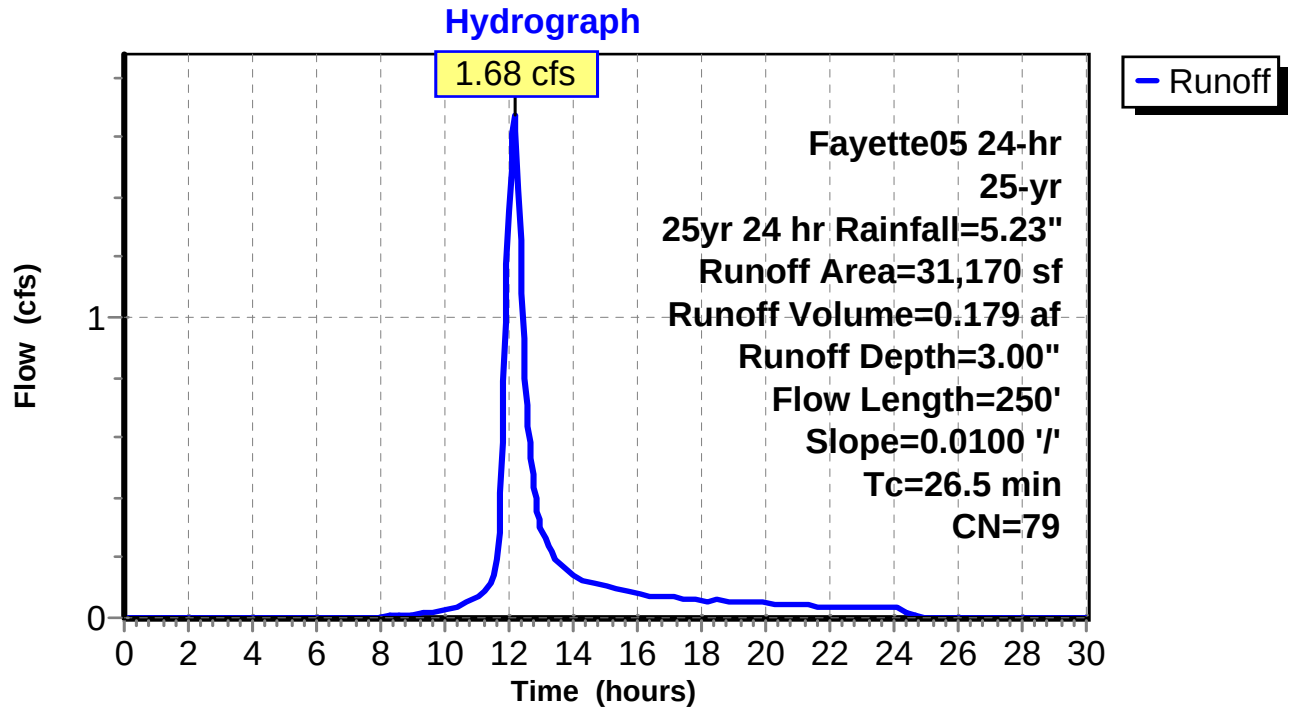
Runoff = 1.68 cfs @ 12.17 hrs, Volume= 0.179 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Fayette05 24-hr 25-yr 25yr 24 hr Rainfall=5.23"

Area (sf)	CN	Description
31,170	79	1 acre lots, 20% imp, HSG C
24,936		80.00% Pervious Area
6,234		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.5	250	0.0100	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"

Subcatchment 11S: (new Subcat)



Summary for Pond 2P: SI NE3 426SI

Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 3.09" for 25yr 24 hr event
Inflow = 7.28 cfs @ 12.02 hrs, Volume= 0.637 af
Outflow = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af, Atten= 0%, Lag= 44.9 min
Primary = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 986.28' @ 12.46 hrs Surf.Area= 33,376 sf Storage= 8,984 cf
Flood Elev= 984.05' Surf.Area= 100 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 17.1 min (836.1 - 819.0)

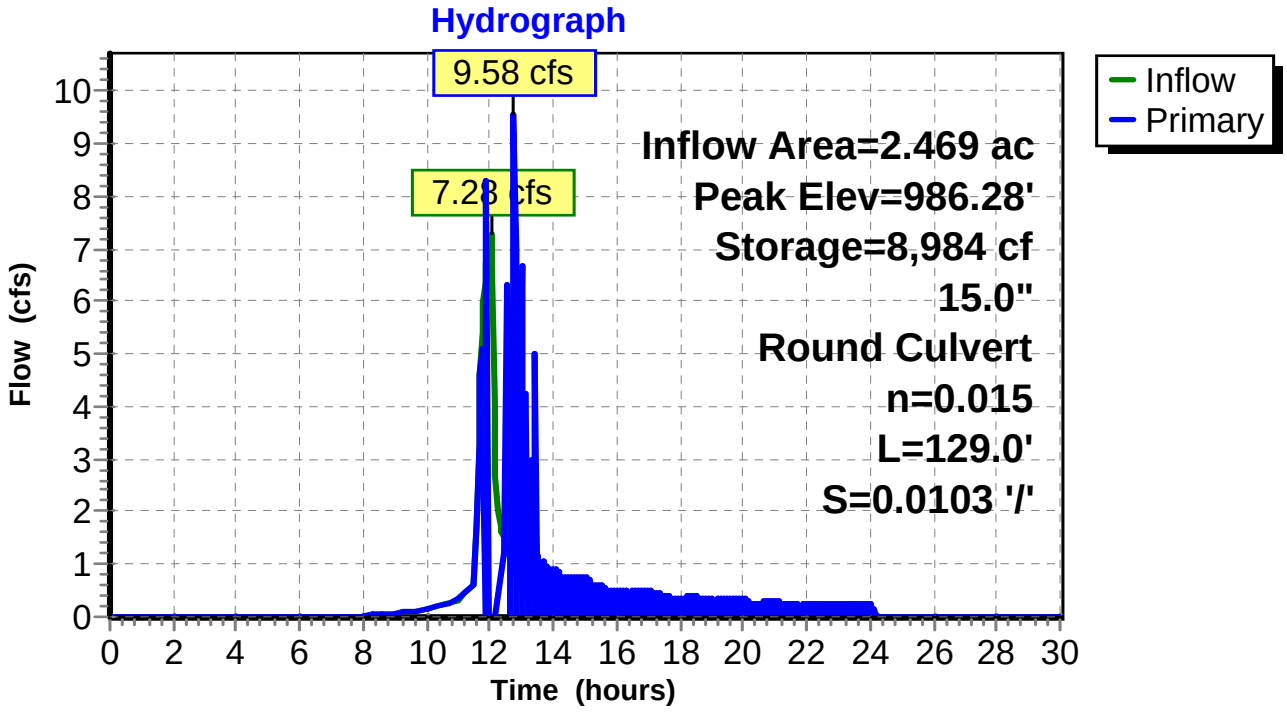
Volume	Invert	Avail.Storage	Storage Description
#1	984.05'	84,160 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
984.05	100	40.0	0	0	100
985.00	1,273	194.0	548	548	2,970
986.00	6,031	489.0	3,358	3,906	19,007
987.00	200,000	20,000.0	80,254	84,160	31,830,969

Device	Routing	Invert	Outlet Devices
#1	Primary	981.65'	**15.0" Round Culvert** L= 129.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 981.65' / 980.32' S= 0.0103 '/' Cc= 0.900 n= 0.015, Flow Area= 1.23 sf

Primary OutFlow Max=3.95 cfs @ 12.77 hrs HW=986.18' TW=985.30' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.95 cfs @ 3.22 fps)

Pond 2P: SI NE3 426SI



Summary for Pond 4P: NE3 427 MH

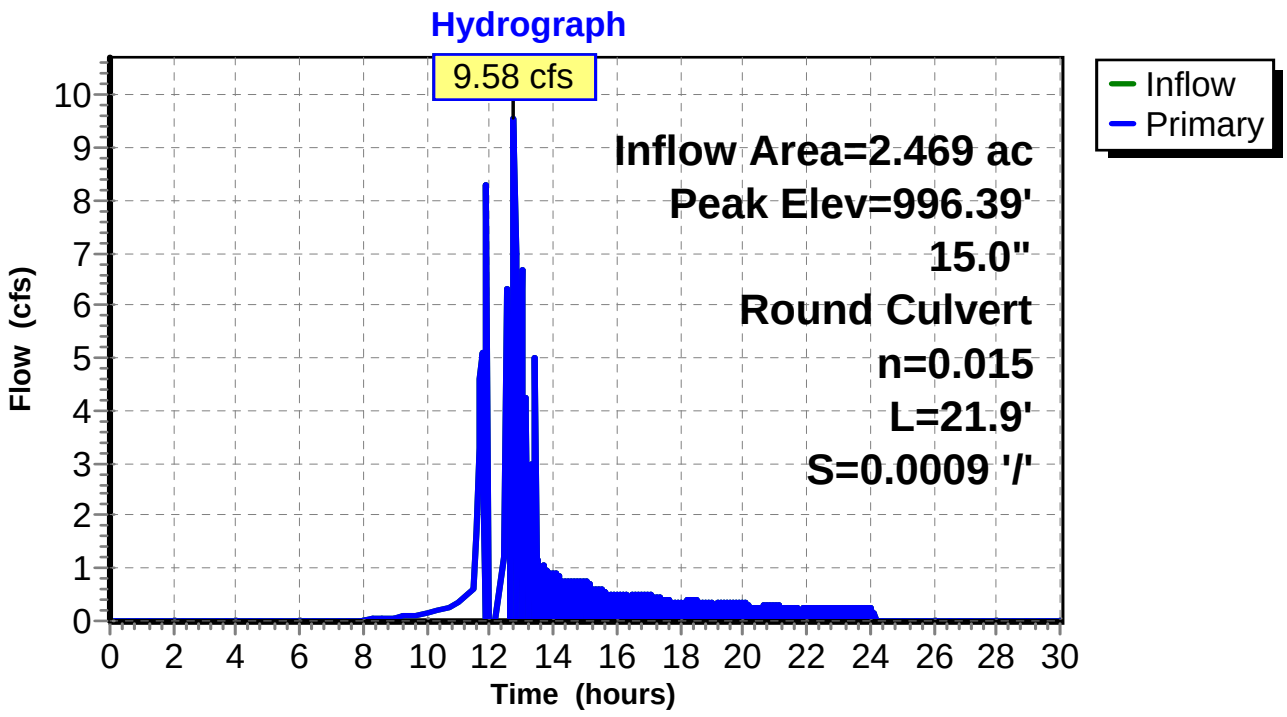
Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 3.13" for 25yr 24 hr event
Inflow = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af
Outflow = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af, Atten= 0%, Lag= 0.0 min
Primary = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 996.39' @ 12.30 hrs
Flood Elev= 985.57'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.32'	**15.0" Round Culvert** L= 21.9' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 980.32' / 980.30' S= 0.0009 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.77 hrs HW=985.30' TW=987.94' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond 4P: NE3 427 MH



Summary for Pond 7P: NE 3 428MH

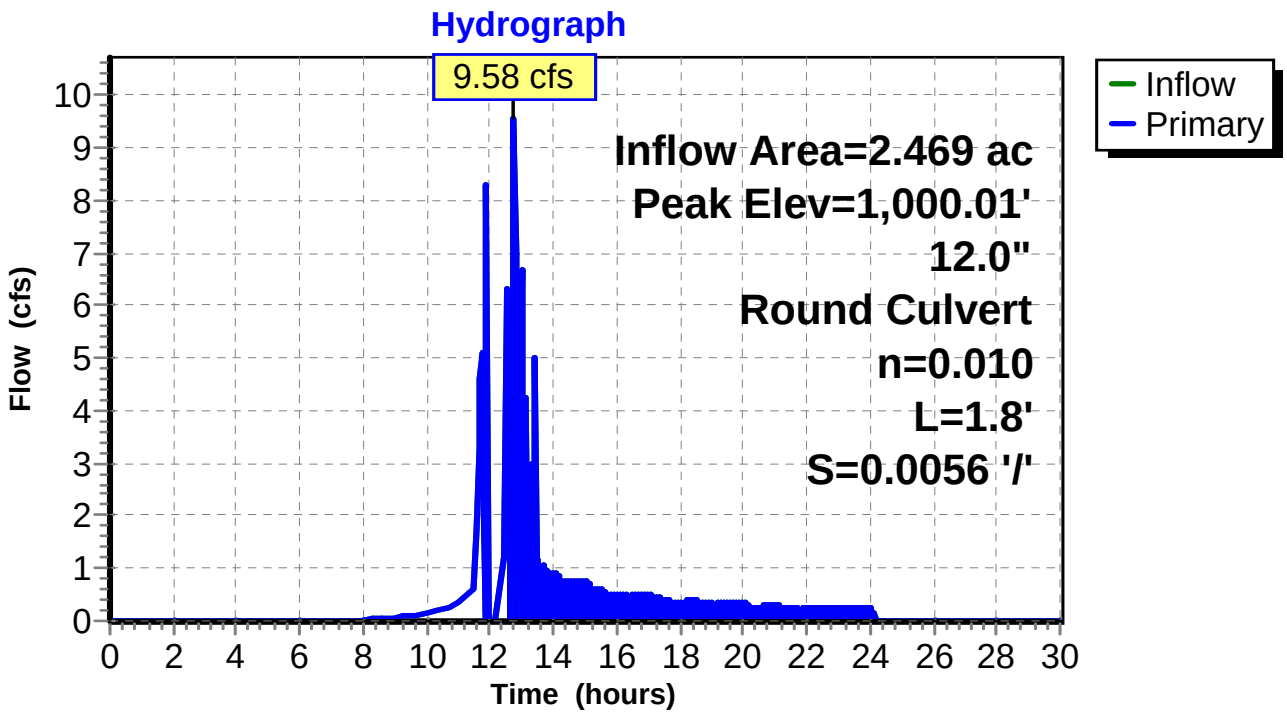
Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 3.13" for 25yr 24 hr event
Inflow = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af
Outflow = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af, Atten= 0%, Lag= 0.0 min
Primary = 9.58 cfs @ 12.77 hrs, Volume= 0.644 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 1,000.01' @ 11.91 hrs
Flood Elev= 985.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.30'	**12.0" Round Culvert** L= 1.8' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 980.30' / 980.29' S= 0.0056 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.78 cfs @ 12.77 hrs HW=987.94' TW=985.61' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.78 cfs @ 7.35 fps)

Pond 7P: NE 3 428MH



Summary for Pond 8P: NE3 429 CI

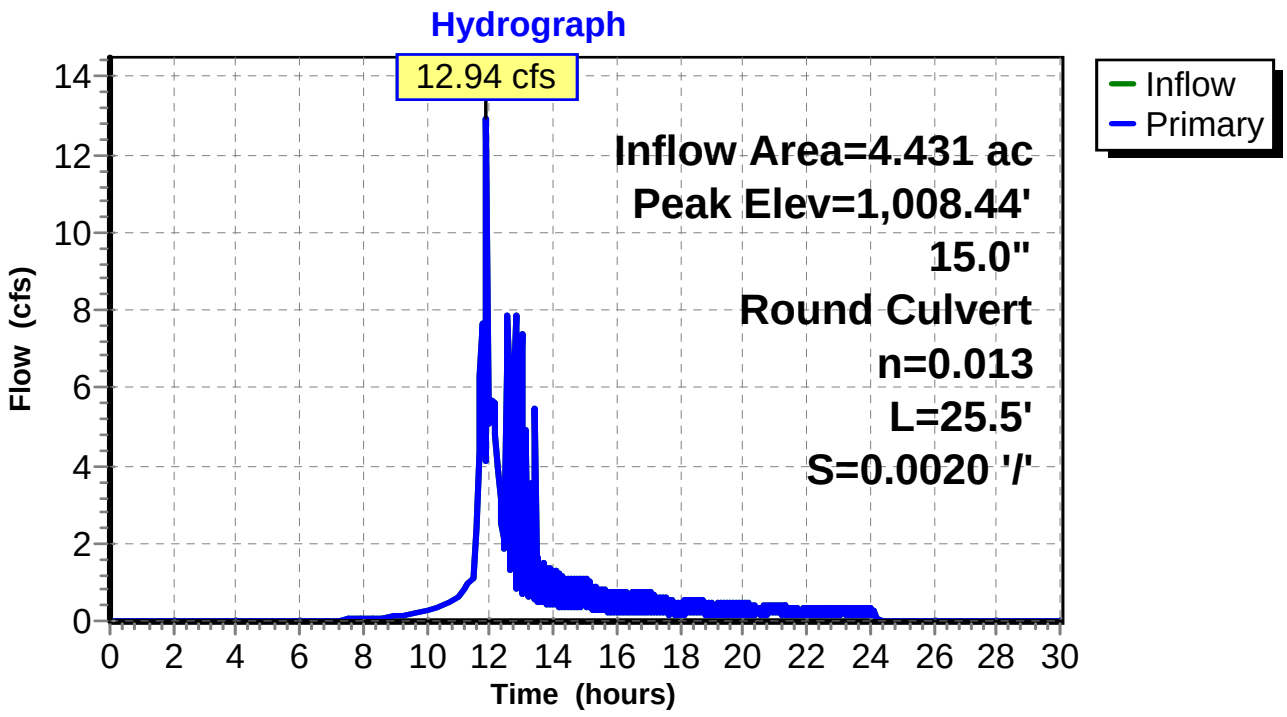
Inflow Area = 4.431 ac, 16.83% Impervious, Inflow Depth = 3.24" for 25yr 24 hr event
Inflow = 12.94 cfs @ 11.90 hrs, Volume= 1.197 af
Outflow = 12.94 cfs @ 11.90 hrs, Volume= 1.197 af, Atten= 0%, Lag= 0.0 min
Primary = 12.94 cfs @ 11.90 hrs, Volume= 1.197 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 1,008.44' @ 11.96 hrs
Flood Elev= 984.29'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.29'	**15.0" Round Culvert** L= 25.5' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 980.29' / 980.24' S= 0.0020 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 11.90 hrs HW=997.88' TW=1,007.25' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond 8P: NE3 429 CI



Summary for Pond 9P: NE 3 430 CI

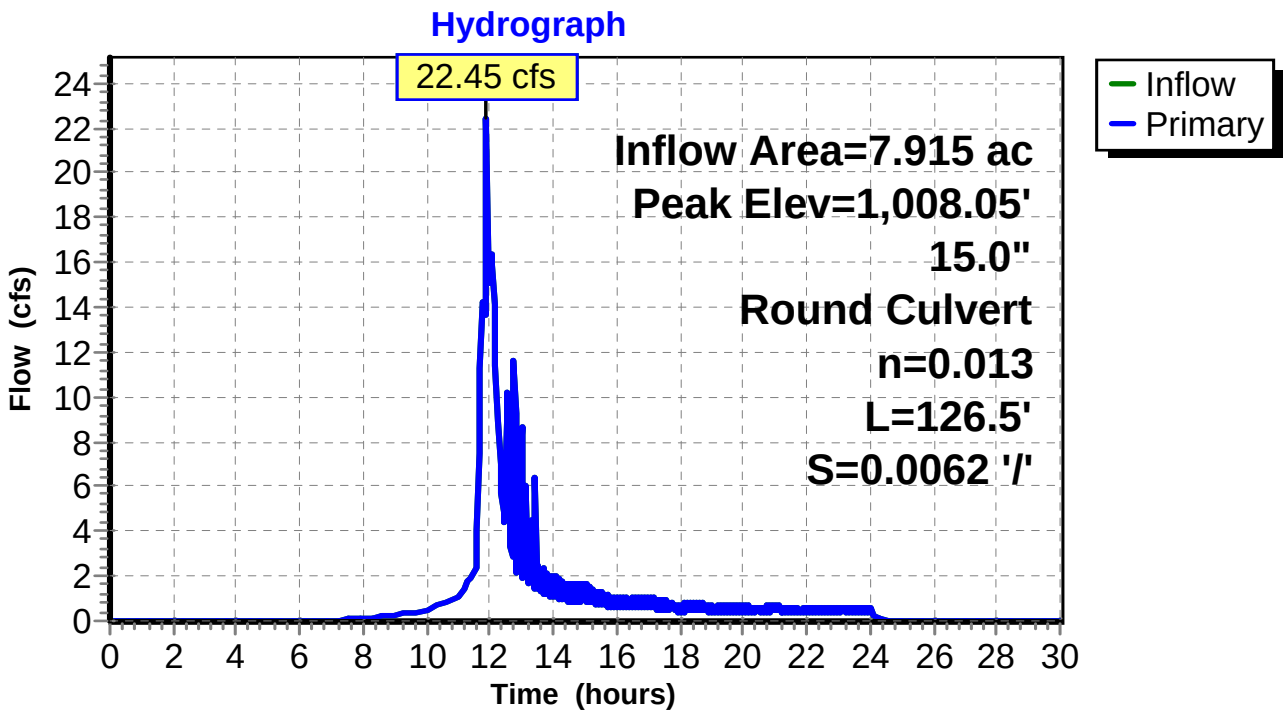
Inflow Area = 7.915 ac, 26.15% Impervious, Inflow Depth = 3.30" for 25yr 24 hr event
Inflow = 22.45 cfs @ 11.90 hrs, Volume= 2.180 af
Outflow = 22.45 cfs @ 11.90 hrs, Volume= 2.180 af, Atten= 0%, Lag= 0.0 min
Primary = 22.45 cfs @ 11.90 hrs, Volume= 2.180 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 1,008.05' @ 11.91 hrs
Flood Elev= 984.34'

Device	Routing	Invert	Outlet Devices
#1	Primary	980.24'	**15.0" Round Culvert** L= 126.5' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 980.24' / 979.45' S= 0.0062 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=18.10 cfs @ 11.90 hrs HW=1,007.09' TW=992.05' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 18.10 cfs @ 14.75 fps)

Pond 9P: NE 3 430 CI



Summary for Pond 10P: NE# 431 SI

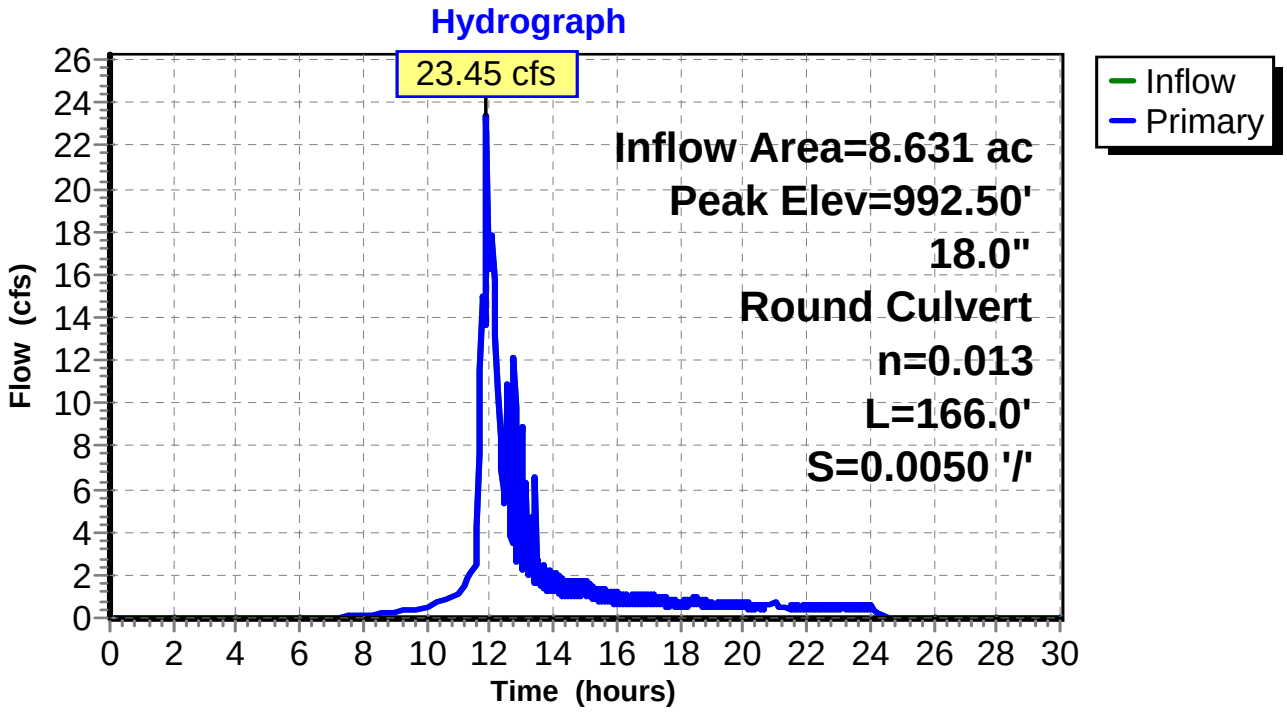
Inflow Area = 8.631 ac, 25.64% Impervious, Inflow Depth = 3.28" for 25yr 24 hr event
Inflow = 23.45 cfs @ 11.90 hrs, Volume= 2.359 af
Outflow = 23.45 cfs @ 11.90 hrs, Volume= 2.359 af, Atten= 0%, Lag= 0.0 min
Primary = 23.45 cfs @ 11.90 hrs, Volume= 2.359 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 992.50' @ 11.90 hrs
Flood Elev= 982.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	979.45'	**18.0" Round Culvert** L= 166.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 979.45' / 978.62' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=22.93 cfs @ 11.90 hrs HW=991.98' (Free Discharge)
└**1=Culvert** (Barrel Controls 22.93 cfs @ 12.97 fps)

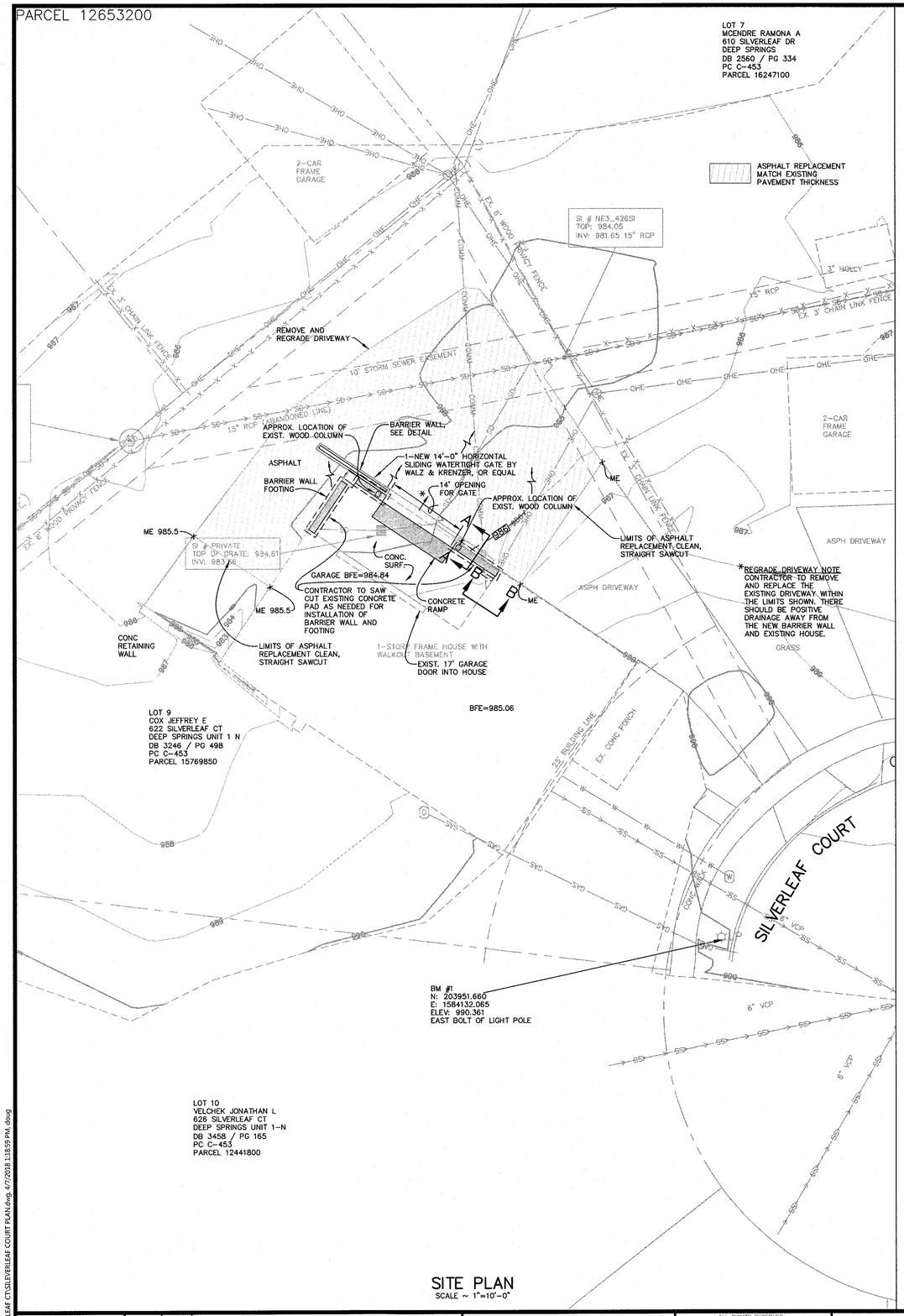
Pond 10P: NE# 431 SI



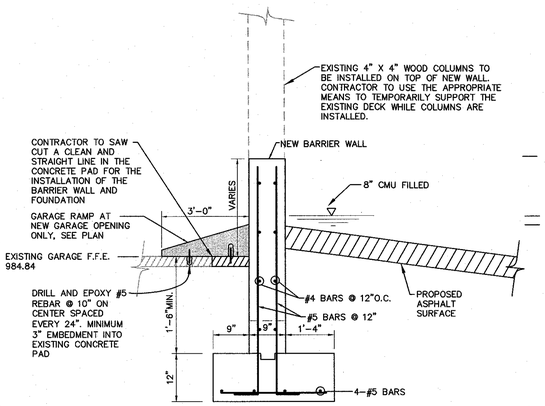
Appendix E – Waterproofing Schematic and

Correspondence from the homeowner of 622 Silverleaf Court

PARCEL 12653200

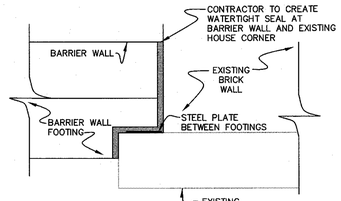


SITE PLAN
SCALE ~ 1"=10'-0"



SECTION A-A
SUGGESTED TYPICAL BARRIER WALL SECTION
N.T.S.

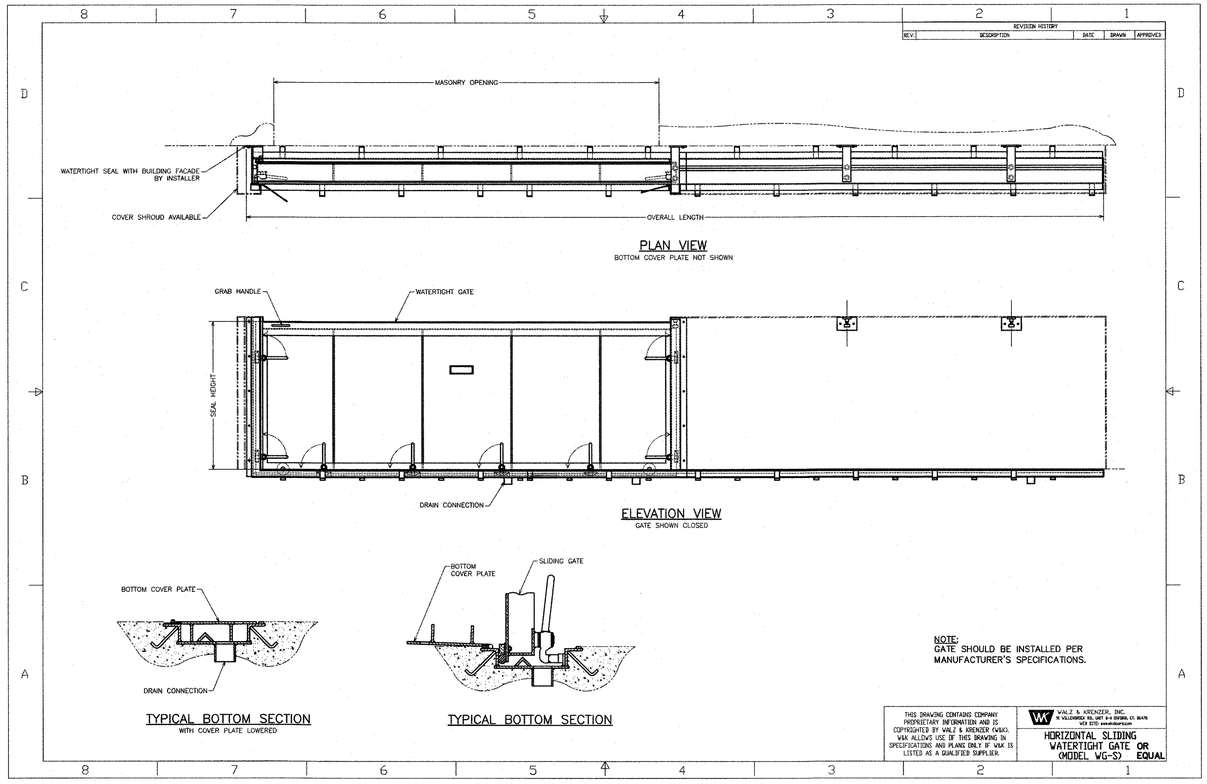
NOTE: WHERE BARRIER WALL ENDS, CONCRETE FOOTINGS SHALL EXTEND 24".



SECTION B-B
SUGGESTED WALL PROFILE AT NEW BARRIER WALL AND HOUSE WALL
N.T.S.

LEGEND:

BTM	BOTTOM OF WALL
CATV	CABLE/TELEVISION
CO	CLEANOUT
CMEP	CORRUGATED METAL ELLIPTICAL PIPE
CMP	CORRUGATED METAL PIPE (CIRCULAR)
COMM	COMMUNICATION
CONC	CONCRETE
DB	DEED BOOK
DW	DRIVEWAY
OHE	ELECTRIC LINE - OVERHEAD
UGE	ELECTRIC - UNDERGROUND
X	FENCE, WOOD PRIVACY
X	FENCE, CHAINLINK
FFE	FINISHED FLOOR ELEVATION
FH	FIRE HYDRANT
FM	FORCE MAIN (SAN.)
GAS	GAS LINE
GM	GAS METER
GV	GAS VALVE
	GUARDRAIL
	GUY WIRE
	HANDRAIL
HW	HEADWALL
INV	INVERT
IPF	IRON PIN FOUND
IPS	IRON PIN SET
PFND	IRON PIPE FOUND
LP	LIGHT POLE
MBX	MAILBOX
NWF	MAG NAIL WASHER FOUND
NWS	NAIL AND WASHER SET
PB	PLAT BOOK
PP	POWER POLE
PP GUY	GUY WIRE FOR POWER POLE
RCB	REINFORCED CONCRETE BOX CULVERT
RCP	REINFORCED CONCRETE PIPE
R/W, ROW	RIGHT-OF-WAY
	STORM DRAIN CURB INLET
	STORM DRAIN GRATE INLET
SD	STORM DRAIN LINE
SDMH	STORM DRAIN MANHOLE
SS	SANITARY SEWER LINE
SSMH	SANITARY SEWER MANHOLE
SW	SIDEWALK
	TREELINE
TOP	TOP OF WALL
UNK	UNKNOWN/INACCESSIBLE
UGT	UNDERGROUND COMM. LINE
VCP	VITRIFIED CLAY PIPE
W	WATER LINE
WM	WATER METER
	WATER VALVE
ME	MATCH EXISTING ELEVATION
BFE	BASEMENT FLOOR ELEVATION
	DRAINAGE DIRECTION



DESIGNER	DATE	BY	REVISION
DRAWN			
CHECKED			
APPROVED			

GRAPHIC SCALE

SCALE: AS NOTED

bell engineering
Lexington, KY (859) 278-5412
Hopkinsville, KY (270) 886-5466
Asheville, NC (828) 774-5499

622 SILVERLEAF COURT
LEXINGTON FAYETTE URBAN COUNTY GOVERNMENT
LEXINGTON, KENTUCKY

622 SILVERLEAF COURT
WATERPROOFING SCHEMATIC DRAWINGS

DIVISION	
CONTRACT NO.	
DATE	APRIL 2018
SHEET NO.	1 OF 1

J:\PJ\CGIS57-101 SILVERLEAF CT\SILVERLEAF COURT PLAN.dwg, 4/7/2018 1:18:59 PM, doug

Project Engineer

P: 859-278-5412 | F: 859-278-2911
jrehner@hkbell.com | www.hkbell.com

2480 Fortune Drive, Suite 350
Lexington, KY 40509

[Quoted text hidden]

Theresa Owen <towen@lexingtonky.gov> Wed, May 9, 2018 at 8:29 AM
To: Jonathan Rehner <jrehner@hkbell.com>
Cc: "Caudill, Steve" <scaudill@hkbell.com>

Jonathan,

Attached is the written word (email) from Mr. Cox stating that he does not want to move forward with our floodproofing plan. To wrap up the documentation please add the attached letter, along with the floodproofing plan that was presented into the technical memo. Therefore, we will have captured the complete story in one document for future reference and also to present to Council Woman Evans.

Once that is done, let's schedule a time to meet and go over the work completed in phase 2. Thus, the invoice for 100% of phase 2 that I received yesterday we will not be processing at this time. Please call with any questions.

Theresa Owen, PE
Project Engineer Coordinator
Department of Environmental Quality & Public Works

859.258.3426 office
lexingtonky.gov

From: Jonathan Rehner [mailto:jrehner@hkbell.com]
Sent: Tuesday, May 1, 2018 3:08 PM
To: Theresa Owen
Subject: Re: Silverleaf Update

[EXTERNAL] Use caution before clicking links and/or opening attachments.

Ok. Sounds good.

[Quoted text hidden]

---------- Forwarded message ----------
From: Jeff <jeff.cox4@gmail.com>

To: Theresa Owen <towen@lexingtonky.gov>
Cc:
Bcc:
Date: Fri, 4 May 2018 20:51:00 +0000
Subject: Flood mitigation 622 Silverleaf Court
[EXTERNAL] Use caution before clicking links and/or opening attachments.

Hi Theresa,
Apologies for not sending a note soon. Based on the plan submitted at our last meeting I'd prefer not to accept that but instead move forward on planning and negotiations for purchase of my home for use as groundwater collection/mitigation.

Please let me know what the next step is.

Thanks,

Jeff

Sent from my iPhone

---

noname.eml
3K